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Editorial

As the pandemic holds sway and often emerges with newer variants the hope for revival of economies has been put to test. While governments across the globe have been trying out innovative fiscal support measures challenges of mobility of human as well as physical inputs remain affecting jobs, supply chains and also business. Heightened efforts by the scientific community including health workers – within and without the laboratories and hospitals – have resulted in the discovery of and widespread reach of preventive vaccines in which India has played a critical role. The trying times also have affected work schedules including those relating to this journal.

This issue of the *Orissa Economic Journal* starts with the article (by Bhabesh Sen) based on his Presidential Address at the 53rd Annual Conference of the Orissa Economics Association (OEA). Written in the midst of the COVID-19 pandemic this paper presents an analysis based on an international comparison of how different economies were impacted by the unprecedented and unpredictable crisis. Health and monetary effects have the key concerns of this article. An important finding has been a significant reduction in the external inflows to developing countries that would threaten their economic progress.

The following article (by Mamata Swain, Sasmita Patnaik and Basanti Renu Hembram) deals with the complex issue of assessing crop insurance schemes in Odisha in the backdrop of climate change variables. Are new and enhanced risks faced by the farm sector being addressed by the insurance provision? The uncertainty in crop production and concomitant losses needs a closer look into the specific mechanism of crop insurance schemes. The authors analyse a number of such schemes and suggest pragmatic policy inputs.

Based on a detailed field survey the article (by Ananda Meher) unravels links between indebtedness and distress migration in rural Odisha. The analysis establishes a close association between highly-prevalent non-institutional borrowing and migration. This points to the need for broad

basing institutional credit facilities in remote rural areas. This paper had received the Best Paper Award at the 53rd Annual Conference of the OEA.

The next article (by Arindam Chakraborty) deals with a case of how a well-implemented employment guarantee scheme as the MGNREGA can contribute effectively to prevent distress migration from rural areas. Through a case study of tribal women workers in West Bengal the author has looked into causes and forms of migration in depressed rural areas and makes a case for creating opportunities for local economic activities.

In a detailed examination of unit level data on the Fourth Census of MSMEs the article (by Jaya Prakash Pradhan and Tareef Husain) unravels subnational/regional factors prompting setting up of new SMEs across Indian states and sectors a little over a quarter of a century since 1980. The rate of formation of SMEs is positively influenced by dimensions as the local market size, skill availability, technological specialization of firms, land transportation networks, and entrepreneurial culture as these vary across states. This article is based on the 8th Professor Kshetra Mohan Pattnaik Memorial Lecture organized by the OEA.

Focusing on the metal products and machinery equipment industry an article (by Prasanta Kumar Roy) attempts a decomposition of output and productivity growth at the national and state levels. In this decadal analysis the paper locates input growth effect and technological progress as key to total factor productivity growth. Policy measures to help reduce per unit cost of production for this sector are essential for improving its competitiveness.

Another article (by D. Narasimha Murthy and S. Puttaswamaiah) analyses the comparative profitability of urban farming based on wastewater and freshwater in peri-urban Bengaluru. Even as wastewater has been used as a source of irrigation, the study finds that, freshwater-based cultivation is a better option from the point of economic returns on investment in various inputs.

In a relatively short note (by Gobind Padhan and Dasarathi Padhan) on the nature and relevance of economics teaching in educational institutions

interesting observations have been made regarding the dominance of neoclassical approaches and also an excessive use of mathematical analyses. The real-life contexts of the Indian economy functioning within a larger socio-economic framework laden with discrimination are missed out in the economics curriculum in Odisha. Similarly, the history of economic thought has also been neglected in the new syllabus.

Finally, we have two book reviews in this issue. The first one (by Harsandeep Kaur) deals with subnational responses, by individual subsectors, to dealing with the Covid-19 pandemic with reference to the state of Punjab. And the second one (by Annavajhula J. C. Bose) engages with the poignant and detailed accounts of a few informal and indigent migrant workers as they walked back home due to the abrupt government announcement of lockdown due to the Covid-19 crisis.

Despite certain challenges, efforts at improving the quality (both content and language) of articles in this journal have been rewarding. Manuscripts have been received from across the nation and following an initial quality check papers are sent to relevant experts from various institutions and universities all over India with a request to review. While rejections have been unavoidable useful comments and suggestions from experts have contributed to definite improvement in the revised papers. If all these lead, maybe gradually, to a rise in the academic quality of the journal, nothing is more satisfying than that.

Keshab Das
Executive Editor

Article

Managing Economic Shocks of COVID-19: Evidences and Lessons

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Bhabesh Sen

The COVID-19 pandemic has affected almost every part of the world, but its health and monetary effects have widely differed across countries and regions. So, it is the right time to remark some conclusions. The effects have not been exactly in ways that would have been predicted. It is quite surprising that the death rates are higher in the US and some western European economies compared to many Emerging Market/Developing Economies (EMDEs). But it is feared that the monetary effect will be higher in EMDEs due to the lack of fiscal space to respond. Both external and domestic financing to EMDEs were already lower than the required SDG spending before the outbreak of the COVID-19 crisis. This leads to, however, a risk of a significant fall in financing in these economies. Given this backdrop, I wish to highlight experiences of managing COVID-19 shocks by some major economies of the world, including India.

Let me begin with the statement of Austan D. Goolsbee, who said to the *New York Times'* David Leonhardt: "Anything that slows the rate of the virus is the best thing you can do for the economy, even if by conventional measures it's bad for the economy." The statement can be interpreted in two different ways, that there might be a trade-off between health and the economy in the short run. But in the long run, the trade-off is illusory. The economy cannot survive when the virus nibbles mankind. So Goolsbee argues for an

Bhabesh Sen, President, Orissa Economics Association (2020-21) and former Professor, Department of Analytical and Applied Economics, Utkal University, Bhubaneswar. Email: senbhabesh@gmail.com

This is a revised version of the Presidential Address delivered at the 53rd Annual Conference of the OEA, organized by the National Institute of Science Education and Research, Bhubaneswar, Odisha, February 12, 2021.

escalation of spending to slow down the virus, and this has actually been the priority of virus economics. Prioritizing the medical battle against COVID-19 helps in the economic battle too. Spending on personal protective equipments (or, PPEs viz., gloves, gowns, and masks used by healthcare professionals), ventilators, additional hospital space, and other healthcare infrastructure not only slows the spread of the virus but also injects money into the economy, which is essential for an economy in the downslide.

Hasell (2020) exhibited the negative relationship between the number of deaths due to COVID-19 and the percentage decline of GDP relative to the same quarter in the previous year for various countries. Advanced economies like the UK, Italy, France, and Belgium are among the worst hit. Albeit the US, which avoided lockdown so far, could arrest its economic decline to a great extent, it had to pay a heavy price in the form of human loss. This negative relationship indicates that no trade-off exists between the economy and health. Among the G-20 countries, India enforced strict lockdown for a considerable period of time, built up PPEs. Its economy was the worst hit in Q1, which continued to Q2 too. But its human loss could be managed to a significant extent. Economies like the UK, Spain and Mexico suffered both economically as well as in the form of loss of life. However, China and South Korea did the best. Among all countries, Peru has experienced the worst economic downturn (30 per cent lower relative to the same period in 2019), followed by Spain and the UK. On the other hand, the economic down turn in Taiwan has been the least (1 per cent lower relative to the same period in 2019), followed by South Korea and Lithuania (Hasell, 2020).

Cause of Differences in COVID-19 Impact across Continents

A spatial analysis across regions indicates that Latin America has been the worst hit, whereas East and South East Asia has done the best. Africa has performed better than expected. What could be the causes? What are the reasons behind the terrible situation in Latin America, as it accounted for about half of the global summer deaths? The prime reasons cited are: It is having big densely populated cities. The share of informal workers is very high, and so many workers are migrants. Furthermore, the public health systems are inadequate and unequal. On the contrary, East and South East Asia present another example. There is a cultural willingness to wear masks. People understood the importance of quarantine and responded

spontaneously. These popular social habits coupled with a sound healthcare system placed them way ahead of the rest of the world, including the developed global north.

Even Africa has apparently done better than expected. This may be due to the low population density, a larger share of young population, experience with epidemics which has developed an adaptation habit in them, etc. Their public healthcare system has been fragile and strained, and they have overly depended on the import of pharmaceuticals and medical protective equipment, which could further exacerbate the situation. But early and quick interventions by governments helped delay the initial transmission of the virus. They have learned valuable lessons on the necessity of decentralising the response to the community level and increasing capacity to detect and diagnose cases from their previous experience of dealing with Ebola and other infectious outbreaks. To mitigate the epidemic, nations have joined their forces and combined their efforts which are excellent examples of cooperation.

Within continents too, different countries faced the crisis differently. Within Latin America, three countries viz., Brazil, Mexico, and Nicaragua suffered badly. Initially, their political leadership lacked comprehension. They were in a denial mode. Testing and provision of PPEs were quite discouraging. However, countries like Uruguay are doing it right. There were rampant testing and quarantining, which ultimately brought down the spread. On the other hand, countries like Peru have tried their best and have not done any wrong, suffered severely.

Within Europe, the UK leadership took the situation casually, and it suffered badly. On the contrary, Germany's leaders took it seriously and managed the situation well.

Economic Impact

The United Nations Development Programme (UNDP) and the World Bank have given a warning that the crisis could push between 40 and 60 million people into extreme poverty this year (2020), with Sub-Saharan Africa to be most affected, followed by South Asia, while the International Labour Organization expects the equivalent of 195 million jobs lost. The World Food Programme projects that 135 million people are facing crisis levels of

hunger or worse, while another 130 million are on the edge of starvation. The SDG has targeted to reduce extreme poverty to 3 per cent globally by 2030. But it has been reversed for the first time in over 20 years because of COVID-19 and a few others. It is predicted that COVID-19 may push up to 100 million additional people into extreme poverty in 2020.

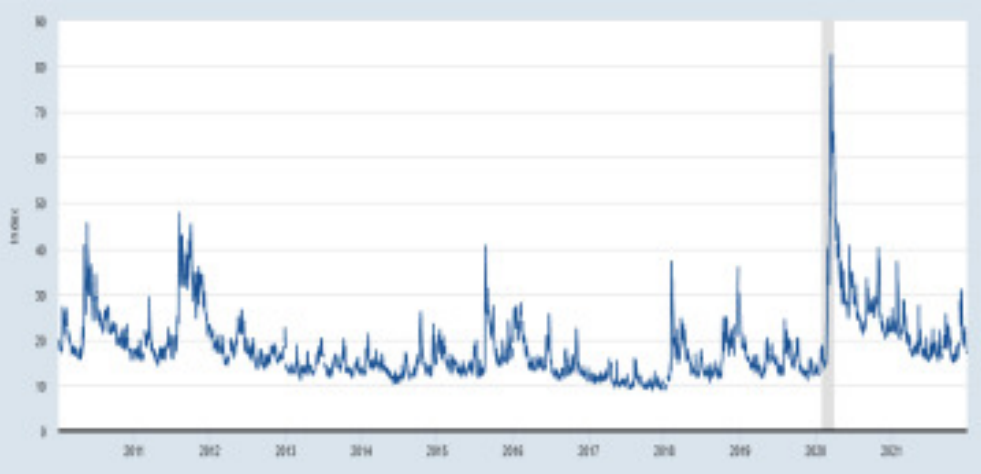
Even before COVID-19, the financial disorder in Europe had spread to developing and other high-income countries, which had not been affected till then. Capital flows to developing countries had fallen sharply. At the same time, growth in several major developing countries (South Africa, Turkey, India, Brazil, and, to a lesser extent, Russia) was significantly slower than it was earlier in the recovery. Worldwide investors decided to back out from EMDEs. The COVID pandemic has worsened the situation. Although there are now some early indications of recovery, the economic outlook is expected to remain gloomy for EMDEs. This is due to the fact the EMDEs lack fiscal space relative to the developed West, including the US and Europe, which can react with expansionary fiscal and monetary policies. The spending response in advanced economies is higher compared to low-income countries.

Discretionary fiscal measures combined with loan guarantees and other credit measures constitute about 23 per cent of GDP in advanced economies compared to less than 3 per cent of GDP in less developed economies. In middle-income countries, it is also not more than 6 percent (A sigh of relief, 2020).

Mühleisenet al. (2020) showed the debt-GDP ratio of emerging market economies (EMEs). Starting 2020 with a high debt-GDP ratio and facing higher sovereign spreads during the COVID-19 pandemic, EMDEs have little space to continue the budget deficit.

It may be noted that during the COVID-19 crisis, the portfolio outflows from emerging markets surpassed the outflows in the 2008 Global Financial Crisis (GFC) or 2013 Taper Tantrum (G20 high-level ministerial conference, 2020). Regarding “Risk off”,- the volatility index (VIX) started rising steeply between February 20 and March 16 of 2020 across the emerging economies, which hit EMEs.

Figure 1: CBOE Volatility Index (VIX), 2010-2021



Source: Chicago Board Options Exchange. Retrieved from fred.stlouisfed.org

Note: Shaded areas indicate U.S. recessions.

Figure 1 exhibits the VIX from 2010 to 2021. It can be seen that, in 2020, the VIX was unprecedented. It started rising steeply between February 20 and March 16 of 2020. Generally, the EMDEs are highly vulnerable to the COVID-19 pandemic. They suffer from uncertain access to international capital markets. International borrowing is ample and cheap when the worldwide growth is high and investors are less risk-averse. But when a global crisis emerges and investors become more risk-averse, that borrowing becomes scanty. Such a credit crunch for EMEs is often denoted as a "sudden stop" of capital flows. Incorporated with the prevailing burdens on many of these economies due to the pandemic, this "sudden stop" could become a serious hindrance in the path of economic recovery and normalization. To trigger a sudden stop, global factors, such as a worldwide spike in investor risk aversion, might be the genuine solution. However, it may result from the pandemic having emerged in EMDEs (Ahmed et al., 2020).

Despite the decline in emerging market indicators, the asset prices in emerging markets have recovered since March (A sigh of relief, 2020). But the question arises will it last? There was a further rise in risky assets despite the gloomy economic outlook, which raised concerns about a discontinuity from economic prospects. In advanced economies, real yield further fell into the negative zone as inflation break-even get back into the pre-pandemic levels. While a sharp depreciation in the dollar value against the euro was

noticed, EME currencies were bounded in range because global investors were less enthusiastic about EME financial assets.

The sovereign debt rating for EMEs has been downgraded, and this downgrades of sovereign debts in 2020 exceed the 1982 international debt crisis, 1997-98 East Asian crisis, 2008-09 GFC, etc. (Bulow et al., 2020).It is yet another fact that the EMDEs have lost private capital inflows during COVID-19. They have confronted falling internal and external demand, significant capital outflows, and rising borrowing costs from external. Governments of EMDEs have raised internal borrowing through unorthodox policies to accumulate fiscal resources to battle against the pandemic. This leads to increase pressure on external finance premiums, which can decrease capital inflows further (Kalemli-Ozcan, 2020). However, it is experienced that prompt funding by multilateral agencies has helped the EMDEs to offset a collapse of government revenue management (Bulow et al., 2020).

Till September 2020, the IMF has focused mainly on precautionary lending and emergency lending to financially aid about 80 countries (Gregory et al., 2020). It may be noted here that the IMF assistance so far focusses on emergency funding. Its financial assistance is basically targeted to help the most vulnerable countries in their economic recovery. The Fund has temporarily doubled the access to its emergency facilities - the Rapid Credit Facility (RCF) and Rapid Financing Instrument (RFI) - allowing it to meet increased demand for financial assistance from member counties without needing a full-fledged program in place. The Flexible Credit Line (FCL) is meant for countries that have very strong policy frameworks and keep records of economic performance during crisis prevention and mitigation. The IMF has also extended debt service relief through the Catastrophe Containment and Relief Trust (CCRT) to 29 of its poorest and most vulnerable member countries to channelize more of their scarce financial resources towards vital emergency medical and other relief efforts. It has approved the establishment of a Short-term Liquidity Line (SLL) to further strengthen the global financial safety.

Conclusion

As mentioned in the following, the pandemic has taught so many lessons to counter it.

- Those countries have been worst affected where governments hide statistics, fail to accelerate testing, or resume early after a shutdown due to political or economic motivations.
- Though some political leaders believe that a trade-off exists between the economy and health, it has been proven deceptive.
- The EMDEs found it most difficult to finance their deficits due to less fiscal space vis-a-vis advanced economies, high debt-GDP ratio, capital outflows following the shock of February 2020, "Risk off" from February, downgrades of sovereign debt, etc.
- However, the official flows especially multilateral have helped. The IMF financing came as a rescue to some of the EMDEs.
- But how long it will take before the financial environment turns against EMDEs is a question to ponder over.

It is feared that the drop in external inflows to developing countries could be over USD 700 billion in 2020 relative to 2019 levels, 60 per cent higher than the drop during the 2008 Global Financial Crisis. This would lead to hinder major development that would, in turn, make them more vulnerable to future pandemics, climate change, and other global public bads. Though immediate accommodative finance is an essential short-term source of financing economic development, the viable long-term source is only tax revenues.

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Article

Performance of Crop Insurance Schemes in Odisha: Need for Redesigning in the Context of Climate Change

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Mamata Swain
Sasmita Patnaik
Basanti Renu Hembram

Abstract

Odisha is extremely vulnerable to climate change and catastrophic loss because of its tropical climate, monsoon-based rain, long coastline, high dependence on agriculture, mass poverty and low irrigation coverage. Manifestations of climate change in Odisha are steady increase in temperature, rise in rainfall variability, weak monsoon activity, water stress, inundation of coastal areas, and increase in frequency and intensity of extreme weather events such as droughts, floods, cyclones and storm surges. These events have caused significant instability in crop yield and production in Odisha and thus, have enhanced agricultural risk and endangered rural livelihood and food security. Crop insurance is a risk transfer mechanism and an ex-ante adaptation measure to cope with adverse effects of natural disasters. This paper analyses the efficacy of the crop insurance schemes implemented in Odisha in addressing the enhanced agricultural risk due to climate change. The paper concludes that crop insurance schemes need to be redesigned in such a manner that insurance not only acts as a risk

Mamata Swain, Professor, Department of Economics, Ravenshaw University, Cuttack, Odisha. Email: mama_swain@hotmail.com

Sasmita Patnaik, Lecturer in Rural Development, Department of Economics, Ravenshaw University, Cuttack, Odisha. Email: sasmita.mitu@yahoo.co.in

Basanti Renu Hembram, Assistant Professor, School of Commerce and Management, Arka Jain University, Jamshedpur. Email: basanti.renu@gmail.com

transfer tool but also a potent device to reduce risk and crop loss by inducing desirable proactive and reactive responses in insurance users.

Keywords: Climate change, Agricultural risk, Crop insurance

1. Climate Change and Its Adverse Effects

Climate change is threatening rural livelihood and food security, mostly in developing economies dependent on agriculture. An overwhelming majority in the scientific community agrees that climate is changing and the globe is warming up primarily as a result of human activities, such as emission of greenhouse gases (GHGs). During the 20th century, the earth's mean global temperature rose by 0.74 °C and is expected to increase by a further 1.10°C to 6.40°C by the end of the 21st century (IPCC, 2007). The impacts of climate change are being felt all over the world. Temperatures are increasing, rainfall is more erratic, sea levels are slowly rising and extreme weather events are becoming more frequent. The Stern Report (2007) points out that the damaging impacts of climate change are likely to be caused by increase in severity of extreme weather events, such as droughts, floods, cyclones and storm surges. These risks can be reduced through systematic efforts to analyse and manage the causal factors, reducing exposure to hazards, lessening vulnerability of people and property, management of land and the environment, and improved preparedness for adverse events. Risks that cannot be prevented or reduced in a cost-efficient manner can either be retained by farmers or transferred to third parties through financial instruments, such as crop insurance (Warner et al., 2013). Insurance does not reduce risk. By providing indemnity to farmers in the event of crop failure insurance helps in mitigating the adverse effects of hazards on consumption and investment.

The Indian economy is extremely vulnerable to climate change risks because of its high dependence on agriculture and preponderance of marginal and small farmers. Consistent warming trends and more frequent and intense extreme weather events are being observed across India The state of Odisha, located in the east coast of India, is considered to be the hotbed of climatic events (GoO, 2018b). The use of micro-insurance to cover losses caused by natural hazards is drawing the attention of the state government. The government has implemented various crop insurance schemes at different points in time to provide economic support to farmers and stabilize farm

income in the event of crop failure due to non-preventable risks, such as natural calamities, infestation of plant diseases, and pest attacks.

In the context of climate change, the primary concern is to reduce risk, whereas crop insurance is a risk transfer mechanism. However, in recent years, emphasis has been placed on designing insurance products to encourage risk reduction activities by providing proper incentives. Crop insurance may be an important tool in a comprehensive climate risk management strategy.

The primary objective of this paper is to critically examine the performance of insurance schemes implemented in Odisha and highlight the innovations required to redesign these schemes to address agricultural risk due to climate change. Section 2 analyzes the climate change manifestations in Odisha and its impact on agriculture. Section 3 critically examines the features of major crop insurance schemes implemented in Odisha. Section 4 assesses their performance with time series data collected from secondary sources. Section 5 summarizes the major findings and indicates how insurance can act as risk reduction mechanism along with its primary role of risk transfer.

2. Vulnerability of Agriculture to Climate Change in Odisha

Climate of the state of Odisha is tropical, characterized by high temperature, high humidity, medium to high rainfall, short and mild winter. Temperature remains high from March to May ranging from average minimum temperature of 25° C to average maximum temperature of 36° can rainfall is high during June to September. The south-west monsoon is the major source of rainfall. The state also receives a small amount of rain from the retreating monsoon in October–November, when cyclone and storms are occasionally experienced. The annual average rainfall of the state is 1451 mm and nearly 80 per cent of rainfall is received from June to September. There is wide variation in quantum of rainfall temporally and spatially. Agriculture is the backbone of the state. However, the share of agriculture in GSDP has declined substantially to 20 per cent in 2017-18 from 60 per cent during the 1960s. Meanwhile, the share of population dependent on agriculture continues to be significant around 50 per cent (GoO, 2018a). Odisha is one of the poorest states in India, with 33 per cent of its population languishing below the poverty line in 2011-12, while 22 per cent of country's population remains below poverty line. Along with chronic poverty,

transient poverty is also very high in the state due to frequent occurrence of climate induced natural disasters, such as floods, droughts and cyclones as shown in Table 1. In Odisha, irrigation facility has been provided to only 41 per cent of cultivable land. Thus, 59 per cent of cultivable land is exposed to the vagaries of the monsoon, causing wide variations in crop output.

The manifestations of climate change as observed in Odisha are drier weather conditions, extended dry season, early end of rainy season, weak monsoon activity, above normal air temperatures (Mujumdar & Ghosh, 2007). The mean maximum temperature and the mean minimum temperature of Odisha have been on the rise. Calculations project that for the next two decades there will be warming of about 0.2° C. Over the years, rainfall has been decreasing in the dry period of the year, whereas it has been increasing during the wet period. As a result, there has been an increase in occurrence of droughts and floods (Gulati et al., 2009).

As indicated in Appendix 1 and Figure 1, the average annual normal rainfall of Odisha shows a declining trend. Between 1961 and 2000, average annual normal rainfall was 1,502.5 mm. It decreased to 1482.2 mm during the years 2001-2004. It has further declined to an average of 1451.2 mm since 2005. During the 53 year-period from 1961 to 2013, only 11 years were normal and the rest 42 years were abnormal, with occurrence of droughts, floods, and cyclones of varying intensity. The variability of actual rainfall from normal was also very high. The co-efficient of variation in annual rainfall was 16.9 per cent.

Odisha's coastal districts are prone to floods and cyclones, while drought is particularly frequent and severe in the western districts of the state. An increase in the variability of precipitation, coupled with increase in temperature due to global warming, has impacted the hydrological cycle in Odisha. This has affected the timing and magnitude of floods, droughts, sediment discharge, and drainage of river systems (Mujumdar & Ghosh, 2007; Patra et al., 2012).

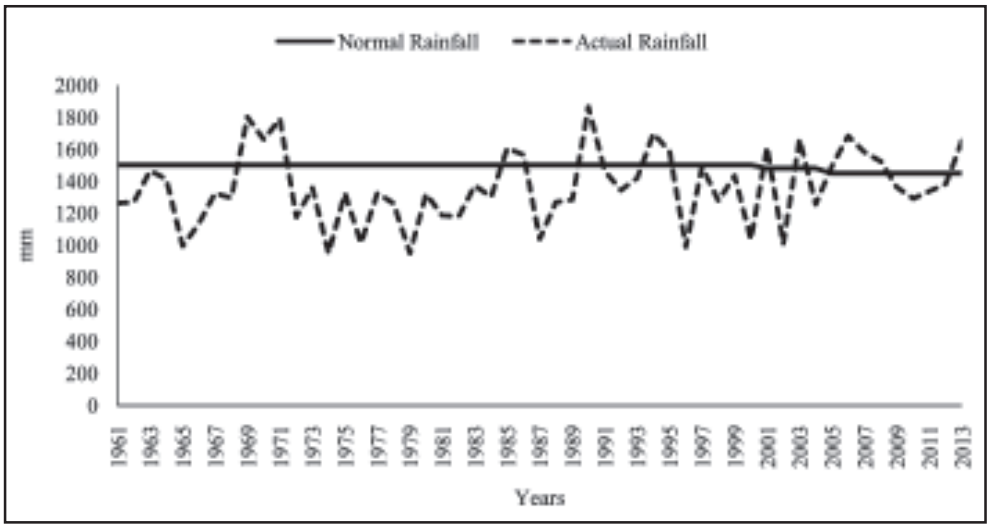


Figure 1: Variability in Rainfall in Odisha, 1961-2013

Large variations in annual rainfall and increased incidence of extreme weather events have caused significant instability in crop yield and production in Odisha (Swain & Bharti, 2009). Table 1 shows the year-wise data on area, yield and production of food-grains in Odisha from 1970 to 2013. Trend in food-grains production indicates that large variations in annual rainfall and increased frequency of extreme weather events have caused significant instability in crop yield and production. The co-efficient of variation for area, yield and production is computed to be 6.8 per cent, 23.0 per cent and 26.1 per cent respectively. Thus, the inter-temporal variations in yield and production are considerable. It may be seen that in abnormal years the yield has been reduced substantially.

Table 1: Area, Yield and Production of Food-grains in Odisha, 1970-2013

Year	Area ('000Ha)	Yield (Kg/Ha)	Production (000MT)	Natural Calamity
1970-71	5781	883	5104	Flood
1971-72	5950	732	4354	Severe Cyclone, Flood
1972-73	5915	822	4860	Drought, Flood
1973-74	6218	881	5480	Flood
1974-75	5992	663	3971	Severe Drought, Flood

1975-76	6484	859	5500	Flood
1976-77	6038	675	4075	Severe Drought
1977-78	6519	853	5561	Flood
1978-79	6680	863	5765	Hailstorm, Tornados
1979-80	6455	600	3872	Severe Drought
1980-81	6909	865	5977	Flood, Drought
1981-82	6738	822	5538	Flood, Drought & Tornado
1982-83	6417	731	4688	High Flood, Drought, Cyclone
1983-84	7323	956	7001	
1984-85	6652	843	5609	Drought
1985-86	7043	989	6968	Flood
1986-87	7010	910	6678	
1987-88	6728	752	5058	Severe Drought
1988-89	6856	1021	7002	
1989-90	6972	1144	7974	
1990-91	7089	992	7031	Flood
1991-92	7252	1141	8273	
1992-93	6946	993	6898	Flood & Drought
1993-94	7208	1140	8216	
1994-95	7120	1122	7986	
1995-96	7194	1101	7923	Flood & Cyclone
1996-97	6360	841	5347	Severe Drought
1997-98	6616	1105	7311	
1998-99	6452	989	6378	Severe Drought
1999-00	6075	922	5602	Super Cyclone
2000-01	5192	958	4976	Drought & Flood
2001-02	6683	1232	8233	Flood

2002-03	5992	675	4045	Severe Drought
2003-04	6568	1178	7737	Flood
2004-05	6576	1154	7588	Moisture Stress
2005-06	6790	1211	8221	Moisture Stress
2006-07	6840	1213	8298	Moisture Stress & Flood
2007-08	6884	1344	9254	Flood
2008-09	6912	1249	8634	Flood
2009-10	6920	1258	8707	Flood & Drought
2010-11	6783	1293	8770	Flood & Drought
2011-12	6483	1175	7616	Flood & Drought
2012-13	6561	1737	11399	Flood & Drought
2013-14	6757	1426	9632	Very severe cyclone Phailin / Flood
Average	**6612.1**	**1007.1**	**6707.1**	
S.D.	**448.1**	**231.8**	**1747.7**	
C.V. (%)	**6.8**	**23.0**	**26.1**	

Source: *Odisha Agriculture Statistics, 2014-2015,* Directorate of Agriculture and Food Production, Government of Odisha.

3. Modality of Crop Insurance Schemes

Realizing the importance of insurance as a risk management tool, the Government of Odisha has implemented different crop insurance schemes from time to time to stabilize farm income and stimulate investment in agriculture. In this regard, a brief review of the recent crop insurance schemes is presented below. The scheme details have been collected from notifications of Department of Cooperation, Government of Odisha (http://coopodisha.in).

3.1 National Agricultural Insurance Scheme (NAIS)

The National Agricultural Insurance Scheme (NAIS) was an area-based crop yield insurance scheme, implemented from1999-2000 Rabi season to 2015 Kharif season in all the 30 districts of Odisha. In this scheme the

indemnification was based on area, which was a block for the major cereal crop paddy. Since 2011, the area considered had been reduced to the gram panchayat level. If there was a shortfall in actual average yield per hectare of insured crop from the threshold yield, each of the insured farmers growing that crop in the defined area was eligible for indemnity. The NAIS covered all food crops (cereals, millets and pulses), cotton, sugarcane and potato and other annual commercial as well as horticultural crops. All loanee farmers were compulsorily covered under the scheme. Non-loanee farmers growing insurable crops were allowed to opt for the scheme.

The NAIS provided comprehensive risk insurance against yield losses due to non-preventable risks, such as natural fire, lightning, storm, hailstorm, cyclone, typhoon, tempest, hurricane, tornado, flood, inundation and landslide, drought, dry spells, pests, diseases, etc. The sum insured extended to the value of the threshold yield of the crop, with an option to cover up to 150 per cent of average yield of the crop on payment of extra premium. The premium rate for kharif crops, such as bajra and oilseeds was 3.5 per cent of sum insured and 2.0 per cent for other food crops. In the Rabi season the premium rate was 1.5 per cent for wheat and 2.0 per cent for other food crops and oilseeds. Also, 50 per cent subsidy in premium was allowed to small and marginal farmers, which was shared equally by the Government of India and state government. The subsidy was phased out in a period of five years. The major drawback of NAIS was its delay in payment of compensation as the collection of crop yield data through crop cutting experiment was a time-consuming process. Moreover, since the claims were equally shared by the central and state government, the insurance company could disburse the compensation only after receiving funds from the central and state government, which caused significant delay in settlement of claims.

3.2 Weather Based Crop Insurance Scheme (WBCIS)

To reduce administrative cost of collecting data on yield and to make faster claim payment in a transparent manner, the Government of Odisha in 2008 on a pilot basis launched the Weather Based Crop Insurance Scheme (WBCIS) in eight blocks in three drought-prone districts (Nuapada, Balangir and Bargarh) in the western part of the state. Initially, The WBCIS was available only to non-loanee farmers. In kharif 2009, the scheme was extended to both loanee and non-loanee farmers growing paddy crop. For

loanee farmers in pilot areas, the WBCIS was compulsory while the NAIS was unavailable. But for the non-loanee farmers both the NAIS and WBCIS were available.

The WBCIS in Odisha envisaged that the insured farmers shall be compensated for financial loss due to anticipated loss in crop yield resulting from deficit rainfall and excess rainfall. In case of adverse weather incidence (AWI), all the insured farmers in the reference unit area were deemed to have suffered the same crop loss and were eligible for the same level of pay-outs. The premium rate for kharif paddy was 2.5 per cent of sum insured.

The WBCIS was an improvement over the NAIS because in comparison to crop yield, rainfall as an index was easier to measure objectively and the process of rainfall data collection from nearby meteorological stations was more transparent and less time consuming. Administrative costs were lower, and this facilitated quicker payment of indemnity to insured farmers. Nevertheless, the major drawback of the WBCIS was the mismatch between the actual crop loss suffered by the insurance users and the indemnity received based on the weather index, a proxy of actual yield (Gine et al., 2008). In the WBCIS, the start-up cost was high because time series and historical data on rainfall and yield were required to define the trigger events that necessitate indemnity payment (Collier et al., 2009; Binswanger & Mkhize, 2012). The WBCIS was withdrawn in 2013 because rainfall as proxy of yield was not satisfactory to the farmers. Farmers did not get indemnity payment if there was crop loss due to reasons other than variability in rainfall, such as pest attack and plant diseases.

3.3 Modified National Agricultural Insurance Scheme (MNAIS)

In 2010 Rabi season, the Odisha government launched the Modified National Agricultural Insurance Scheme (MNAIS) on pilot basis for paddy crop in selected districts, viz., Balasore, Bhadrak, Bargarh, Kalahandi and Sonepur. The MNAIS tried to correct the loopholes in the existing NAIS. The main objective of the scheme was to provide insurance coverage to the farmers in the event of failure of the any of the notified crops as a result of natural calamities, pests, diseases or errant weather conditions. The novel features of the MNAIS included coverage of prevented sowing/planting risk (failure of farmer to sow/plant) and post-harvest loss, provision of

higher level of indemnity, provision for mid-season on-account payment of compensation on the basis of expected crop loss, and allowing private sector participation. The farmers of Odisha had opposed high rate of premium under MNAIS, following which the scheme had to be withdrawn by the state government from six districts after notification during 2013 kharif season.

3.4 Pradhan Mantri Fasal Bima Yojana (PMFBY)

The Pradhan Mantri Fasal Bima Yojana (PMFBY) was launched in 2016. This scheme replaced (NAIS) and (MNAIS) from kharif 2016. Odisha implemented the PMFBY in all the 30 districts. The PMFBY provides comprehensive insurance coverage against crop loss on account of non-preventable natural risks such as (i) natural fire and lightning, (ii) storm, hailstorm, cyclone, typhoon, tempest, hurricane, tornado etc. (iii) flood, inundation and landslide (iv)drought, dry spells (v) pests or diseases etc. This scheme is compulsory for loanee farmers, who avail crop loans from institutional sources of finance. Non-loanee farmers also insure their crops voluntarily. The objectives of the scheme are : (a) to provide financial support to the farmers in the event of crop failure; (b) to stabilize their income; (c) to encourage them to adopt innovative and modern agricultural practices; and (d) to ensure flow of credit to the agriculture sector.

In the PMFBY, the risk coverage of crop cycle has increased, through the inclusion of prevented sowing/planting and post-harvest losses in addition to plant growth stage. In addition to hailstorm and landslide for individual farm level assessment, inundation was incorporated as a localized calamity. An area approach is adopted for settlement of claims for widespread damage. A cluster approach is adopted- wherein a group of districts with variable risk profile is allotted to an insurance company through bidding for up to three years. Participation of private companies in crop insurance has been encouraged.

Notified Insurance unit has been revised to panchayat from block for major crops. Uniform maximum premium of only 2 per cent, 1.5 per cent and 5 per cent is to be paid by farmers for all kharif crops, rabi crops and commercial and horticultural crops respectively. There is provision of individual farm-level assessment for post-harvest losses due to cyclonic and unseasonal rains for crops drying in the fields up to 14 days.

The scale of finance in each district for each crop forms the basis for calculation of sum assured. This roughly corresponds to costs incurred in cultivation of crops and gives farmers adequate financial protection without any capping as followed in earlier schemes. The sum assured has doubled in case of the PMFBY in comparison to earlier schemes. PMFBY is an actuarial model-based scheme, where token premium is charged from the client farmers, and government pays as subsidy the balance premium quoted by insurance companies. These companies are selected by states through transparent bidding. The subsidy amount is equally shared between the centre and the state. However, the full liability of payment of claims lies with the insurance companies. Government is keen to improve the implementation of scheme by focusing on timely settlement of claims. There are penal provisions for agencies that cause delays in releasing claims to farmers.

Though a number of crop insurance schemes have been implemented in Odisha, low participation of farmers is a major worry for the government. During 2017-18, the total coverage of crop insurance in Odisha was 15.8 lakh hectare (ha), which included 15.2 lakh ha during kharif season and 0.6 lakh ha during rabi season. Thus, the percentage of gross cropped area (83.6 lakh ha) under crop insurance was 18.9 per cent. Also, more than 90 per cent of insured farmers were loanee farmers compulsorily covered under crop insurance schemes. Voluntary adoption of crop insurance as a risk management tool is low. Causes of low participation in crop insurance include the lack of insurance literacy, complexity of insurance products, low willingness, and the farmers' inability to pay.

In all the crop insurance schemes implemented in Odisha, the role of insurance has been emphasized only as a risk transfer mechanism. In the PMFBY, there is provision to encourage risk reduction measure by lowering premium for farmers undertaking soil and water conservation measures and adopting environment friendly technology. Nonetheless, this provision has not been operationalised. The following section assesses the performance of crop insurance schemes in Odisha.

4. Performance of Crop Insurance Schemes in Odisha

The NAIS, MNAIS, WBCIS and PMFBY are the important crop insurance schemes implemented in Odisha. This section assesses the trend in the performance of these schemes, using secondary data collected from Bhubaneswar's Regional Office of Agriculture Insurance Company of India

Limited (AICI) and various issues of *Odisha Agriculture Statistics* published by the Directorate of Agriculture & Food Production, Government of Odisha. The performance of the schemes has been assessed on the basis of several indicators, such as area and number of farmers covered, farmers benefited, sum assured, claim to premium ratio, etc. Trends in these indicators have been analysed for both kharif and rabi seasons from 1999-2000 to 2020-2021.

4.1 Coverage of Crop Insurance Schemes in Odisha

To evaluate the performance of crop insurance schemes in Odisha, the trends in the area covered and number of farmers covered in both kharif and rabi seasons, from 1999 to 2020 have been analyzed in Table 2 and Table 3, respectively. During the kharif season, the total number of farmers covered under crop insurance has increased from 6.8 lakh in 2000 to 33.1 lakh in 2020 (386.8 per cent). However, the area covered has nearly halved to 4.0 lakh ha in 2017 from 7.5 lakh ha in 2000 (Figure 2).

Rabi crops are usually grown in irrigated areas, where requirement for insurance is low. Therefore, for any given year the insurance coverage during rabi season is significantly lower than that of kharif season. The trend in the coverage of the scheme during Rabi seasons reveals that the coverage of the scheme with respect to number of farmers and area covered (Figure 2) has declined over the period. The number of farmers covered has declined to 0.4 lakh in 2020 from 1.2 lakh in 2000 (-66.7 per cent). The area covered has decreased to 0.7 lakh ha in 2020 from 1.1 lakh ha in 2000 (-36.4 per cent).

Table 2: Farmers Covered under NAIS, MNAIS, PMFBY and WBCIS, Kharif and Rabi 1999-2020

(In Lakh)

Season Kharif	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
2000	6.8		6.8			6.8	
2001	6.3		6.3	-7.4		6.3	-7.4
2002	12.0		12.0	90.5		12.0	90.5
2003	6.4		6.4	-46.7		6.4	-46.7
2004	8.7		8.7	35.9		8.7	35.9

2005	9.0		9.0	3.4		9.0	3.4
2006	8.8		8.8	-2.2		8.8	-2.2
2007	8.4		8.4	-4.5		8.4	-4.5
2008	6.1		6.1	-27.4	0.1	6.2	-26.2
2009	10.7		10.7	75.4	0.8	11.5	85.5
2010	11.1		11.1	3.7	0.7	11.8	2.6
2011	14.3		14.3	28.8	1.1	15.4	30.5
2012	14.5		14.5	1.4	0.3	14.8	-3.9
2013	13.1	0.7	13.8	-4.8		13.8	-6.8
2014	18.0		18.0	30.4		18.0	30.4
2015	21.5		21.5	19.4		21.5	19.4
2016 PMFBY	17.6		17.6	-18.1		17.6	-18.1
2017 PMFBY	17.6		17.6	0.0		17.6	0.0
2019 PMFBY	8.6		8.6	-51.1		8.6	-51.1
2020 PMFBY	33.1		33.1	284.9		33.1	284.9
Rabi							
1999-2000	2.3		2.3			2.3	
2000-01	1.2		1.2	-47.8		1.2	-47.8
2001-02	2.1		2.1	75.0		2.1	75.0
2002-03	1.4		1.4	-33.3		1.4	-33.3
2003-04	2.0		2.0	42.9		2.0	42.9
2004-05	2.1		2.1	5.0		2.1	5.0
2005-06	2.3		2.3	9.5		2.3	9.5
2006-07	2.0		2.0	-13.0		2.0	-13.0
2007-08	1.3		1.3	-35.0		1.3	-35.0
2008-09	1.6		1.6	23.1		1.6	23.1
2009-10	1.3		1.3	-18.8		1.3	-18.8
2010-11	0.3	0.4	0.8	-38.5		0.8	-38.5
2011-12	0.7	0.1	0.8	0.0		0.8	0.0
2012-13	0.8	0.2	1.0	25.0		1.0	25.0
2013-14	0.0	0.1	0.1	-90.0		0.1	-90.0
2014-15	1.2		1.2	1100.0		1.2	1100.0

2015-16	1.1		1.1	-8.3		1.1	-8.3
2016-17 PMFBY	0.6		0.6	-45.5		0.6	-45.5
2017-18 PMFBY	0.6		0.6	0.0		0.6	0.0
2019-20 PMFBY	0.3		0.3	-50.0		0.3	-50.5
2020-21 PMFBY	0.4		0.4	33.3		0.4	33.3

Sources: (i) *Odisha Agriculture Statistics, (2015-16)*, Directorate of Agriculture & Food Production, Government of Odisha.
(ii) AICI Regional Office, Bhubaneswar.

Note: Data on status of PMFBY in Odisha for the year 2018-19 are not available.

Table 3: Area Covered under NAIS, MNAIS, PMFBY and WBCIS, Kharif and Rabi 1999- 2020

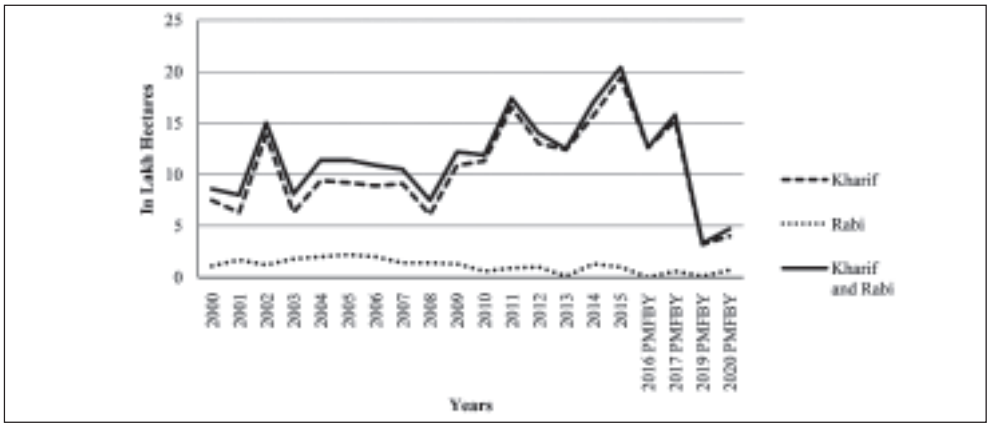
(In Lakh Hectare)

Season Kharif	NAIS	MNAIS	Total	% Increase	WBCIS	Grand Total	% Increase
2000	7.5		7.5			7.5	
2001	6.3		6.3	-16.0		6.3	-16.0
2002	13.8		13.8	119.0		13.8	119.0
2003	6.3		6.3	-54.3		6.3	-54.3
2004	9.4		9.4	49.2		9.4	49.2
2005	9.2		9.2	-2.1		9.2	-2.1
2006	8.9		8.9	-3.3		8.9	-3.3
2007	9.1		9.1	2.2		9.1	2.2
2008	5.9		5.9	-35.2	0.2	6.1	-33.0
2009	9.8		9.8	66.1	1.1	10.9	78.7
2010	10.3		10.3	5.1	1.0	11.3	3.7
2011	14.8		14.8	43.7	1.7	16.5	46.0
2012	12.5		12.5	-15.5	0.5	13.0	-21.2
2013	11.9	0.5	12.4	-0.8		12.4	-4.6
2014	15.7		15.7	26.6		15.7	26.6
2015	19.4		19.4	23.6		19.4	23.6
2016 PMFBY	12.6		12.6	-35.1		12.6	-35.1
2017 PMFBY	15.2		15.2	20.6		15.2	20.6
2019 PMFBY	3.2		3.2	-78.9		3.2	-78.9
2020 PMFBY	4.0		4.0	25.0		4.0	25.0

Rabi							
1999-2000	1.6		1.6			1.6	
2000-01	1.1		1.1	-31.3		1.1	-31.3
2001-02	1.7		1.7	54.5		1.7	54.5
2002-03	1.2		1.2	-29.4		1.2	-29.4
2003-04	1.8		1.8	50.0		1.8	50.0
2004-05	2.0		2.0	11.1		2.0	11.1
2005-06	2.2		2.2	10.0		2.2	10.0
2006-07	2.0		2.0	-9.1		2.0	-9.1
2007-08	1.4		1.4	-30.0		1.4	-30.0
2008-09	1.4		1.4	0.0		1.4	0.0
2009-10	1.3		1.3	-7.1		1.3	-7.1
2010-11	0.3	0.3	0.6	-53.8		0.6	-53.8
2011-12	0.8	0.1	0.9	50.0		0.9	50.0
2012-13	0.9	0.1	1.0	11.1		1.0	11.1
2013-14	0	0.1	0.1	-90.0		0.1	-90.0
2014-15	1.2		1.3	1200.0		1.3	1200.0
2015-16	1.0		1.0	-23.1		1.0	-23.1
2016-17 PMFBY	0		0	-100.0		0	-100.0
2017-18 PMFBY	0.6		0.6	-		0.6	-
2019-20 PMFBY	0.1		0.1	-83.3		0.1	-83.3
2020-21 PMFBY	0.7		0.7	600.0		0.7	600.0

Sources: (i) *Odisha Agriculture Statistics, (2015-16)*, Directorate of Agriculture & Food Production, Government of Odisha.
(ii) AICI Regional Office, Bhubaneswar.

Figure 2: Area Covered under Crop Insurance during Kharif and Rabi, 2000-2020



The total area under crop insurance including kharif and rabi season has increased to 15.8 lakh ha in 2017 from 8.6 lakh ha in 2000 (Table 4). However, if we consider the percentage of Gross Cropped Area (GCA) covered under crop insurance, it is found to be (Figure 3) only 10.1 per cent in 2000, which has increased to 18.9 per cent during 2017. Thus, more than 80 per cent of GCA is not yet covered under crop insurance in the state, which is a major concern for the government. During drought years of 2002, 2011, and 2015 the coverage of crop insurance was greater in comparison to normalyears without natural calamities.

In Odisha, during the period from 2000 to 2017, the compound annual growth rate of total area covered under all crop insurance schemes including kharif and rabi area was computed to be 3.64 per cent and the growth rate in number of farmers covered was 4.95 per cent.

The Government of India aims to double the crop insurance coverage to 50 per cent through the PMFBY by 2018. However, in Odisha, the coverage under the PMFBY during 2016 and 2017 had declined with respect to both area and number of farmers covered in comparison to the coverage under the NAIS in 2015. Though the PMFBY was introduced with hype, the penetration of insurance is lower than expected.

Table 4: Area Insured (Kharif plus Rabi) as a Percentage of Gross Cropped Area, Kharif and Rabi 1999-2017

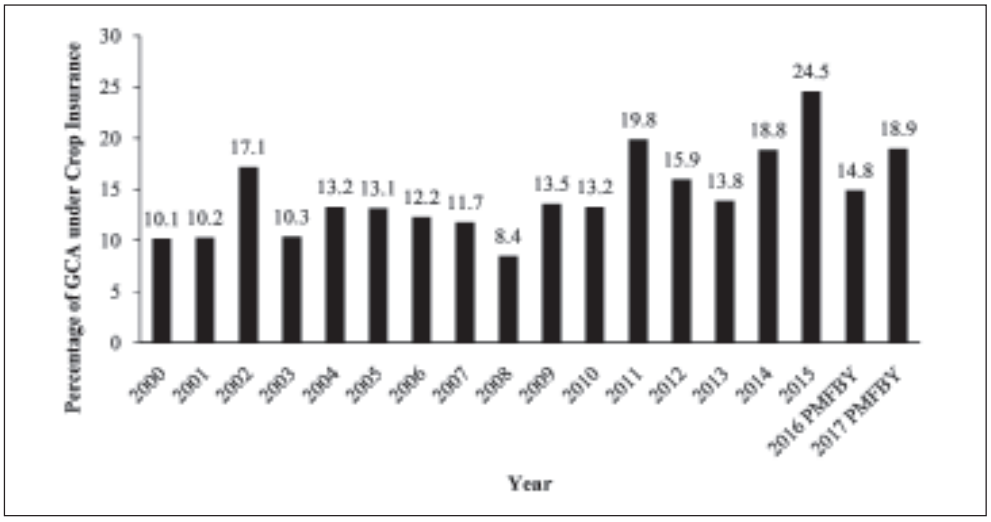
(Area in lakh ha)

Year	NAIS	MNAIS	WBCIS	Total Area	GCA	% of GCA
2000	8.6			8.6	85.3	10.1
2001	8.0			8.0	78.8	10.2
2002	15.0			15.0	88.0	17.1
2003	8.1			8.1	78.5	10.3
2004	11.4			11.4	86.4	13.2
2005	11.4			11.4	87.2	13.1
2006	10.9			10.9	89.3	12.2
2007	10.4			10.4	89.6	11.7
2008	7.4		0.2	7.6	90.1	8.4
2009	11.1		1.1	12.3	90.7	13.5

2010	10.6	0.3	1.0	12.0	90.8	13.2
2011	15.7	0.1	1.7	17.4	88.0	19.8
2012	13.4	0.1	0.5	14.1	88.8	15.9
2013	11.9	0.5		12.5	90.5	13.8
2014	16.9			16.9	90.10	18.8
2015	20.5			20.5	83.85	24.5
2016 PMFBY	12.6			12.6	85.41	14.8
2017 PMFBY	15.8			15.8	83.61	18.9

Sources: (i) *Odisha Agriculture Statistics, (2015-16)*, Directorate of Agriculture & Food Production, Government of Odisha.
(ii) AICI Regional Office, Bhubaneswar.

Figure 3: Percentage of Gross Cropped Area (GCA) under Crop Insurance, 2000-2017



Many studies have tried to explore the reasons for low adoption of crop insurance in India and particularly in Odisha (Singh &Vyas, 2006; Kalavakonda& Mahul, 2005; Raju & Chand, 2008; Swain, 2014). The concern is that voluntary adoption of crop insurance remains low. Less than 10 per cent of the insured farmers are non-loanees and voluntarily insure their crops. Thus, as high as 90 per cent of insurance users are loanee farmers, compulsorily covered under crop insurance. Swain & Patnaik (2016) in their study on assessment of crop insurance schemes in Balangir and Kalahandi districts of Odisha find that while cooperatives, regional rural banks and commercial banks extend insurance facilities to loanee

farmers, for whom insurance is compulsory, they are reluctant to provide insurance services to non-loanee farmers due to additional work burden and the shortage of manpower. Most farmers are unaware of the benefits of the insurance schemes because no awareness campaigns have been conducted in the area either by the Agriculture Insurance Company of India (AICI) or banks. Farmers are reluctant to insure their crops because the area-based scheme does not cover individual and independent risks. The farmers apprehend that they may not get much benefit from the scheme, even if they suffer huge losses and if the insured area as a whole is not affected.

4.2 Sum Insured and Farmers Benefitted under Crop Insurance

The trend in sum insured per hectare during the reference period is shown in Table 5. The trend during Kharif seasons reveals that it has increased to Rs. 74571 in 2020 under the PMFBY from Rs. 5699 under the NAIS in 2000. During rabi seasons, sum insured has also increased to Rs. 60987 under the PMFBY in 2020 from Rs. 7952 under the NAIS in 1999.

It is worth examining whether farmers have benefited from the scheme, when there is crop loss. As shown in Table 6, the percentage of farmers benefited ranged from 1.7 per cent in 2001 kharif season to 69.7 per cent in 2002 kharif season. In the case of Rabi season, it varied from nil in 1999 to 27.4 per cent in 2008. Over the reference period, the percentage of farmers benefited was more during drought affected kharif seasons in 2000, 2002, 2011 and 2015. A comparison of the NAIS and WBCIS reveals that the percentage of farmers benefited in corresponding years from 2008 to 2012 was higher for the WBCIS than for the NAIS.

Table 5: Sum Insured (Rs. Per Hectare) under NAIS, MNAIS, PMFBY and WBCIS, Kharif and Rabi 1999- 2020

Season - Kharif	NAIS	MNAIS	WBCIS
2000	5699		
2001	6396		
2002	7442		
2003	8518		
2004	9518		

2005	10431		
2006	12034		
2007	12341		
2008	14235		20000
2009	16054		12000
2010	18161		12000
2011	19099		12000
2012	25212		12001
2013	28225	37841	
2014	33374		
2015	36599		
2016 PMFBY	54813		
2017 PMFBY	53612		
2019 PMFBY	66430		
2020 PMFBY	74571		
Rabi			
1999-2000	7952		
2000-01	8340		
2001-02	9467		
2002-03	10513		
2003-04	10684		
2004-05	11598		
2005-06	12713		
2006-07	13451		
2007-08	14421		
2008-09	17402		
2009-10	19684		
2010-11	23604	27040	
2011-12	25733	31549	
2012-13	30383	34965	

2013-14		39945	
2014-15	40557		
2015-16	47198		
2016-17 PMFBY	49122		
2017-18 PMFBY	63191		
2019-20 PMFBY	69354		
2020-21 PMFBY	60987		

Sources: (i) *Odisha Agriculture Statistics, (2015-16)*, Directorate of Agriculture & Food Production, Government of Odisha.
(ii) AICI Regional Office, Bhubaneswar.

Table 6: Percentage of Insured Farmers Benefited under NAIS, MNAIS, PMFBY and WBCIS, Kharif and Rabi 1999- 2020

Season - Kharif	NAIS	MNAIS	WBCIS
2000	51.3		
2001	1.7		
2002	69.7		
2003	6.0		
2004	5.2		
2005	2.2		
2006	7.8		
2007	7.8		
2008	9.1		100.0
2009	9.3		67.3
2010	19.3		18.6
2011	42.5		92.5
2012	6.0		87.9
2013	28.5	69.5	
2014	9.8		
2015	53.9		
2016 PMFBY	9.5		

2017 PMFBY	28.2		
2019 PMFBY	31.1		
2020 PMFBY	5.6		
Rabi			
1999-2000	0.0		
2000-01	20.8		
2001-02	8.7		
2002-03	11.8		
2003-04	0.7		
2004-05	3.5		
2005-06	3.1		
2006-07	9.8		
2007-08	0.7		
2008-09	27.4		
2009-10	15.7		
2010-11	8.5	19.3	
2011-12	1.9	4.7	
2012-13	15.7	23.4	
2013-14		2.0	
2014-15	9.0		
2015-16	13.2		
2017-18 PMFBY	7.0		
2019-20 PMFBY	8.1		
2020-21 PMFBY	0.0		

Sources: (i) *Odisha Agriculture Statistics, (2015-16)*, Directorate of Agriculture & Food Production, Government of Odisha.
(ii) AICI Regional Office, Bhubaneswar.

4.3 Claim-premium Ratio under Crop Insurance

In this section, the financial performance of the scheme is evaluated by examining the quantum and trend in the premium paid, claims received and the claim-premium ratio for different crop insurance schemes as shown

in Table 7 and Table 8. The claim-premium ratio was computed by dividing the indemnity claim or compensation payment by insurance premium collected. If the claim-premium ratio exceeds one, it indicates financial loss on the part of the insurer but the farmer receives more compensation than the premium paid.

In case of the NAIS and PMFBY, during the reference period 2000-2020 Kharif seasons,in most of the seasons (14 out of 20 seasons), the claim received was greater than premium paid. However, in the case of rabi seasons, over the period from 1999 to 2020, in most of the seasons (17 out of 20 seasons), the claim received was lower than the premium paid by the farmers. Between 2000-2020 kharif seasons, claim-premium ratio for the NAIS and PMFBY was greater than one for 15 seasons out of the total 20 seasons (Table 8). The claim-premium ratio ranged from the lowest 0.2 during 2001 and 2005 to the highest 9.8 during 2015. The claim-premium ratio was observed to be higher in drought years of 2000, 2002, 2011 and 2015. During rabi seasons, the claim-premium ratio is less than one for most of the years for the NAIS and PMFBY (except 3 years) and MNAIS and, thus, farmers are not much benefited from the crop insurance schemes. The claim-premium ratio for the WBCIS is found to be lower than for the NAIS in all the corresponding years between 2008 and 2012 (Table 8).

Table 7: Premium Paid and Claims received (Rs. per hectare) under NAIS, MNAIS, PMFBY and WBCIS, Kharif and Rabi 2000-2020

Season	**NAIS**			**MNAIS**			**WBCIS**		
Kharif	Premium	Claim	Difference	Premium	Claim	Difference	Premium	Claim	Difference
2000	150	1403	-1254						
2001	164	37	126						
2002	217	1771	-1555						
2003	218	287	-69						
2004	270	156	115						
2005	264	41	223						
2006	309	309	0						
2007	312	265	47						
2008	368	514	-145				2000	1862	138
2009	405	478	-73				1200	662	538

2010	456	1333	-877				1200	123	1077
2011	491	4644	-4153				1200	993	207
2012	611	488	123				1200	506	694
2013	717	3329	-2612	1357	13523	-12166			
2014	854	1630	-776						
2015	930	9135	-8205						
2016 PMFBY	1096	3391	-2295						
2017 PMFBY	1076	5878	-4802						
2019 PMFBY	1322	4415	-3093						
2020 PMFBY	1389	1906	-517						
Rabi									
1999-2000	139	0	139						
2000-01	171	133	37						
2001-02	190	62	128						
2002-03	206	95	111						
2003-04	189	6	184						
2004-05	252	18	234						
2005-06	267	102	165						
2006-07	263	208	55						
2007-08	275	12	263						
2008-09	344	579	-235						
2009-10	354	494	-141						
2010-11	473	235	238	1304	1226	78			
2011-12	515	120	395	1277	447	831			
2012-13	625	592	34	1352	2345	-993			
2013-14				976	147	829			
2014-15	823	673	151						
2015-16	946	614	332						
2017-18 PMFBY	1019	884	135						
2019-20 PMFBY	1037	7853	-6816						
2020-21 PMFBY	1043	0	1043						

Sources: (i) *Odisha Agriculture Statistics, (2015-16)*, Directorate of Agriculture & Food Production, Government of Odisha.
(ii) AICI Regional Office, Bhubaneswar.

Table 8: Claim-Premium Ratio under NAIS, MNAIS, PMFBY and WBCIS, Kharif and Rabi 2000- 2020

Season - Kharif	NAIS	MNAIS	WBCIS
2000	9.4		
2001	0.2		
2002	8.2		
2003	1.3		
2004	0.6		
2005	0.2		
2006	1.0		
2007	0.9		
2008	1.4		0.9
2009	1.2		0.6
2010	2.9		0.1
2011	9.5		0.8
2012	0.8		0.4
2013	4.6	10.0	
2014	1.9		
2015	9.8		
2016 PMFBY	3.1		
2017 PMFBY	5.5		
2019 PMFBY	3.3		
2020 PMFBY	1.4		
Rabi			
1999-2000	0.0		
2000-01	0.8		
2001-02	0.3		
2002-03	0.5		
2003-04	0.0		
2004-05	0.1		
2005-06	0.4		

2006-07	0.8		
2007-08	0.0		
2008-09	1.7		
2009-10	1.4		
2010-11	0.5	0.9	
2011-12	0.2	0.3	
2012-13	0.9	1.7	
2013-14		0.2	
2014-15	0.8		
2015-16	0.6		
2017-19 PMFBY	0.9		
2019-20 PMFBY	7.6		
2020-21 PMFBY	0.0		

Sources: (i) *Odisha Agriculture Statistics, (2015-16)*, Directorate of Agriculture & Food Production, Government of Odisha.
(ii) AICI Regional Office, Bhubaneswar.

4.4 Comparing Performance of NAIS and WBCIS

In order to make a comparative assessment of the performance of the NAIS and WBCIS, we have taken into account indicators shown in Table 9 for the period from 2008 to 2012 kharif seasons. WBCIS was initiated in 2008 and was withdrawn in 2013, and it was available only for kharif paddy.

Table 9: Performance Indicators of NAIS and WBCIS in Odisha, Kharif 2008-2012

Season	Area Insured (Hectare/ Farmer)	Sum Assured (INR/ Hectare)	% of Farmers Benefitted	Premium Paid (INR/ Hectare)	Claim Received (INR/ Hectare)	Claim/ Premium	% of Non-Loanee Farmers
NAIS							
2008	1.0	14235	9.1	368	514	1.4	2.6
2009	0.9	16054	9.3	405	478	1.2	3.0

2010	0.9	18161	19.3	456	1333	2.9	1.0
2011	1.0	19099	42.5	491	4644	9.5	12.3
2012	0.9	25212	6.0	611	488	0.8	
WBCIS							
2008	1.7	20000	100.0	500*	1862	0.9	100.0
2009	1.4	12000	67.3	300*	662	0.6	8.8
2010	1.4	12000	18.6	300*	123	0.1	2.9
2011	1.5	12000	92.5	300*	993	0.8	
2012	1.7	12001	87.9	300*	506	0.4	

Source: Computed from data collected from the Regional Office of Agriculture Insurance Company of India, Bhubaneswar.

Note: * These are subsidised premiums calculated at 2.5% of sum assured. The gross premium is 10% of sum assured and INR 2000 in 2008 and INR 1200 during 2009 onwards.

A comparison of the performance indicators presented in Table 9 indicates that the insured area per farmer was higher in the case of the WBCIS than NAIS for all the kharif seasons. If we consider the voluntary adoption of the scheme, the percentage of non-loanee farmers and area insured was greater for the WBCIS than for NAIS during the corresponding years. Thus, the adoption of the WBCIS is better in comparison to the NAIS. This may be due to faster claim payment; as rainfall data is easier to collect that yield data, which enables quick loss assessment. During 2008, only the WBCIS was available to non-loanee farmers in pilot areas and all loanees were compulsorily covered under NAIS. Moreover, the percentage of farmers who benefited out of the total number of insurance users was much higher for the WBCIS than for NAIS.

The indicators of financial performance shown in Table 9 reveal that in four out of five years, the per hectare sum assured and premium paid were higher for the NAIS than for WBCIS while in three out of five years claim received was higher for the WBCIS than for NAIS. To assess the financial performance, we computed the claim-premium ratio for the NAIS and WBCIS. In all the years from 2008 to 2012, the claim premium ratio for NAIS was greater than that for the WBCIS.

The data suggest that the WBCIS, performed better than the NAIS because

of the higher adoption rate, the higher percentage of farmers benefited, and the lower premium. Many empirical studies based on household surveys also reveal that the frequency of receiving indemnity is higher in the case of the WBCIS though the claim amount is greater in the case of the NAIS because of the higher sum assured (Swain, 2015).

5. Conclusion and Policy Implications

Agriculture in Odisha is vulnerable to climate change. As a result, the farmers are in need of crop insurance, which will provide them economic support and stabilize their farm income in the event of crop losses due to non-preventable risks. The Government of Odisha has introduced many crop insurance schemes such as the NAIS, MNAIS, WBCIS and PMFBY to provide resilience to agriculture and livelihood support to farmers.

The performance of crop insurance schemes in Odisha reveals that its coverage is very low. The coverage was only 10.1 per cent in 2000, which had increased to 18.9 per cent during 2017. Thus, more than 80 per cent of GCA has not been covered under crop insurance in the state, which is a major concern of the government.

Furthermore, the crop insurance scheme is operational mainly because the farmers availing loan from institutional sources like cooperatives, regional rural banks and commercial banks are compulsorily covered under the scheme. The voluntary adoption of crop insurance is low.

As regards benefits from the scheme, the percentage of farmers benefited ranged from 1.7 per cent in 2001 kharif season to 69.7 per cent in 2002 kharif season. In the case of rabi season, it varied from the lowest zero per cent in 1999 to 27.4 per cent in 2008.

The claim-premium ratio has been computed for different crop insurance schemes. During the period 2000-2020 kharif seasons, in most of the seasons, the claim received by the farmers was greater than premium paid by them. The claim-premium ratio was observed to be higher in drought years of 2000, 2002, 2011 and 2015, when there was crop loss due to deficiency in rainfall. However, in the case of rabi seasons, over the reference period, in most of the years, premium paid was higher than claims received.

A comparison of performance of the NAIS and WBCIS reveals that the later performs better because of the higher adoption rate, the higher percentage of farmers who have benefited and the lower premium. Also, in case of the WBCIS, the claim payment is faster and there is more transparency in loss assessment and less scope for manipulation. Thus, in the context of aggravated risk due to climate change, there is a need to reintroduce the WBCIS in Odisha, which was withdrawn in 2013. Varied insurance products may be offered catering to the needs of the farmers in different agro-climatic locations.

The insurance industry can help both in mitigation and adaptation to climatic risks by inducing proper proactive and reactive responses in insurance users. The mitigation measures include incentivizing use of clean technology, climate friendly cropping pattern, promoting organic farming and less energy intensive agriculture. Discount in premium may be given for taking risk reducing actions, such as water conservation and sustainable farming practices. Insurance can induce proactive adaptation responses, such as cultivation of drought resistant variety crops and seed variety, pest management, seed treatment, efficient irrigation methods, etc. The insurance industry can also induce desirable reactive responses after the occurrence of crop loss by making quick payment of indemnity, so that insurance buyers do not deplete their productive assets and fall into poverty trap. Also, mid-season payment may be made if there is clear indication of ultimate crop loss due to severe drought condition or excess rainfall at crucial growth stage of crop. Insurance, if appropriately embedded among risk reduction measures and with the right incentives, has the potential to reduce disaster risk and advance adaptation.

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Appendix 1: Rainfall and Natural Calamities in Odisha, 1961-2013

Year	Normal	Actual	Deviation from normal		Natural Calamity
			in mm	in %	
1961	1502.5	1262.8	-239.7	-16.0	
1962	1502.5	1269.9	-232.6	-15.5	
1963	1502.5	1467.0	-35.5	-2.4	
1964	1502.5	1414.1	-88.4	-5.9	
1965	1502.5	997.1	-505.4	-33.6	Severe Drought
1966	1502.5	1134.9	-367.6	-24.5	Drought
1967	1502.5	1326.7	-175.8	-11.7	Cyclone, Flood
1968	1502.5	1296.1	-206.4	-13.7	Cyclone, Flood
1969	1502.5	1802.1	299.6	19.9	Flood
1970	1502.5	1660.2	157.7	10.5	Flood
1971	1502.5	1791.5	289.0	19.2	Severe Cyclone, Flood
1972	1502.5	1177.1	-325.4	-21.7	Drought, Flood
1973	1502.5	1360.1	-142.4	-9.5	Flood
1974	1502.5	951.2	-551.3	-36.7	Severe Drought, Flood
1975	1502.5	1325.6	-176.9	-11.8	Flood
1976	1502.5	1012.5	-490.0	-32.6	Severe Drought
1977	1502.5	1326.9	-175.6	-11.7	Flood
1978	1502.5	1261.3	-241.2	-16.1	Hailstorm, Tornados
1979	1502.5	950.7	-551.8	-36.7	Severe Drought
1980	1502.5	1321.7	-180.8	-12.0	Flood, Drought
1981	1502.5	1187.4	-315.1	-21.0	Flood, Drought & Tornado
1982	1502.5	1179.9	-322.6	-21.5	High Flood, Drought, Cyclone
1983	1502.5	1374.1	-128.4	-8.5	
1984	1502.5	1302.6	-199.9	-13.3	Drought
1985	1502.5	1606.8	104.3	6.9	Flood
1986	1502.5	1566.1	63.6	4.2	
1987	1502.5	1040.8	-461.7	-30.7	Severe Drought
1988	1502.5	1270.5	-232.0	-15.4	
1989	1502.5	1283.9	-218.6	-14.5	
1990	1502.5	1865.8	363.3	24.2	Flood

1991	1502.5	1465.7	-36.8	-2.4	
1992	1502.5	1344.1	-158.4	-10.5	Flood & Drought
1993	1502.5	1421.6	-80.9	-5.4	
1994	1502.5	1700.2	197.7	13.2	
1995	1502.5	1588.0	85.5	5.7	Flood & Cyclone
1996	1502.5	990.1	-512.4	-34.1	Severe Drought
1997	1502.5	1493.0	-9.5	-0.6	
1998	1502.5	1277.5	-225.0	-15.0	Severe Drought
1999	1502.5	1435.7	-66.8	-4.4	Super Cyclone
2000	1502.5	1035.1	-467.4	-31.1	Drought & Flood
2001	1482.2	1616.2	134.0	9.0	Flood
2002	1482.2	1007.8	-474.4	-32.0	Severe Drought
2003	1482.2	1663.5	181.3	12.2	Flood
2004	1482.2	1256.7	-225.5	-15.2	Moisture Stress
2005	1451.2	1497.7	46.5	3.2	Moisture Stress
2006	1451.2	1682.8	231.6	16.0	Moisture Stress & Flood
2007	1451.2	1583.2	132.0	9.1	Flood
2008	1451.2	1525.5	74.3	5.1	Flood
2009	1451.2	1362.6	-88.6	-6.1	Flood & Drought
2010	1451.2	1293.1	-158.1	-10.9	Flood & Drought
2011	1451.2	1338.1	-113.1	-7.8	Flood & Drought
2012	1451.2	1384.1	-67.1	-4.6	Flood & Drought
2013 Flood	1451.2	1653.1	201.9	13.9	Very severe cyclone Phailin /
Average		**1366.1**			
SD		**230.9**			
CV (in %)		**16.9**			

Sources: (i) *Status of Agriculture in Odisha, 2014-15*, Directorate of Agriculture &Food Production, Government of Odisha.
(ii) *Odisha Agriculture Statistics, 2014-15*, Directorate of Agriculture & Food Production, Government of Odisha.

Article

Debt and Migration: A Study from Rural Odisha

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Ananda Meher

Abstract

The link between debt and labour has been studied extensively. This study revisits the relationship between indebtedness and migration through a primary survey of 651 households in rural Odisha in order to test findings of previous studies and assess whether any critical variables need to be factored. The impact of debt on decision to migrate has been substantiated through binary logistic regression analysis. The study found that the demand for credit is similar across social groups, but access to institutional sources of credit is significantly lower among socially marginalised groups. Hence, they have no option but to approach non-institutional sources to meet their contingency expenditure. The results of the logistic regression suggest that borrowers from non-institutional sources have higher tendency to migrate. The amount of credit from non-institutional sources has positive association with the decision to migrate, after controlling other socio-economic factors. A significant proportion of households use remittances to repay their debt.

Keywords: Migration, Institutional credit, Non-institutional credit, Logistic regression, Rural Odisha.

Ananda Meher, Ph.D. Scholar, School of Economics, University of Hyderabad, Hyderabad. Email: aanandameher@gmail.com

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1. Introduction

Breman (1985) has explained the link between debt and migration in a study of seasonal labour migration in south Gujarat. The International Organization for Migration (IOM, 2019) has recently published a report on debt and the migration experience in Southeast Asia. This study mostly concentrates on international migrants. This report focuses attention on the role of debt and indebtedness in the migration process. Research on debt finance migration demonstrates that migrant households take on debt to migrate (mostly international migration) and repay after earning some income (Platt et al., 2017). The findings have been echoed in a study conducted in Bangladesh, the complexity and multiplicity of the economic costs of migration to the Gulf Cooperation Council (GCC) countries (Rahman, 2015). The study also demonstrates that Bangladeshi migration to the Gulf states runs on debt, with migrants and their families indebting themselves in the migration process (Rahman, 2015).

Debt can also be a facilitator of the migration process. How does microcredit interact with migration patterns? Drawing on qualitative research in northwest Cambodia, Bylander (2014) explores the uses, meanings, and implications of migrant-loans — microcredit loans' impact on international migration. The study has shown that loans from microfinance institutions (MFIs) are primarily used for a variety of non-productive purposes, and are most frequently repaid through wage labour both within and outside the country (Bylander, 2015). The same pattern of results was also found in a cross-sectional households' survey conducted in Kurigram district under Rangpur division of Bangladesh. The research suggests that people with prior access to microcredit are more likely to migrate during lean agricultural season (Shonchoy, 2015). Debts may suck more value from the sending population than it returns (Stoll, 2010).

The link between debt and seasonal migration in India has been mostly explained through qualitative tools (Breman, 1985; Srivastav & Sutradhar, 2016). Research has examined the impact of debt on migration through primary survey indifferent regions of India (Majumder, 2015; Korra, 2011). The link between debt and migration is often unproductive and unprofitable for those involved (Mosse et al., 2002). The cause of seasonal migration in rural Odisha has been investigated by Sengupta and Gudabarti (2016). They found that debt is one of the reasons behind the seasonal migration to the brick kiln industry. In contrast, some researchers have argued that there is

a need to move away from simplistic negative analyses that view migration as a symptom of distress and start developing ways to maximise its benefits for poverty reduction (Deshingkar et al., 2006; Deshingkar, 2017). There are a host of complex social and economic reasons for migration into construction work, including better earnings prospects, more regular work, the ability to remit money home and the desire to experience urban lifestyles (Deshingkar, 2017).

Most research on debt and migration concludes debt as a push factor for temporary migration. In the context of India, research on debt and migration concentrate on debt bondage labour work. However, the relationship between debt and migration has not been quantified adequately. In this regard, this study analyses the relationship between debt and migration through a primary survey of 651 households in rural Odisha. The impact of debt on the decision to migration has been substantiated through binary logistic regression analysis. This paper has five sections. The data and methodology have been presented in the second section. The third section presents the pattern of borrowing and temporary migration. The fourth section illustrates the role of debt in the decision to migrate, through cross-tabulation and logistic regression model. The concluding section presents the summary and results of our investigation.

2. Data and Methodology

2.1 Data Source

The study mostly depends on primary sources to verify migrants' access to credit. The state of Odisha has been selected for the survey because of the high rate of cyclical migration and its poor performance in development indicators such as 25th position in Sustainable Development Goals (NITI Aayog, 2018) and 24th rank in Multi dimension Poverty Index out of 29 states of India. The districts of Balangir, Baleswar and Ganjam have been selected for the survey based on the pattern of migration and their economic rank within the state. The Balangir district had the highest seasonal migration rate (12.8 per cent) whereas Ganjam district had the highest rate of semi-permanent migration rate (10.0 per cent) and the cyclical migration rate of Baleswar district (5.2) was nearly similar to migration rate of rural Odisha. The district level migration rate has been calculated from the 64th Round of the NSSO. The per capita Net District Domestic Product (NDDP)

was around 20000 in Baleswar and Balangir district, whereas it was around 24000 in Ganjam and all Odisha Level in 2011-12. The ranks of survey districts Ganjam, Baleswar and Balangir on per capita NDDP were 13th, 16th, and 20th, respectively (GoO, 2012). From each district, three villages have been selected for the survey, based on diverse population and proportional representation of Scheduled Castes (SC) and Scheduled Tribes (ST) in the total population. From each of the selected villages, around one-third of the total households have been taken for the sample survey. The survey has 651 sample households or 34 per cent of 1906 households through proportionate stratified random sampling method.

2.2 Methodology

The relationship between debt and migration has been verified through regression analysis. The logistic regression model is used when the dependent variable is categorical (Shonchoy, 2015). In the migration model, the decision of migration is a binary categorical variable, i.e., whether to migrate- yes or no. Binary logistic regression estimates the probability of an event for any given linear combination of independent variables.

P = E(Y/X) (outcome of Interest/ all possible outcome)
Y= {1 if any member of households migrated, or, 0 if not}
Odds- (P/(1-P)) = (Probability of occurring / probability of not occurring)
Log it is Natural Log of Odd- LN((P/(1-P)) = $LN\{P|(1-P\} = X\beta + U$

Odd Ratio= (Odd (X+1)/Odd(X)) = $\frac{\frac{P\hat{}(X+1)}{1-P(X+1)}}{\frac{P\hat{}(X)}{1-P(X)}} = \frac{e^{(X+1)\beta}}{e^{(X\beta)}} = e^{\beta}$

The dependent variable is the migration information of the household. The independent variables include socio-economic characteristics of households, such as the amount of land possessed, social groups, monthly per capita consumption expenditure (MPCE), gender, education level, occupation and age of the household head, source and amount of credit. X is the metrics of independent variables and â vector of regressor coefficient. In the model, land possessed, monthly per capita consumption expenditure (MPCE) explainshouseholds economic status. Social category or caste representsthe social status of the household, which includes SC, ST, Other Backward Class (OBC) and Other Categories (OC). The sources of credit and the amount of debt variables describe the importance of debt in the decision to migrate. This paper also uses cross-tabulation to show the percentage

difference in access to credit among migrant and non-migrant households across socioeconomic characteristics. The significant difference in migration rate due to borrowing is verified through bivariate analysis. The chi-square test is used to analyse the difference in migration rate in the bivariate analysis. The cause of migration and use of remittance is cross-tabulated across socio-economic variables of the households.

3. Pattern of Borrowing and Temporary Migration

3.1 Pattern of Borrowing

Credit is one of the most critical requirements for rural poor for investment and emergency expenditure. There are four categories of borrowing those that borrow from only institutional sources, only non-institutional sources of credit, and from both. A fourth group does not borrow from any sources; we called them non-borrowing/non-demanding households (Pal, 2002; Chaudhuri & Cherical, 2012).

Table 1: Demand and Access to Credit across Social Groups

Social group	Percentage of non-borrowing HHs	Percentage of non-borrowing HHs	Percentage of HHs borrowing from only Institutional sources of credit	Percentage of HHs borrowing from only non-Institutional sources of credit	Percentage of HHs borrowing from both institutional & non-Institutional sources of credit
ST	26.1 (24)	73.9 (68) {103}	17.4 (16)	46.7 (43)	9.8 (9)
SC	33.3 (84)	66.7 (168) {309}	27.8 (70)	23.4 (59)	15.5 (39)
OBC	31.5 (78)	68.6 (170) {292}	35.5 (88)	21.4 (53)	11.7 (29)
OC	45.8 (27)	54.2 (32) {34}	45.8 (27)	6.8 (4)	1.7 (1)
All HH	32.7 (213)	67.3 (438) {738}	30.9 (201)	24.4 (159)	12 (78)

Source: Author's primary survey (2018)

Notes: HH-Households. The value inside the parenthesis () represents the number of HH. The value inside the parenthesis {} explains the number of credits taken by the respective social group.

Access and demand for credit across social group are presented in Table 1. Across social groups, a higher proportion of ST households has taken credit followed by OBC, SC and OC households. The institutional source of credit is noticeably less among ST households. Only 27.2 per cent of ST households have access to the institutional source of credit, and 43.3, 47.2 and 47.5 per

cent, respectively among SC, OBC and OC households. The percentage of families that have taken credit from non-institutional source is the highest among ST households, followed by SC, OBC and OC households. A higher percentage of SC and ST households depends on borrowing, followed by OBC and OC households. But access to institutional credit is less among the SC and ST households, forcing them to borrow from the non-institutional sources of credit. Access to institutional credit is on average equal among OC and OBC households, due to less demand for credit among the OC households. The need for a non-institutional source of credit is higher among OBC households compared to OC households.

Table 2 presents access and demand for credit among land possessing groups. Across all survey households, 76.3 per cent of small and 75 per cent of medium farmers borrow, followed by the landless, marginal, and large farmer. Access to the institutional source of credit is the highest among the medium farmer followed by large, small, landless, and marginal farmer group. The large farmer accesses institutional credit less compared with the medium farmer because the demand for credit is less among large farmer households. None of the large farmers borrowed only from non-institutional sources of credit. The large farmer borrows from the non-institutional source when the amount of credit demand is not fulfilled in the institutional source. The need for the non-institutional source of credit decreases with the increment in land possesses group. Nearly 40 per cent of marginal farmers have borrowed from non-institutional sources of credit. For landless, small, medium and large farmer groups the respective furures are 36.7, 35.1, 22.8 and 11.1 per cent. Access to institutional sources of credit is directly associated with landholding.

Table 2: Demand and Access to Credit across Land Possessing Groups

Land poss-essing group	Percen tage of non-borrow ing HHs	Percentage of non-borrowing HHs	Percentage of HHs borrow ing from only institutional sources of credit	Percentage of HHs borrowing from only non-institutional sources of credit	Percentage of HHs borrowing from both institutional & non-institutional sources of credit
LL	33.7 (58)	66.3 (114) {201}	29.7 (51)	23.3 (40)	13.4 (23)
MF	35.3 (113)	64.7 (207) {356}	24.7 (79)	30 (96)	10 (32)
SF	23.7 (23)	76.3 (74) {128}	41.2 (40)	18.6 (18)	16.5 (16)

MDF	25 (11)	75 (33) {42}	52.3 (23)	11.4 (5)	11.4 (5)
LF	44.4 (8)	55.6 (10) {12}	44.4 (8)	0 (0)	11.1 (2)
All HH	32.7 (213)	67.3 (438) {739}	30.9 (201)	24.4 (159)	12.0 (78)

Source: Author's primary survey (2018)

Notes: LL- Land Less, MF- Marginal Farmer, SF- Small Farmer, MDF- Medium Farmer, LF- Large Farmer. The figure in parenthesis () represents the number of HH. The figure in parenthesis {} explains the number of credits taken by the respective group.

Access to institutional sources of credit is high among OBC and OC households, and medium and large farmers within land possessing groups. Institutional sources of credit seem to be biased towards higher caste and class groups among the surveyed households. This implies that SC and ST households, and lower landholding groups as landless, marginal and small farmers are bound to depend on non-institutional sources of credit. The percentage of borrowing households is a sum of individual household's access to an institutional source of credit and the household's demand for a non-institutional source of credit. So, the percentage of borrowing households is similar across castes and land possessing groups.

3.2 Pattern of Temporary Migration

Keshari & Bhagat (2012) scrutinised India's temporary and seasonal migration pattern and found the antagonistic relation between economic and educational attainment and temporary migration through logistic regression analysis, in both urban and rural India. The study concludes that temporary mobility is higher among the weaker section (economically and socially) of Indian society irrespective of the state's level of economic development. Majumder's (2015) study has investigated migration of labourers to brick kilns in Uttar Pradesh. It concludes that socially and economically marginalised groups are over-represented in migration to brick kilns. Further, Korra (2011) studies the nature and characteristics of seasonal labour migration based on a household level primary survey and finds that more women migrate to rural areas, while men go to the urban informal sector for jobs such as construction worker, brick maker, auto driver and factory worker.

Kundu & Sarawati (2012) have concluded that poverty-induced migration has become a less critical component of mobility over time; migration is picking up people from relatively higher economic and social strata. So, poor are concentrated in rural areas and cast out from the urban growth process through the exclusionary institution of urban space. Parida & Madheswaran (2011) have examined India's internal migration by combining individual and household utility maximisation approach. They have used a probit regression model to verify the individual probability of migration. The STs, SCs and OBCs have less (or more?) chance to migrate than the Other Castes. They argue that migrants are more likely to come from households with smaller landholdings because they have the greatest need for additional income.

Most of the research both from primary survey and national level data investigation, confirms that mobility is higher among socially and economically marginalised sections of society. The study found that the percentage of households that engage in migration is diverse across household features. It has defined migrant household where at least one working-age member has migrated for employment before survey years (2017-18). A migrant household demarcates as family migrant households if both male and female members of the household engage in migration and if any single-gender (male or female) member of the household engages in migration than we define this as a single migrant household.

Table 3 demonstrates the migration rate, single and family migration rate and the average number of members engaging in migration per household across social groups. Socially marginalised section of the society has a higher migration rate than the privileged groups. Family migration is also high among ST households followed by OBC, SC households. All the OC migrants are only from single migrant households. The average number of persons engaged in migration per households is the highest among ST, followed by OBC, SC and OC households.

Table 3: Migration Rate, Single and Family Migration Rate and Average Number of Members Engaged in Migration across Social Groups

Social Group	Percentage of HH engaged in migration		Percentage of HH with single-member migrating	Percentage of HH with family migration	Average number of members engaged in migration per HH
	Yes	NO			
ST	62.0 (57)	38.0 (35)	45.6 (26)	54.4 (31)	1.9
SC	61.5 (155)	38.5 (97)	82.6 (128)	17.4 (27)	1.6
OBC	48.8 (121)	51.2 (127)	71.9 (87)	28.1 (34)	1.7
OC	39.0 (23)	61.0 (36)	100.0 (23)	0.0 (0)	1.2
All HH	54.7 (356)	45.3 (295)	74.2 (264)	25.8 (92)	1.7

Source: Author's primary survey (2018)
Note: The figure in parenthesis () represents the number of HH.

Table 4 represents the migration rate, single and family migration rate, and the average number of members engaged in migration per households across land possessing group. Across land possessing group, household migration rate negatively associates with land possessing group. Around 61.6 per cent of landless household engage in migration followed by marginal, small, medium, and large farmer groups, with their migration rate as 58.4, 47.4, 29.5 and 22.2 per cent, respectively. The family migration rate is the highest among migrants of the large farmer, followed by small, marginal, medium farmers and landless households[1]. Our field investigation confirms that mobility is higher among the socio-economically marginalised section of society. The family migration is higher among the socially marginalised section of the community.

[1] Most large farmers belong to the Scheduled Tribes; the amount of land in their possession is more but the quality of land is not suitable for cultivation.

Table 4 Single and Family Migration across Land-possessing Groups

Social group	Percentage of HHs engaged in migration		Percentage of HHs with single-member migrating	Percentage of HH with family migration	Average number of members engaged in migration per HH
	Yes	NO			
LL	61.6 (106)	38.4 (66)	78.3 (83)	21.7 (23)	1.6
MF	58.4 (187)	41.6 (133)	73.3 (137)	26.7 (50)	1.7
SF	47.4 (46)	52.6 (51)	69.6 (32)	30.4 (14)	1.7
MDF	29.5 (13)	70.5 (31)	76.9 (10)	23.1 (3)	1.3
LF	22.2 (4)	77.8 (14)	50.0 (2)	50.0 (2)	2.0
All HH	54.7 (356)	45.3 (295)	74.2 (264)	25.8 (92)	1.7

Source: Author's primary survey (2018)

Note: The figure in parenthesis () represents the number of HH.

4. Indebtedness and Migration Decision

Debt acts as a push factor in decisions to migrate (Breman, 1985; Majumder, 2015). This section explains how debt is one of the crucial variables to present the migration decision. Table 5 demonstrates the migration rate among different households with respect to the source of credit. Migration is the lowest among households taking credit from institutional sources, while it is the highest among households that take credit from non-institutional sources. The same pattern of migration rate across sources of credit also was found among different social groups.

The percentage difference in migration rate among borrowing versus non-borrowing, institutional source of credit (ISC) versus no institutional source of credit (Non_ISC) and non-institutional source of credit versus no non-institutional source of credit (Non_NISC) is presented in Appendix, Table 1. The chi-square test suggests that the significant difference in migration rate is due to the act of borrowing as well as the different sources of borrowing. We found that the migration rate is not significantly different among borrowing and non-borrowing households. The migration rate is positively associated with the non-institutional source of borrowing.

Table 5: Percentage Distribution of Migrant Households around Sources of Credit across Social Groups

Sources of credit	SC/ST Any member of the HH current migrant		OBC/OC Any member of the HH current migrant		All HH Any member of the HH current migrant	
	Yes	No	Yes	No	Yes	No
Borrowing	60.2 (142)	39.8 (94)	50.0 (101)	50.0 (101)	55.5 (243)	44.5 (195)
NB	64.8 (70)	35.2 (38)	40.9 (43)	59.1 (62)	53.1 (113)	47.0 (100)
ISC	49.2 (66)	50.8 (68)	39.3 (57)	60.7 (88)	44.1 (123)	55.9 (156)
Non_ISC	69.5 (146)	30.5 (64)	53.7 (87)	46.3 (75)	62.6 (233)	37.4 (139)
NISC	67.3 (101)	32.7 (49)	71.3 (62)	28.7 (25)	68.8 (163)	31.2 (74)
Non_NISC	57.2 (111)	42.8 (83)	37.3 (82)	62.7 (138)	46.6 (193)	53.4 (221)
All HH	61.6 (212)	38.4 (132)	46.9 (144)	53.1 (163)	54.7 (356)	45.3 (295)

Source: Author's primary survey (2018)

Notes: ISC- Institutional source of credit, NISC- Non-institutional source of credit, Non_ISC- no credit from institutional sources, Non_NISC- no credit from non-institutional sources, BSC- Both Sources of credit, and NB- non-borrowing. The figure in parenthesis () represents the number of HH.

4.1 Result of Logistic Regression

The relationship between migration rate and credit was revealed in the following logistic regression results. Migrating households were seen to depend on their socioeconomic characteristics and their access to credit and amount of credit. The independent variables are both categorical as well as continuous variables. The categorical dependent variables are Social Group, Households Type (according to the source of income), Sources of Credit, Institutional Source of Credit, Non-institutional Source of credit. Percentage and frequency distribution of each category in the respective categorical variables are presented in Appendix Table 2, revealing that each group's representation in each variable is not diverse, except the OC category in social group variable. The source of credit and amount of credit variables have high multicollinearity, so we have used each variable in the different model to show their impact on migration.

Seven continuous variables have also been incorporated in the logistic regression model. Table 6 states the average, standard deviation, skewness and kurtosis value of each independent continuous variable. Most of the variables follow normal distribution except the variable - Amount of land possessed variable, it is positively skewed with Plato kurtosis. Average family size is five, landholding is 2.01 acres, household head's age is 45 years, and household head's education is six years among survey households.

Table 6: Descriptive Statistics of Continuous Variable

Variable	Mean	Std. Deviation	Skewness	Kurtosis
Family size	4.97	1.642	0.821	1.591
Amount of land possessed	2.01	2.723	2.736	9.112
Age of HH head	45.10	10.733	0.182	-0.642
Years of education of HH head	5.97	4.234	0.228	-0.451
Ln of MPCE	6.495	0.329	0.306	0.130
Ln of institutional loan	4.476	5.188	0.308	-1.888
Ln of non-institutional loan	3.648	4.855	0.605	-1.588

Source: Author's primary survey (2018)

There are three models in our analysis of migration. Each model demonstrates the relationship between different sources of credit and amount of credit with migration. Model-1 has used at least one credit from institutional and non-institutional source as variables, Model-2 has incorporated sources of credit as the variable, and Model-3 has included the amount of loan on the institutional and non-institutional source of credit as variables. The result of the logistic regression model is presented in Table 7. The coefficient (odd ratio) and average predicted probability of independent variables are similar across three models, except for the amount of credit. 'The social group' variable is insignificant in all three models, suggesting that all caste groups have an equal chance to engage in migration. The agricultural labourer has the highest probability of migrating, followed by self-employed in agriculture, non-agricultural labour and other categories of the household type variable.

There are two variables related to the credit market in Model-1. The households borrowing from institutional sources have a lesser need to migrate than households that do not have access. The households borrowing from non-institutional sources for credit has higher (1.67 times) chance of migrating than the households that have not availed credit from non-institutional sources. In Model-2, we have used source of credit as an independent variable. This model divides all survey households into four categories as borrowing from only institutional sources, only non-institutional sources, borrowing from both sources of credit and non-borrowing households. The chance of migration among the only non-institutional source of borrowing households is the highest (2.14 time of non-borrowing households), followed by non-borrowing, both sources and institutional source of credit households. Households availing credit only from institutional sources have significant and lower need to migrate than non-borrowing households.

Table 7: Binary Logistic Regression of Indebtedness on Migration (N=648)

Variable	Category	(Model -1)		(Model -2)		(Model -3)	
		OR	PP	OR	PP	OR	PP
(Intercept)		0.03*** (12.44)		0.03*** (13.59)		0.03*** (12.32)	
Social group	ST	0.8 (0.23)	0.55	0.81 (0.21)	0.54	0.8 (0.24)	0.54
	SC	0.83 (0.24)	0.55	0.86 (0.15)	0.55	0.82 (0.26)	0.55
	OBC	0.64 (1.49)	0.49	0.66 (1.36)	0.49	0.64 (1.55)	0.48
	OC	1	0.60	1	0.59	1	0.60
Type of HH according to their income source	Self Emp. in Agriculture	4.93*** (38.26)	0.67	4.95*** (38.72)	0.67	4.87*** (37.82)	0.67
	Agricultural Labour	10.92*** (43.2)	0.82	10.96*** (43.5)	0.82	10.9*** (43.18)	0.82
	Non-agricultural Labour	1.29 (0.55)	0.35	1.29 (0.52)	0.35	1.3 (0.56)	0.35
	Other	1	0.30	1	0.29	1	0.29
Institutional credit	Yes	0.52*** (10.29)	0.47	-	-		
	NO	1	0.63	-	-		
Non-institutional credit	Yes	1.76*** (7.61)	0.62	-	-		
	NO	1	0.48	-	-		

Sources of credit	Institutional Credit	-	-	0.6** (4.92)	0.41		
	Non-institutional Credit	-	-	2.14*** (8.06)	0.72		
	Both Source Credit	-	-	0.81 (0.45)	0.49		
	No Credit	-	-	1	0.54		
Family size		1.6*** (33.72)	-	1.6*** (33.98)	-	1.59*** (33.54)	
Amount of land owned by HH		0.83*** (12.91)	-	0.83*** (12.62)	-	0.83*** (12.59)	
Age of HH head		1.005 (0.3)	-	1.01 (0.31)	-	1.01 (0.3)	
Years of education of HH head		0.96 (2.33)	-	0.96 (2.35)	-	0.96 (2.29)	
MPCE		1.001** (6.4)	-	1.001*** (6.95)	-	1.001*** (6.29)	
Ln of institutional loan amount		-	-	-	-	0.94*** (9.71)	
Ln of non-institutional loan amount		-	-	-	-	1.06*** (8.54)	
Omnibus Testa (Chi-Square)		189.61***		190.93***		189.93***	
-2 Log likelihood		702.768		701.447		702.444	
R Square		0.339		0.255		0.254	

Source: Author's calculation of primary survey data.
Notes: *, **, *** represent 10%, 5% and 1% level of significance, respectively. The figure in parenthesis () represents Wald chi-square statistics.

Model-3 has used the amount of credit variables to see the effect of credit from the institutional and non-institutional sources on migration decision. One per cent increase in the amount of loan from the institutional source of credit leads to 0.06 per cent decline in the probability of migration. A opposite results is found in case of an amount of loan from the non-institutional source of credit. Borrowing does not explain much about the decision of migration. The source of credit has a significant relation with the migration decision. The institutional source of credit is negatively, and non-institutional source of credit is positively related to the migration decision. The average predicted probability of migration increases at a decreasing rate from 0.3 to 0.95, with an increase in household size from 2 to 13 (see, Appendix Graph 2). One acre increase in landholding leads to

0.17 per cent in the likelihood of migration. The average predicted probability of migration decreases linearly from 0.6 to 0.2, with landholding rising from 0 to 12 acres (see, Appendix Graph 2). A rupee increases in MPCE results in a 0.001 per cent increase in the probability of migration. The average predicted probability of migration increases from 0.4 to 0.9 at a decreasing rate with the raise of MPCE (see, Appendix Graph 1).

4.2 Use of Remittance

The relation between migration and debt is substantiated through reason of migration and uses of remittance information. The study has collected information regarding the major two reasons of migration and use of remittance in the primary survey.

4.2.1 Reason for Migration

The first important reason for migration is described in Table 8, and the second important reason for migration is in Appendix Table 4. Around 75 per cent of migrants report that their first important reason for migration is repayment of debt and to meet regular consumption expenditure. Another 18 per cent have migrated due to lack of employment in their local region. Across social groups, indebtedness and regular consumption expenditure dominate the first important reason for migration, except OC migrant.

Table 8: Percentage Distribution First Reason for Migration across Social Group

Social group	To repay debt	Regular consumption expenditure	Social expenditure	Lack of employment	Other reasons
ST	47.1	33.7	6.7	11.5	1.0
SC	30.7	51.0	2.5	14.9	0.8
OBC	46.5	25.2	4.5	19.3	4.5
OC	11.1	29.6	0.0	59.3	0.0
All migrant	38.3	37.8	3.8	17.9	2.1

Source: Author's primary survey (2018)

4.2.2 Use of Remittance

Each migrant household on an average spends around 60 to 70 per cent of total remittance on first major uses. The rest 30 to 40 per cent of remittance is spent on the second major uses. The percentage distribution of the first major uses of remittance or migration income across social groups and land possess groups represents in Table 9.

Among migrant households, around 45.5 per cent of households have spent their remittance (Migration Income)[2] on regular consumption, and more than one fourth on repayment of debt. The first major uses of remittance are the highest on debt repayment among SC, ST followed by OBC, and OC migrant households, respectively. The migrant households have two options to sustain their livelihood either take debt to spend on regular consumption expenditure and repay the debt through remittance or wait till receiving the remittance and spend the remittance on regular consumption expenditure. The second major uses of remittance across social group are presented in Appendix Table 5. On an average 36 per cent of migrant households spend on other activity as the second purpose of their remittance. Moreover, 24, 25.3, and 14.6 per cent of migrant families spend on consumption, investment, and repayment of debt purpose, respectively. A significant proportion of households use their remittance to repay debt in the first and second major uses of remittance.

Table 9: Percentage Distribution of First Major Amount Uses of Remittance across Social Groups

Social Group	Consumption	Investment	Repayment of debt	Other	Total 1st uses of remittance / income
ST	45.7 (21)	15.2 (7)	17.4 (8)	21.7 (10)	100.0 (46)
SC	47.9 (104)	6 (13)	26.3 (57)	19.8 (43)	100.0 (217)
OBC	38.6 (56)	11.7 (17)	33.1 (48)	16.5 (24)	100.0 (145)
OC	63 (17)	11.1 (3)	14.8 (4)	11.1 (3)	100.0 (27)
All Migrant Person	45.5 (198)	9.1 (40)	26.9 (117)	18.4 (80)	100.0 (435)

Source: Author's primary survey (2018)

Note: The figure in parenthesis () represents the number of migrant persons.

[2] Advance payment is included in income/ remittance of migrant.

5. Conclusion

The demand for credit is similar across social groups, but access to an institutional source of credit is significantly lower among socially marginalised groups. The socially marginalised section of the society has no option but to avail credit from non-institutional sources to meet contingency expenditure. MFIs are not able to significantly substitute non-institutional sources of credit. The migration pattern suggests that the socially marginalised section has a higher migration rate than OC. Most of the migrant of OC are single migrants, whereas a substantial proportion of family migrants are among ST, SC and OBC households.

Among socio-economic factors, lower landholding and bigger family size with higher regular consumption expenditure households significantly increase the likelihood of migration. Farming households have a higher probability of engaging in migration than other households. After controlling other socioeconomic factors, the study found that households borrowing from non-institutional sources have higher likelihood of migrating. This study supports the existing research on the effect of debt on migration (Breman, 1985; Srivastav & Sutradhar, 2016; Majumder, 2015; Korra, 2011). It has found a positive relation between non-institutional credit and decision of migration in rural Odisha. It has also been argued that migration itself increases access to credit (Deshingkar et al., 2006). But this study lacks information to counter this argument and requires longitutional data to analysis the impact of migration on access to credit.

Appendix

Table 1: Percentage Change in Migration Rate due to Borrowing

Differences	SC/ST	OBC/OC	All HH
Borrowing - (non_borrowing)	4.6 (0.68)	9.1 (2.27)	2.4 (0.34)
ISC - (Non_ISC)	-20.3*** (14.21)	-14.4** (6.4)	-18.5*** (22.13)
NICS - (Non_NISC)	10.1* (3.67)	34.0*** (28.9)	29.9*** (29.8)

Source : Same as Table 5
Notes : *, **, *** represent 10%, 5% and 1% level of significance, respectively. The figure in parenthesis () represents the calculated value of chi-square.

Table 2: Percentage and Frequency Distribution of Categorical Variable Use in the Decision of Migration Model (Binary Logistic Regression)

Variable	Category	N	Per cent	Variable	Category	N	Per cent
Migrant HH	No	293	45.2	Institutional Source	Yes	278	42.9
	Yes	355	54.8		No	370	57.1
	Total	648	100.0		Total	648	100.0
Category	ST	92	14.2	Non-institutional Source	Yes	236	36.4
	SC	250	38.6		No	412	63.6
	OBC	247	38.1		Total	648	100.0
	Others	59	9.1	Source of Credit	Institutional Credit	200	30.9
	Total	648	100.0		Non-institutional Credit	158	24.4
Type of HH according to their source of income	Self employed in agriculture	295	45.5		Both Source Credit	78	12.0
	Agricultural labour	126	19.4		No Credit	212	32.7
	Non-agricultural labour	90	13.9		Total	648	100.0
	Other	137	21.1				
	Total	648	100.0				

Source: Author's primary survey (2018)

Table 3: Significance of Individual Variable in the Decision of Migration Model

Source Variable	1ST MODEL Wald Chi-Square	2nd MODEL Wald Chi-Square	3rd MODEL Wald Chi-Square
(Intercept)	11.66*** (0.001)	12.38*** (0.0)	11.36*** (0.00)
Social Group	2.48 (0.48)	2.48 (0.48)	2.54 (0.47)
Type of HH	73.09*** (0.00)	73.75*** (0.0)	72.56*** (0.0)
Sources of credit	-	18.71*** (0.0)	-
Institutional source of credit	10.29*** (0.001)	-	-
Non-institutional source of credit	7.61*** (0.006)	-	-

Family Size	33.72*** (0.00)	33.98*** (0.0)	33.54*** (0.0)
Amount of land owned by HH	12.91*** (0.00)	12.62*** (0.0)	12.59*** (0.0)
Age of HH head	0.3 (0.59)	0.31 (0.58)	0.3 (0.58)
Year of education	2.33 (0.13)	2.35 (0.12)	2.29 (0.13)
MPCE	6.4** (0.011)	6.95*** (0.01)	6.29** (0.01)
Log of institutional loan	-	-	9.71*** (0.00)
Log of non-institutional loan	-	-	8.54*** (0.00)

Note: *, **, *** represent 10%, 5% and 1% level of significance, respectively. Figure in parenthesis () represent significance level

Table 4: Percentage Distribution Second Reason for Migration across Social Groups

Category	Repay debt	Regular consumption expenditure	Social function	Lack of employment	Other reason
ST	15.5	35.1	11.3	23.7	14.4
SC	20.3	33.6	10.8	21.6	13.8
OBC	13.3	37.8	15.8	14.3	18.8
OC	3.7	51.9	0.0	25.9	18.5
All migrant	16.1	36.2	12.1	19.6	16

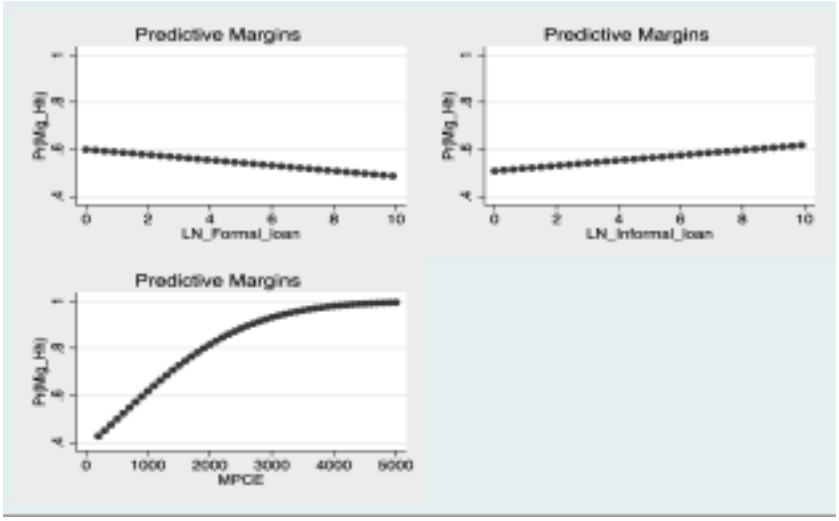
Source: Same as Table 8

Table 5: Percentage Distribution of Second Major Use of Remittances across Social Groups

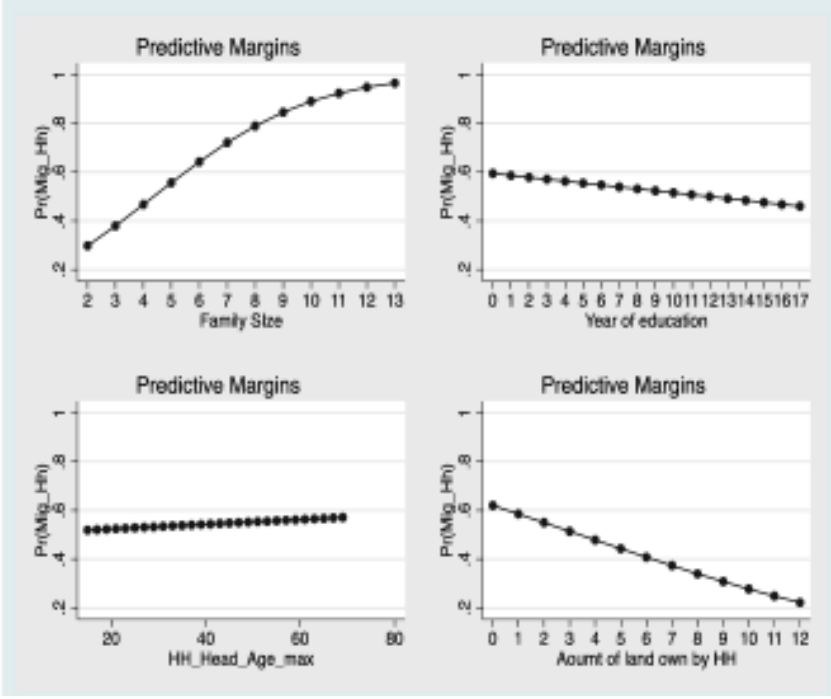
Social Group	Consumption	Investment in agriculture	Repayment of debt	Other	Total 2nd use of remittance / income
ST	24.3 (9)	24.3 (9)	10.8 (4)	40.5 (15)	100.0 (37)
SC	24.6 (51)	20.3 (42)	17.9 (37)	37.1 (77)	100.0 (207)
OBC	23.2 (32)	29.7 (41)	11.6 (16)	35.5 (49)	100.0 (138)
OC	22.2 (6)	44.4 (12)	3.7 (1)	29.6 (8)	100.0 (27)
All Migrants	24 (98)	25.4 (104)	14.2 (58)	36.4 (149)	100.0 (409)

Source: Same as Table 9

Graph 1: Predicted Probability Curve of Migration Decision on Institutional Loan Amount, Non-institutional Loan Amount and MPCE (in clockwise direction; drawn from the results of logistic regression)



Graph 2: Predicted Probability Curve of Migration Decision on Family Size, Year of Education of HH Head, Land Owned (in acres), and Age of HH Head (in a clockwise direction; drawn from the results of logistic regression)



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Article

MGNREGA and Migration: The Case of Tribal Women in West Bengal

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Arindam Chakraborty

Abstract

Migration represents mobility of the labour force. Migration, in any form, is one of the shared development challenges of countries such as India, Mexico and China. This paper has contextualized migration through an examination of India's employment guarantee legislation, Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). Specifically, distress migration is a matter of concern in rural India. Mitigating distress migration in rural areas has been the covert objective of MGNREGA. It is presumed that migration under distress would be arrested if the scheme is successfully implemented. This paper demonstrates that employment created by MGNREGA has both directly and indirectly reduced distress migration among tribal women in rural West Bengal.

Keywords: MGNREGA, Guaranteed employment, Distress migration, Aspirational migration, Tribal women, Rural Bengal

1. Introduction

India embarked on economic reforms in 1991 with the belief that the benefits would trickle down to the masses. But as time passed, the entire growth process became service-led and questions of distribution arose. Growth in

Arindam Chakraborty, Associate Professor of Economics, Sudhiranjan Lahiri Mahavidyalaya, Nadia, West Bengal. Email: arindamfulia@gmail.com

gross demestic product (GDP) led to deterioration of personal, sectoral and regional distribution (Pankaj, 2012a). The GDP growth was seen to be largely driven by the growth in the tertiary sector, and to some extent in the secondary sector. From 1990-91 to 2000-01, the share of agriculture to GDP declined to 24.00 per cent from 32.20 per cent, while the share of service sector rose to 54.20 per cent from 46.09 per cent. Therefore, a rise by about eight percentage points in the share of the service sector and almost similar decline in the agricultural sector have been witnessed, with very little change in the share of industrial sector (Sastry et al., 2011). This faster growth mostly in the tertiary sector, and to some extent in the secondary sector, has led to sectoral imbalances. In the post-reforms period, inter-state disparities have also widened (Ahluwalia, 2011). At the occupational level, it was seen that the real wages of agricultural labourers increased more slowly than per capita GDP and conversely with public sector employees. It implies the intensification of economic inequality between occupation groups (Deaton & Dreze, 2002). In the post-reform period, income inequality has also increased significantly for both rural and urban areas (Dev & Ravi, 2007) widening the rural-urban gap in per capita expenditure and rising inequality of per capita expenditure within urban areas in most states (Deaton & Dreze, 2002). So, the increasing gap between growth and employment and between income and distribution has aggravated income, occupational, sectoral and regional inequalities.

In addition, growth in the secondary and tertiary sectors was not accompanied by the creation of sufficient jobs. The growth witnessed in the post-reforms period was referred to as jobless growth (Bhaduri, 2011). This led to further overcrowding in the primary sector. However, during the reform phase, the condition of the primary sector, providing livelihood to the majority of the population has worsened. Its growth rate declined to 2.57 per cent in the reforms period (1992-93 to 2004-05) from 3.08 per cent in 1980s. Although the contribution of primary sector to GDP decreased, there has been no significant decline in the population dependent on the sector (Pankaj, 2012b). This led to a relative decline in labour productivity in agriculture compared to other sectors. Labour productivity declined, but out of 70 per cent of the total population living in rural India majority earned their livelihood from agriculture. In 2004-05, out of 467 million estimated labour force, 71.4 per cent lived in rural areas and 56.5 per cent

of the total labour force earned their livelihood from agriculture. This indicated a low level of diversification of occupation in rural areas as well as rising disguised unemployment in agriculture. On the one hand, there was declining agricultural productivity and surplus of labour and on the other hand, there was increasing unemployment in the forms of open and disguised and low occupational diversification in the rural economy. All these have led to large scale intra- and inter-state migration from rural to urban areas (Ibid).

Against this backdrop of rising inequalities, jobless growth, decline in the growth of agricultural productivity and increasing distress migration, the Government of India in 2005 passed the Mahatma Gandhi National Rural Employment Guarantee Act (hereinafter MGNREGA[1] or NREGA or the Act), and initiated it in a phased manner with effect from 2006. This rights-based legislation proposed to be demand-driven in nature, and urges self-selection. Due to its self-selection design, the programme has received significant acceptability among the least privileged population in rural areas (Liu & Barrett, 2013).

2. Migration and MGNREGA: A Preview

Migration is viewed from multiple ideological and disciplinary positions and is a contested issue for policymakers as well as practitioners and researchers (United Nations Development Programme [UNDP], 2015). Generally, migration takes place due to lack of economic opportunities in rural areas along with land shortages and poor infrastructure. It also occurs because of perceived better employment prospects elsewhere and improved communication (Food and Agricultural Organisation [FAO], 2010). Broadly, migration can be categorized in two forms namely, aspirational and distress (Shah, 2016). In case of aspirational migration whether it is within the country or outside, most migrants get benefitted in the form of higher incomes, improved access to education and health as well as better prospects

[1] MGNREGA ensures every rural household 100 days of casual employment on public works at the statutory minimum wage in a financial year. Initially, it was National Rural Employment Guarantee Act (NREGA). From October 2, 2009, NREGA has been rechristened as MGNREGA).

for their children (*Human Development Report* [HDR], 2009). In this regard, migration can be and is indeed a powerful source of prosperity (Shah, 2016).

There are multiple reasons for economic distress in a household. It is not only extreme poverty that often culminates into economic distress, but several seasonal trends and factors such as crop failure or continuing debt also lead the households to acute distress. While multiple factors contributing to economic distress, there are limited pathways for managing distress. Sometimes livelihood diversification can be a good pathway for escaping poverty. But for alleviating distress as well as for escaping from poverty, migration offers solutions. In rural areas in coping with the crisis of labour market, vulnerable groups, such as the landless and small farmers, often resort to migration (UNDP, 2015). MGNREGA can offer a solution to slow down distress migration to urban areas (Dreze, 2011). By recognizing agricultural labour force as workers and legislating for them an entitlement to work, MGNREGA has attempted to curb distress migration from rural to urban areas for the most marginalized and the vulnerable sections of society (UNDP, 2015). It has exerted a more direct and positive impact in curbing distress migration in comparison with migration for economic prosperity (Ministry of Rural Development [MRD], 2012).

One of the primary objectives of MGNREGA has been to reduce short term rural out-migration by generating employment especially during the lean season (Das, 2014). Ambasta et al. (2008) found some evidence of reduction of migration due to NREGA in Madhya Pradesh in their study. It was evident from Jandu's (2008) study that NREGA created reasons and opportunities for people to work and remain in their villages. There had been a decline in the rate of migration as well as a shift in the pattern of migration in all the surveyed areas under his study. As a result, there had been significant impacts on questions of security, health and children's education, all of which were often compromised during migration. Khera & Nayak (2009) maintained that NREGA had a significant impact on single women, allowing them some measure of protection from having to migrate for work. Sometimes, due to the availability of NREGA work they could postpone migration. There were some costs and risks always associated with migration. So, protection from migration led to significant improvement in the quality of their life. Chandrasekhar & Ghosh (2009) also observed in their study that a significant increase in women's paid work has led to a decline in distress migration.

Before NREGA, there had been out-migration in rural areas due to lack of employment opportunities. The commencement of NREGA has led to a decline in the incidence of out-migration, especially seasonal. In some cases, people are no more interested in earnings from wage labour. Rather with the NREGA income, they have started taking interest in increasing net income from cultivation through improved agricultural practices (Banerjee & Saha, 2010). MGNREGA has been found to have greater impact on the Scheduled Castes and Scheduled Tribes, engaged as agricultural labour as well as the people with BPL cards. They have a greater probability of migration. It has been observed that, as households work more and more under the Act and get income out of that, the probability of migration decreases significantly (Das, 2014). Shah (2016) also opined that MGNREGA was most effective in reducing distress migration.

3. Objective and Scope

Studies have offered fair documentation of the impact of MGNREGA on the migration issue. At the same time, they left a plethora of questions particularly relating to migration. In view of that, the paper adjudges the policy instrument MGNREGA on the dimension of job creation culminating in arresting distress migration. It is hypothesized that guarantee of work for all can mitigate the problem of migration to a large extent. In exercising the relation between the guaranteed employment under the programme and the issue of migration the author thinks it prudent to consider the case of tribal women who generally shoulder the burden of their families due to existing typical social fabric in the study areas. At the same time, the paucity of employment opportunities at the local level is a compelling factor for them to migrate to other areas for alternative livelihoods. So, to be more specific in nature and scope the study has zoomed into the issue of migration among tribal women with MGNREGA thereby delving into a newer area of research and unfolding some novel dimensions of social perspective.

4. Methodology and Data

4.1 Collection of Data

The findings of this paper are based on an extensive survey carried out during 2016-17 at the household level in Nadia district of West Bengal. Multi-stage random and purposive sampling procedure has been followed

in the study. Nadia district was selected as it topped the list among 19 MGNREGA districts of the state in the performance ranking made by the State MGNREGA cell based on 11 parameters[2] in 2015-16. It was expected that the top-ranking district would deliver excellence in most of the fields. In Nadia, there were 17 blocks in 2015-16. In the second stage, out of them, three blocks namely, Chakdaha, Krishnaganj and Santipur were selected randomly. From these three blocks, five gram panchayats were chosen randomly in the third stage. In the fourth stage, villages were selected purposively taking one or two villages from each of the panchayats so as to ensure representation of the Scheduled Tribes workers in the sample. In the fifth stage, tribal households working in the MGNREGA work were selected randomly and surveyed. However, the target was to reach to the female workers only. For the purpose, a well-designed structured questionnaire consisted of variables relating to the objectives and concepts of the study was used to collect both qualitative as well as quantitative data from the concerned sources and presented as per need of the study.

4.2 Sample Profile

This section deals with the socio-economic features of the sample such as age, literacy, marital status, poverty level, etc. In the study, in presenting the workers by their age, the age group has been divided into four classes namely, 18[3]-30, 31-45, 46-60 and above 60 years. All the women in the sample were scattered in the different age groups. Almost half of the workers were from the age group 31-45 years, comprising of 48.6 per cent. In the age group 18-30 there were 16.4 per cent workers and another 30 per cent women were in the age group 46-60 years. In the sample, 5 per cent of workers were above 60 years of age. This is a picture showing the willingness of the workers to be engaged in the work of different ages. What is most

[2] Parameters are: % of person-days generated against last year performance; Average person-days per household; % of households completed 100 days; % of work with convergence; work completion rate; % of SC/ST households provided employment against registered SC/ST; % of wage paid within 15 days; % of women person-days; Expenditure (in Rs. lakh); % of less than 15 days employment provided against household provided employment; % of Aadhaar number w.r.t active workers.

[3] As per the Act, employment under the scheme would be provided to an adult who has completed 18 years of age.

interesting is that even women over 60 years of age also vied for MGNREGA works as revealed by the data. This indicates two aspects. Women aged more than 60 years had to struggle for their survival due to their abject penury. In some of the work sites they did the job of water carriers, but most of the senior women had to work hard even carrying the soil for earning the wage, if not digging. Any case, the scheme has created a space even for the senior women to work for their livelihood which is hardly found in other schemes. This is no doubt the uniqueness of the scheme.

Our sample has witnessed lower literacy rate among women. It is reflected from the data that 122 workers (87.2 per cent) are being illiterate. So, of the remaining 12.8 per cent women workers 1.4 per cent women had primary education (1-4 standard) and 11.4 per cent women had secondary education (5-10 standard). No woman with higher education was found in the sample. At the time of collecting data, women were asked to reveal their marital status in six categories viz., unmarried, married, widow, divorced, deserted, and separated. However, only two categories of women, married and widow were found in the survey. Around 80.7 per cent women working under the scheme were married and the remaining 19.3 per cent were widows. So, it reveals that the scheme rendered good employment opportunity to housewives. It offered some earning opportunities to the widows as well who often shouldered the burden of earning two square meals for the family.

On the economic front, the study has tried to amass data on the poverty level of the selected households. Poverty can be defined as the inability of an individual to secure a normative minimum level of living or to attain some basic needs of life. This normative minimum defines the poverty line in terms of money per capita per month living below which a person is deemed to be poor (Planning Commission, 2014). On the poverty account, data were collected on three heads, namely APL, BPL and the IAY[4] beneficiaries. In our sample, around 65.7 per cent of the workers belonged to BPL families while the remaining 34.3 per cent households were above the poverty level. Out of 140 households in the sample, 34 families (24.3 per cent) received the IAY benefits as they were poor to a considerable

[4] Indira Awas Yojana (IAY), a flagship scheme of the Ministry of Rural Development, Government of India provides assistance to BPL families who are either houseless or having inadequate housing facilities for constructing a safe and durable shelter

extent. The scheme has been formulated to fight poverty more effectively. The data reflect that in most cases the study has dealt with workers for whom the scheme has been designed.

4.3 MGNREGA Participation

The study has been undertaken based on the hypothesis that participation under the MGNREGA works has some mitigating impacts on migration in rural areas. It is, therefore, necessary to present the extent of MGNREGA participation of the sample workers. The study has assessed the average participation of the sample women for the last three years under MGNREGA. The survey was done in the 2016-17 financial year. So, MGNREGA participation of the sample workers was considered for 2013-14, 2014-15 and 2015-16 financial years. For analytical purpose, MGNREGA participation of the sample workers has been classified into five groups namely, 1-15, 16-30, 31-60, 61-90, and 91-100 days of employment. Considering the aggregate data, it can be stated that around 43.6 per cent women in the sample enjoyed 31-60 days of employment on average under the scheme during the last three years, the highest in the roll. On the other hand, on average 27.1 per cent, 23.6 per cent and 5.7 per cent women enjoyed respectively 1-15, 16-30 and 61-90 days of work during the period. There was no worker found in the 91-100 days work bracket.

5. Analysis and Findings

5.1 Migration Status

A migrant is an individual who changes his usual residential place, by way of either crossing an international border or moving within the country from one place to another region, district or municipality (HDR, 2009). Who is migrating is a very crucial and complex question. However, some trends can be ascertained. In the human developmental span, it is seen that the elderly people and young children may necessarily migrate due to distress. Gender and migration also share important relation. Women also migrate and through migration power relations within households get impacted (UNDP, 2015).

The issue of migration has been addressed in the study from different angles. Who is the migrant in a family and the overall migration status have been of utmost concern in the study. So, special emphasis has been given during survey to encompass every possible data on migration, the status of which has been documented in Table-1 following the report of the Indian School of Women's Studies Development (2006).

The question of migration in the labour market is not limited to only the head of the family, rather every adult member of a family is subject to migration. This point has been taken into cognizance in the study. The study reflects three types of migrants such as self, i.e., the women themselves, their husbands and other members of the family. Four types of migration destination have been identified viz. outside village panchayat, outside block, outside the district and the state. In aggregate there were 43 households (30.71 per cent) in the sample with an instance of migration. The migrants, women were the majority (81.4 per cent) followed by other members and husbands. In respect of destination, in 39.4 per cent cases migration occurred outside the village panchayat; in 41.9 per cent cases they migrated outside the block and in 18.6 per cent cases, it occurred outside the state. There was no case of migration outside the district in the sample.

Table 1: Migration Status of the Workers Families

	Migrating Households	Migrant			Destination				Type of Migration		
		Self	Husband	Other	Outside Panchayat	Outside Block	Outside District	Outside State	Sometime	Frequently	Permanent
Number	43	35	03	5	17	18	0	8	15	22	6
Total %	30.71	81.4	7	11.6	39.5	41.9		18.6	34.9	51.2	13.9

Source: Primary data

Status of migrants has been presented in Table 2. It reflects that women workers migrated outside the village panchayat or the block sometime or frequently in the year. The tribal women who were basically the agricultural workers migrated in search of job outside the village panchayat or the block

sometimes or frequently in the year depending upon the availability of employment within the village panchayat or the availability of MGNREGA work locally. However, husbands of the women workers or head of the family migrated sometimes or permanently in the year outside the state. Other members of the family, generally sons of the workers, migrated permanently outside the state in quest of better employment opportunity. It was reported during the survey that in case of husband or the other member of the family, they left home in search of some better job and better income in hotels or construction-related works in other states such as Maharashtra, Kerala, Delhi or Gujarat. In some cases, panchayats they belonged to offered good employment during the period. But employment guaranteed by the scheme did not have any impact on this type of migration as they were hopeful for much higher income than the income MGNREGA offered. This simply tells that MGNREGA employment was in no way attractive to them.

Table 2: Migrant vs Destination, Type of Migration

Migrant	Destination			Type of Migration		
	Outside Panchayat	Outside Block	Outside State	Sometime	Frequently	Permanent
Self	17 (48.57)	18 (51.43)	-	13 (37.14)	22 (62.86)	-
Husband	-	-	3 (100)	2 (66.67)	-	1 (33.33)
Other	-	-	5 (85.71)	-	-	5 (100)
Total	17 (39.5)	18 (41.9)	8 (18.6)	15 (34.9)	22 (51.2)	6 (14)

Source: Primary data

Note: Figures in parentheses indicate percentages

5.2 Migration- Distress or Aspirational

The micro-level data clearly suggest that in rural West Bengal people do migrate in quest of job to other places. As shown in Table 1 in 30.71 per cent households someone had migrated. So, even in the presence of the

scheme the problem of migration remains. To know whether the migration has been distress driven or aspirational, a cross-tabulation has been tried between the poverty level and the migrant, the results of which have been presented in Table3.

Table 3: Poverty Level vs Migrant

	Migrant			Total
Poverty Level	**Self**	**Husband**	**Other**	
APL	2 (5.7)	1 (33.3)	5 (100)	8 (18.6)
BPL	33 (94.3)	2 (66.7)	-	35 (81.4)
Total	35 (100)	3 (100)	5 (100)	43 100

Source: Primary Data
Note: Figures in parentheses indicate percentages

Table 3 shows pinpoints whether the persons in the sample migrated out of distress or in search of economic prosperity. While 81.4 per cent migration cases occurred in BPL families. 94.3 per cent women migrants belonged to those families. But in case of other members of the family who migrated, all of them belonged to APL categories. Considering the annual family income of the women workers it is observed from our survey data that in case of women and their husbands, all of them belonged to the income group of Rs. 10001-60000. But in case of other members of the family who migrated, 80 per cent belonged to income group of Rs. 60001-200000. So, mostly women workers and their husbands migrated out of economic distress while the migration type in respect of other members of the family was aspirational.

5.3 Factors Explaining Migration

Migration or more specifically distress migration is a matter of concern in rural India. Mitigating the problem of distress migration in rural areas has been the covert objective of MGNREGA. It has been presumed in the Act

that the migration due to distress would be arrested if the scheme is successfully implemented. Keeping this in view a causal relation between participation and migration has been taken care of in this paper based on primary data. During the survey, 99 women (70.7 per cent of the total workers) in the sample replied to have other work apart from maintaining household chores. Hence, agricultural wage income came out to be the biggest source of other income among the women. A large section of women workers was engaged in agricultural activity as labour. In view of the surplus of labour in the rural economy and the gendered dimension of labour, the opportunities in agricultural work tend to be seasonal in nature (Khera & Nayak, 2009). In the sample, women who hailed from tribal families were to take a lot of burden in running the families as the male members of these families were alcoholic. Male members were also agricultural labour, but their wage-earnings were wasted on alcohol. As the women workers in the sample played the deciding role in running the families from agricultural wage-earning, any seasonal variation or the paucity of work in the local areas forced them to migrate to other places. In this way, the issue of migration has got focused in the study.

Now, what are the factors working behind the issue of migration? In general, there is no single issue made responsible for migration due to inherent spatial diversity. As per several studies, education or community-specific skill, such as masonry or lack of landholdings; opportunity and access to work in proximity or the lack of access to work or caste and community networks may give an insight into the likely patterns of migration (UNDP, 2015). In view of these whether MGNREGA can offer a good answer to the issue of migration has been the concern of the study for which a logistic analysis has been resorted to.

In the study, the response variable migration is considered to be a binary one where migration =1 if yes, otherwise =0. Hence, the estimation can be done by using logit regression analysis where the probabilities describing the possible outcomes of a single trial are modelled, using a logistic function, as a function of the explanatory variables which are the predictors as well. Logistic regression measures the relationship between one dependent binary variable and one or more nominal, ordinal or interval independent variables, by using probability scores as the predicted values of the dependent variable. In Logit regression, the binary response variable can be converted into a

continuous variable Y= log(p/1-p), defined as the log odds ratio, which takes the values from -" to +", p being the probability that any observation belongs to the group having 1 as the value of the response variable. The log odds ratio is a linear function of the explanatory variables (Maddala & Lahiri, 2013). The logit models are estimated by maximum likelihood method of estimation.In order to get the effect of the ith independent variable, it is necessary to calculate the marginal effect, which is defined as aip/(1-p) representing the effect of a change in predictor on p, where ai denotes the coefficient of the ith independent variable in the regression explaining the outcome value of the binary response variable (Mandal & Ghose, 14-15).

In the study the following logistic equation is considered:

$$Y=Log\ (p/1-p) = \hat{a}_0 + \hat{a}_1 X_1 + \hat{a}_2 X_2 + \hat{a}_3 X_3 + \hat{a}_4 X_4 + \hat{a}_5 X_5 + u_i (1)$$

where p is the probability of migration and

p/1-p= the odds ratio

X_1= Age in years

X_2= Poverty level, a dummy variable, where BPL=1, APL=0

$X_{3=}$ Women workers' other work, a dummy variable, 1 for yes, 0 otherwise

X_4= Women workers 3-year average participation in MGNREGA

X_5= Family income excluding MGNREGA income (in Rs. lakh)

u_i= error term in the model

The results of the logistic analysis for migration are presented in the Table 4 as estimated coefficients, marginal effects and odds ratio for various co-variates under the study. The results describe the relationship between the independent variables and the response variable, which is on the logit scale. The likelihood ratio $\div^2$ of 42.72 with a p-value of <0.001 implies that the model as a whole fits significantly.

Table 4: Results of Logistic Regression for Migration

Variables	Coefficients	P Value	Odds Ratio	Marginal Effects
Constant	-0.908 (1.316)	0.490	0.403 (0.531)	
Age	-0.066* (0.025)	0.008	0.936 (0.023)	-0.011 (0.004)

Poverty	1.306* (0.513)	0.011	3.691 (1.893)	0.196 (0.071)
Female other work	3.005* (0.803)	<0.001	20.187 (16.219)	0.368 (0.060)
Women workers 3-year average participation in MGNREGA	-0.029** (0.016)	0.079	0.972 (0.016)	-0.005 (0.003)
Family income excluding MGNREGA income (in Rs. lakh)	1.169 (1.147)	0.308	3.219 (3.692)	0.198 (0.192)

Source: Primary data
Notes: Standard errors are in parentheses
LR chi2(5) = 42.72, Prob > chi2=0.000
Cox & Snell R Square 0.263, Nagelkerke R Square 0.369
*Significant at 1% level, ** Significant at 10% level

All the four coefficients of the explanatory variables excepting that for Family income excluding MGNREGA income have come out to be significant here. Family Income Excluding MGNREGA Income has been considered as an explanatory variable on the presumption that income apart from MGNREGA earnings does have a bearing upon the migration. The sign of the coefficient has favoured the aspirational migration. However, the coefficient of this variable is found to be insignificant. So, we can dispense with it in our analysis. Now, for every one-unit increase in age, we expect 0.936 times decrease in the odds of migration. Women workers having lower age, as usual, have a higher tendency to migrate. Similarly, people living below the poverty level have a higher propensity to migrate. Poverty defines the distress which compels a person to migrate another place for the better employment opportunity. It increases the likelihood of migration by 19.6 percentage points.

In the study, women workers having other works have a highly positive impact on migration. It increases the likelihood of migration by 36.8 percentage points. It has been found in the sample that all of the migrating women workers are agricultural labour. As the women are to shoulder the family burden and there is a scarcity of work in the locality, they need to migrate outside the village panchayat territory or outside the block as per availability of the job. They even used to migrate 30 to 40 km away from their home in search of job in agricultural activity in peak season.

Considering the coefficient of MGNREGA participation of women it can be stated that for every one-unit increase in MGNREGA participation of women, we expect 0.972 times decrease in the odds of migration. It is reflected from the survey where MGNREGA job availability was between 1 to 30 days among the tribal women, they migrated frequently in a year while with the MGNREGA job availability of 31-60 days women migrated sometime in a year. So, increased MGNREGA participation has a clear mitigating impact on the tribal women's migration, especially of distress type. In the case of acute distress, MGNREGA has provided a choice particularly to women (UNDP, 2015).

6. Conclusion

This paper has contextualized the issue of migration with one of our policy instruments, MGNREGA, deriving the extent of addressing the challenge. The issue of migration has been incorporated in the study to make a causal relation between participation under MGNREGA and mitigation of migration problem in the study areas. In aggregate, there have been 30.71 per cent tribal households in the sample, in which migration occurs in some way or other. Eventually, women are found to constitute the majority among migrants. Among them, younger women have more propensity to migrate. In the study, women aged between 18-45 years are the majority (65 per cent of the total).

In the study areas, both types of migration have been found. While women workers migrate due to economic distress, migration among other members of the family is purely aspirational. Women workers have a particular type of occupation and scarcity of work in this occupation in their local areas compels them to migrate to other places. In case of other members of the family, they migrate to other places and choose jobs as per availability mostly for economic prosperity.

The study has identified the explanatory factors for migration, which have marked the causes of migration and at the same time provided answer to them. Women living below the poverty line have found to have more propensity to migrate to overcome economic distress. Similarly, paucity of employment opportunity at the local level has been compelling women to migrate as they need to shoulder the burden of their families. On the other hand, in the study, increased MGNREGA participation has been found to

have a clear mitigating impact on migration, especially on women experiencing distress. The programme has been effective in curbing distress migration for the most marginalized and the vulnerable population, through guarantee of decent work. So, effective implementation of MGNREGA would have both direct, as reflected from the statistical analysis, as well as indirect impact on migration via poverty reduction.

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Article

Empirical Drivers of SME Formation in Indian States

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Jaya Prakash Pradhan
Tareef Husain

Abstract

The development of small and medium enterprises (SMEs) sector is a policy priority as these enterprises play a critical role in the growth and development process of any economy. The present study explores the regional dimensions of entry of new SMEs across Indian states and sectors from 1980-2007. It expands the literature on formation of firms from the sub-national perspective, empirically uncovering regional factors that significantly determine the formation of new firms. Findings suggest that new SME formation in India is characterized by a concentrated regional pattern during the study period, with a few regions accounting for disproportionate share of the number of new SMEs formed. Also, Indian sub-national entities exhibited considerable disparity in the entry rate of new SMEs. Regional factors like local market size, availability of skills, technological specialization of manufacturing sector, land transportation networks, and entrepreneurial culture tend to play positive role in the formation rate of SMEs in Indian states.

Keywords: SMEs, India, Regions, Entry Rate

Jaya Prakash Pradhan, Professor and Dean, School of Social Sciences, and Chairperson, Centre for Studies in Economics & Planning, Central University of Gujarat, Gandhinagar. Email: pradhanjayaprakash@gmail.com

Tareef Husain, Assistant Professor of Economics, Galgotias University, Gautam Buddh Nagar, Uttar Pradesh. Email: tareefhussain.amu@gmail.com

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1. The Background of the Study

The existence of the small and medium enterprises (SMEs) sector is deemed to be critical for the growth and development of any economy. The SME sector contributes a significant stake of national output, employment, number of enterprises and export earnings in both high-income and developing economies. SMEs contribute over 55 per cent of Gross Domestic Product (GDP) and over 65 per cent of total employment in high-income countries, while the corresponding shares for middle-income countries are 70 and 95 per cent and for low-income countries shares are 60 and 70 per cent (OECD, 2004). In India, micro, small and medium enterprises (MSMEs) accounted for 31.8 per cent of gross value added during 2016-17, 48.1 per cent of total export during 2018-19,while estimated number of workers in unincorporated non-agriculture MSMEs stood at 11.1 crore during 2015-16 (PIB, 2019).Therefore, development of SME sector has emerged as policy priority in both developed and developing countries. In addition to enhancing competitiveness, SME development strategy must focus on facilitating formation of new SMEs.

Higher rate of SMEs formation is found to be positively related to the growth of an economy (Djankov et al., 2002; Gallagher and Robson, 1994) and generation of employment (Thurik and Wennekers, 1999). Moreover, formation of new firms also brings in numerous new products, processes and technologies into the market, improving the efficiency and productivity of industries (Acs and Audretsch, 1990; Geroski, 1989). A continuous inflow of new firms, apart from bringing in new technology with them, is likely to pressurize existing firms to continue advancing their technology and efficiency and help in removing slacks in business operation. Likewise, the entry of new firms increases the competition and diversification among firms (Fritsch and Falck, 2003).

Formation of new SMEs may play a decisive role in the removal of developmental disparities among various countries as well as different sub national regions within a country. In a vast developing country like India, characterized by widespread spatial heterogeneity, the formation of new firms in backward regions will reduce developmental inequality among various sub national regions. Given the continued socio-economic disparities along with growing geographical concentration of economic activity, the study of regional economies is gaining importance with the advancement of various regional theories like regional innovation system (Cooke, 2001),

learning region (Florida, 1995; Rutten and Boekema, 2007) and cluster (Porter, 1990; 1998). In India, regional differences are quite strongly represented by the disparities among various Indian states.

The present study explores the regional dimensions of entry of new SMEs across Indian states, specifically those SMEs established since the 1980s and surviving till 2006-07. An emerging literature is enlightening the notion of new firm formation from the regional perspective (e.g., Fritsch, 1997; Baptista and Preto, 2011);where regional or local factors are found to be playing a significantly positive role in determining the formation of new firms in a region (Glaeser et al., 1992; Lee et al., 2004), this study examines the role of spatial factors, such as agglomeration, skill, demand, infrastructure, etc. in the observed regional patterns of SME formation in India.

This study expands the literature on formation of firms from the sub national perspective and uncovers the formation of new SMEs in India. Utilizing the unit-level data of 4th All *India* Census of *Micro Small and Medium Enterprises (MSME)* 2006-07, this analysis covers an extensive study period 1980-2007 of new SMEs formation in the registered sector, across Indian regions, states and sectors. Presently, such a study on regional patterns of new SMEs formation is not available. Second, it also revisits the empirical role of theoretically determining factors of new firm formation in the sub national context of India with a multidimensional empirical framework, controlling for unobserved spatial heterogeneity through panel fixed effects estimation. Third, it may also indicate the direction in which changing policy environment in India has affected SME formation.

The Indian literature presents two strands of thought while discussing the impact of different policy environment on the emergence and existence of SMEs in India, especially since the 1990s' economic reforms. It was recognized that economic reforms have not only opened opportunities for new and emerging SMEs but also posed threat of competition for the existing SME (Bhavani, 2002; Tendulkar and Bhavani, 1997). Das and Pradhan (2010) and Das (2008) have argued that the changing policy instruments and economic reforms have impacted relatively bigger size of the small-scale sector, while majority of the small firms are crippled with persisting constraints with respect to loan-finance, infrastructure, and technology support. Small firms are now facing competition at a global level with the implementation of measures like de-reservation, increasing openness to

foreign investment and technology, removal of non-tariff barriers, widespread reduction in import duties and adoption of product patent regime (Pradhan, 2011a). The increased FDI inflows and imports into the Indian economy has affected the SMEs depressingly (Subrahmanya, 2004). Some policy support like fiscal and financial incentives, special incentives to backward regions and reservation of items for SME sector are still argued to have somehow compensated the depressing impact of globalisation on Indian SMEs (Subrahmanya, 1995). Thus, it will be useful to examine these encouraging and depressing impacts of changing policies on the formation of Indian SMEs.

Layout of the Study

The present study is divided into six sections. Section 2 presents the trends and patterns of SMEs formation across sub national regions in India. Based on the year of installation of initial plant and machinery/equipment, the formation year of SMEs are determined for the registered sector unit level data of the 4th Census of MSMEs and different measures like number of new SMEs formed and entry rates are estimated[1]. Whenever the year of initial machinery installation was unavailable, the year of initial production was used. The use of the census data implies that the study will cover only those SMEs formed during 1980-2007 and which have survived till the year of 2007. The entry rate for new SMEs formation is defined as the number of new SMEs formed per 1000000 working-age population (ages 15-59). This is basically the labour market approach to the estimation of the regional rate of new firm formation (Audretsch and Fritsch, 1994).

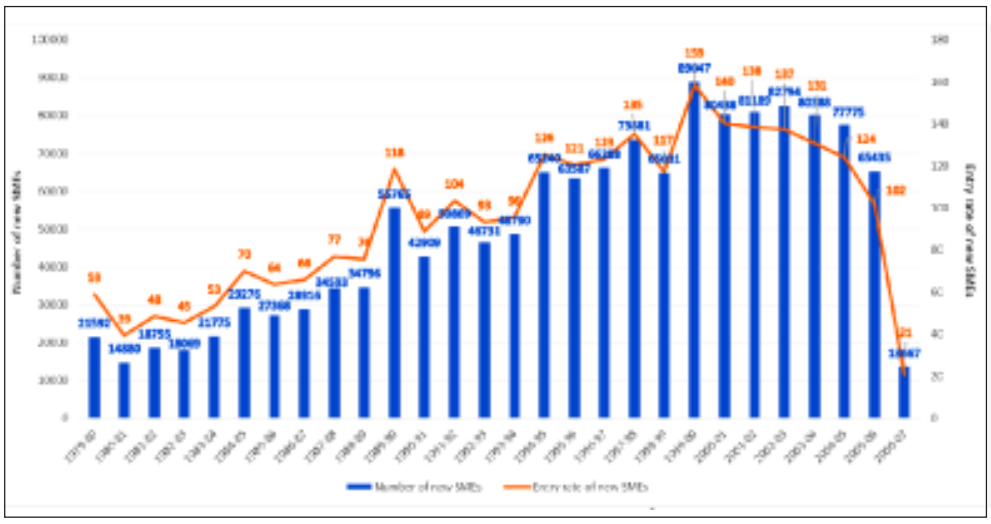
Section 3 deals with the theoretical aspects of new firm formation and develops the empirical framework for the analysis of regional patterns of formation of Indian SMEs. Section 4 presents the econometric specification of the model, method of estimation and data sources and measurements. Section 5 summarizes empirical findings on the regional determinants of SMEs formation. Last section of the study deals with the conclusion and highlights the local policy implications.

[1] Results from the 4th Census of MSMEs 2006-07 are provided separately for two sectors, namely, registered and unregistered. The registered sector covers enterprises registered with District Industries Centres, Khadi and Village Industries Commission/Khadi and Village Industries Board, Coir Board and factories falling under the coverage of section 2m(i) and 2m(ii) of the Factories Act, 1948 used by the Annual Survey of Industries. All other enterprises constitute the unregistered sector.

2. Regional Patterns of Emergence of New SMEs

Considering the number of new SMEs formed and level of their annual entry rate, the Indian economy has exhibited largely rising SME entrepreneurship trend during 1979-80 to 2002-03 while both the number and entry rate of new SMEs have fallen during 2002-03 to 2006-07 (Figure 1). Five-years periodic analysis since 1979-80, as summarized in Table 1, confirmed that the number of SMEs formed has grown from 97,665 during 1980-84 to 423, 414 during 2000-04.The increase in the number of new SMEs formed has been regionally widespread[2] with all the Indian regions reporting rising SME numbers successively up to 2000-04. Thereafter each region experienced a decline in the absolute number in the period of 2005-07. As the period 2005-07 covers a three-year period compared to 2000-04 covering a five-year period this decline in the absolute numbers of new SMEs is partially understandable.

Figure 1: Number of New SMEs Formed and Their Entry Rate in India, 1979-80 to 2006-07



Source: Authors' estimation based on unit level data for registered sector, 4th MSME Census 2006-07 and Population Census data on working-age population.

Note: Entry rate is the number of newly formed enterprises in the region per 1 million labour force (working age population, 15-59 age).

[2] All Indian regions have seen rise in numbers of new SMEs in absolute terms, however, the growth rates and entry rates differed significantly across the regions.

Similarly, entry rate of new SMEs for India as a whole has consistently increased from 49 SMEs during 1980-84 to 141 SMEs during 2000-04 (Table 1, Figure 2) and then declined to 82 during 2005-07. The rates of formation of new SMEs have increased for all the Indian regions over the different periods from 1980-84 to 2000-04 while they have declined during 2005-07, except for Central India. This implies the fact that an increasing number of working-age individuals (individuals in the age group of 15-59) are taking up entrepreneurship by establishing SMEs in India. This rising tendency of entrepreneurship in India, during the last three decades since 1980s, is contributed by most of the Indian regions.

While the absolute number of new SMEs formed and entry rate have increased successively for different periods from 1980-84 to 2000-04, a distinct slowdown in their growth can be discernible during 2005-07. The growth rate of number of new SMEs formed increased from just 3 per cent during 1980-84 to above 10 per cent during 1985-94, but it then decelerated considerably to -33 per cent during 2005-07 (Table 1). The growth of entry rates of new SMEs has fallen from more than 8 per cent during 1985-94 to -34 per cent during 2005-07. These trends clearly suggest that the late 1980s and the early 1990s were the boom periods for formation of new SMEs in the Indian economy. However, the increased competition in the form of dismantling of product reservation for small firms, entry of large number of foreign firms and large-scale imports appear to have shrunk the business opportunities for small entrepreneurs. Also, different sub national regions have depicted different entrepreneurial responses to the changing macroeconomic environment. While West India and South India have largely shown similar decelerating growth trends in the number of SMEs formed and entry rates, North India has shown growth rate of more than 13 per cent during199-2004 before experiencing negative growth.

The geographical composition of new SMEs formation throws a concentrated regional pattern with West India, South India and North India together contributing more than 76 per cent of the number of new SMEs formed during 1980-84 (Table 1). The combined share of these top three regions went above 82 per cent during 1985-2004. The rise of South India as a hotbed for SMEs entrepreneurship is quite spectacular whose share in number of national SMEs formation increased successively from 26 per cent during 1980-84 to 44 per cent during 1995-99. Thereafter, the share of South India declined to 30 per cent during 2005-07. While the share of West India has fallen from 24 per cent in the early 1980s to 20 per cent in the period 2005-07, that of North India initially fell to 17 per cent during

1995-99 from 23 per cent in the early 1980s but since then it started increasing to reach above 26 per cent during 2005-07. The other regions namely, Central India and East India have also depicted the declining share, whereas North-east India has reported negligible shares in the number of newly formed Indian SMEs over the study period.

For each period from 1980-84 to 2005-07 Indian regions exhibited considerable disparity in the entry rate of new SMEs. During 198-84, the entry rate varies from a high of 73 firms in West India to as low as 21 firms in Northeast India. The gap between the regions having highest and lowest entry rates or the range of entry rates for Indian regions, thus, was 52 firms in the said period. Subsequently, the range of entry rate for these regions has increased to 60 firms, 127 firms and 195 firms, respectively, during 1985-89, 1990-94 and 1995-99. For each of these periods, South India depicted the highest regional entry rate for new SMEs while East India possessed the lowest entry rate. West India has consistently the second highest entry rate during these periods. However, the range of entry rate decreased to 192 firms during 2000-04 and further to 111 firms during 2005-07. These trends confirmed continuing regional disparities in the ability of different regions to host new SMEs in India.

Table1: Formation of New SME in India, Numbers and Entry Rates

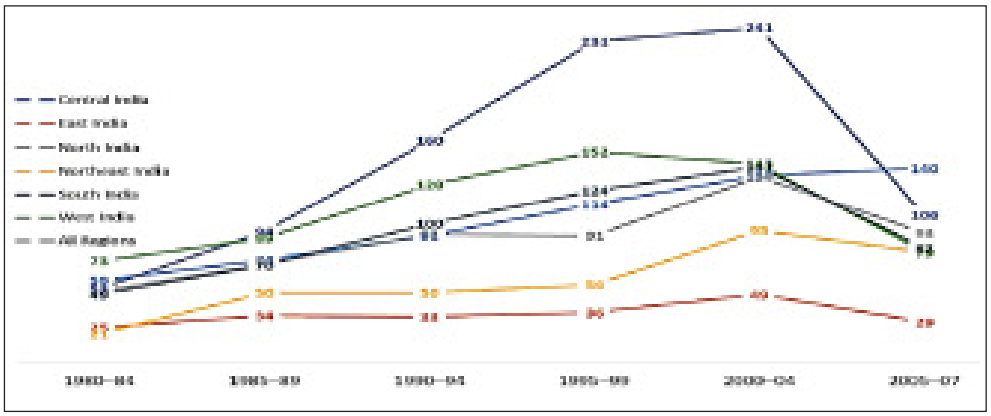
Region	New SMEs formed											
	Number						Annual Average entry rates (No.)					
	1980 - 84	1985 - 89	1990 -94	1995 -99	2000 -04	2005-07	1980 -84	1985 -89	1990 -94	1995 -99	2000 -04	2005 -07
Central India	10535 (10.79)	14946 (9.39)	20205 (8.05)	25350 (7.42)	31385 (7.41)	21204 (13.17)	59	74	91	114	135	140
East India	11284 (11.55)	17350 (10.90)	18707 (7.46)	21506 (6.30)	31917 (7.54)	12203 (7.58)	25	34	33	36	49	29
North India	22489 (23.03)	35463 (22.27)	51672 (20.59)	57156 (16.74)	93729 (22.14)	42587 (26.44)	51	71	92	91	134	93
Northeast India	1471 (1.51)	3913 (2.46)	4429 (1.77)	5687 (1.67)	10899 (2.57)	5839 (3.63)	21	50	50	56	95	79
South India	25083 (25.68)	50039 (31.43)	94805 (37.79)	149648 (43.83)	168852 (39.88)	47681 (29.61)	53	94	160	231	241	106
West India	26803 (27.44)	37514 (23.56)	61084 (24.35)	82093 (24.04)	86633 (20.46)	31538 (19.58)	73	89	128	152	143	79
All Regions	97665 (100)	159226 (100)	250902 (100)	341440 (100)	423414 (100)	161052 (100)	49	70	100	124	141	82

	Annual Average Growth Rate (%)											
Central India	15.75	2.43	8.63	5.65	19.61	-29.88	12.44	-0.17	7.61	5.75	17.25	-31.77
East India	2.24	7.65	4.80	7.32	15.99	-41.15	-0.29	5.23	3.18	6.13	13.86	-42.45
North India	5.14	10.05	1.00	13.32	13.94	-34.42	2.26	7.36	-1.26	11.00	11.25	-36.08
Northeast India	20.09	18.34	4.62	1.63	23.03	-36.75	16.67	15.33	2.01	-0.77	20.18	-38.19
South India	10.48	14.89	20.02	7.32	-1.44	-31.51	7.81	12.37	17.69	5.46	-3.09	-32.62
West India	-5.21	11.94	9.37	4.46	2.02	-27.11	-7.88	9.13	6.63	1.95	-0.40	-28.80
All Regions	2.98	10.78	10.27	7.01	5.52	-32.67	0.27	8.17	8.11	5.22	3.38	-34.16

Source: Same as Figure 1.

Note: Percentage share to all regions is in parenthesis.

Figure2: Average Entry Rates of New SMEs



Source: Same as Figure 1.

The participation of Indian states in national SMEs formation too differs widely which are summarised in Table-2. Of the 35 Indian states and union territories in the dataset, just top 15 states accounted for over 90 per cent of new SMEs formed during1980-84 to 2005-07, suggesting wide spatial concentration in the emergence of new SMEs in India. Again, it should be noted that with the passage of time not only the disparity in terms of number of SMEs formation has increased among Indian states, but also the compositions of largest contributing states have changed. For example, the

period 2000-04 has top two states namely, Tamil Nadu and Uttar Pradesh, contributing more than 15 per cent share in the number of national SMEs formation, and then other leading three states of Gujarat, Karnataka and Kerala each contributing with more than 10 per cent share. Together these top five states have contributed national SMEs formation with round about 64 per cent share in 2000-04. In contrast, the largest five states during 1980-84 were Gujarat (15 per cent), Madhya Pradesh (9 per cent), Tamil Nadu (9 per cent), Rajasthan (7 per cent) and Karnataka (7 per cent) together they were contributing with 47 per cent share.

Table 2: The 15 Largest States for SME Formation in India

Region	New SMEs formed											
	Number						Annual Average entry rates (No.)					
	1980 - 84	1985 - 89	1990 -94	1995 -99	2000 -04	2005-07	1980 -84	1985 -89	1990 -94	1995 -99	2000 -04	2005 -07
Andhra Pradesh	3822 (3.91)	7683 (4.83)	9272 (3.70)	8046 (2.36)	6910 (1.63)	4395 (2.73)	25	44	48	38	30	29
Assam					6840 (1.62)	4044 (2.51)					88	79
Bihar	3796 (3.89)	8589 (5.39)	9364 (3.73)	9492 (2.78)	10589 (2.50)	3920 (2.43)	20	42	42	44	48	27
Chhatt isgarh	2228 (2.28)	3445 (2.16)	4024 (1.60)	5117 (1.50)					59	82	84	97
Gujarat	14917 (15.27)	24105 (15.14)	43237 (17.23)	52356 (15.33)	48047 (11.35)	12909 (8.02)	157	220	354	380	309	128
Haryana	3523 (3.61)	4651 (2.92)	7492 (2.99)	7853 (2.30)		2904 (1.80)	102	118	166	150		71
Jharkhand		2249 (1.41)	3181 (1.27)	3493 (1.02)	4844 (1.14)			42	55	52	65	
Karnataka	6493 (6.65)	12360 (7.76)	19172 (7.64)	35202 (10.31)	42604 (10.06)	13395 (8.32)	62	107	148	239	262	126
Kerala	5835 (5.97)	11213 (7.04)	26576 (10.59)	48129 (14.10)	44977 (10.62)	7786 (4.83)	78	135	296	501	447	124
Madhya Pradesh	8308 (8.51)	11500 (7.22)	16182 (6.45)	20233 (5.93)	26718 (6.31)	19150 (11.89)	59	72	92	120	154	170
Mahara shtra	5101 (5.22)	7916 (4.97)	12054 (4.80)	19342 (5.66)	21013 (4.96)	10880 (6.76)	28	39	52	74	72	57
Odisha	1618 (1.66)				7083 (1.67)	2820 (1.75)	22				65	40
Punjab	8926 (9.14)	10942 (6.87)	8930 (3.56)	6020 (1.76)			188	207	153	90		

Rajasthan	6362 (6.51)	4981 (3.13)	5267 (2.10)	9343 (2.74)	16083 (3.80)	7489 (4.65)	70	48	44	68	104	72
Tamil Nadu	8765 (8.97)	18531 (11.64)	39536 (15.76)	57887 (16.95)	73674 (17.40)	21813 (13.54)	61	116	227	309	365	167
Uttar Pradesh	5478 (5.61)	13460 (8.45)	28013 (11.16)	34736 (10.17)	70685 (16.69)	29388 (18.25)	19	40	76	86	159	100
Uttara khand					8514 (2.01)	5602 (3.48)					347	348
West Bengal	4660 (4.77)	5075 (3.19)	4662 (1.86)	5283 (1.55)	9400 (2.22)	3819 (2.37)	30	29	24	24	38	24
Top 15 states	89831 (91.98)	146699 (92.13)	236961 (94.44)	322534 (94.46)	397982 (93.99)	150314 (93.33)						
All States	97665 (100)	159226 (100)	250902 (100)	341440 (100)	423414 (100)	161052 (100)	49	70	100	124	141	82

Source: Same as Figure 1.

Note: Percentage share to all regions is in parenthesis.

The high contribution of Tamil Nadu in national SMEs formation is driven by the convenient industrial policies of state and locational advantages, such as adequate infrastructure and skilled workforce. Similarly, the high contribution of Uttar Pradesh in national SMEs formation is believed to be driven by the availability of inexpensive labour force. The state of Gujarat is known for its entrepreneurial culture, industry friendly policies and availability of good infrastructure like, power, transportation etc. which make the state of Gujarat to be one of the attractive states for entrepreneurship in India.

While looking at entry rates of SMEs among top 15 Indian states accounting for the number of new SMEs formed, one can again observe considerable spatial variation in the entry rate. The difference between highest and lowest entry rates for these states turns out to be 169 firms during 1980-84: 188 firms in the case of Punjab to 19 firms of Uttar Pradesh. The range of SME entry rates for states then considerably increased to 477 firms during 1995-99 before falling to 324 firms during 2005-07.

Overall, these statistics on formation of new SMEs in India across different regions and states shows that the number and entry rate of new SMEs have increased in magnitude but with successively slower rate of growth. Also, there exists considerable regional heterogeneity in the emergence of new firms. It is necessary to explore the regional sources or determinants of continued regional disparities in the formation of SMEs in India.

3. New Firm Entry and Space: Theoretical Background

The formation of new firms reflects entrepreneurial activity undertaken by individuals in a given economy. For Cantillon (1755) individuals become entrepreneurs when they organize production and exchanges to earn uncertain profit in the marketplace[3]. Enterprises are born as a result of these actions undertaken by entrepreneurs. Say (1803) put individuals turning entrepreneurs at the centre of the entire process of production and distribution[4]. Schumpeter (1911) visualized entrepreneur as the economic actor who causes development by introducing new combinations of resources. These combinations may take the form of a new or an improved product, a new use of an existing good, a new production method, opening up of a new market and changes in economic organization. He termed the carrying out of new combinations of resources as 'enterprise' and individuals whose function it is to carry them out as 'entrepreneurs'. Knight (1921) has modelled entrepreneurial action of individuals on their subjective abilities to bear uncertainty and make judgmental decision.

The interplay between the psychological behaviour of individuals (e.g., achievement seeking, risk loving, autonomy motivation, leadership, etc.) and socio-business environmental characteristics of the location wherein individuals reside (product market characteristics, input market conditions, government policies, cultural values, etc.) can explain regional formation rates of new enterprises (Giannetti and Simonov, 2004; Lundström and Stevenson 2005; Reynolds and Storey, 1993; Shane, 2004; Sternberg, 2009)

Very often these location-related environmental forces provide a powerful incentive for personal beliefs and perceptions of individuals which in turn

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3 "The farmer is an entrepreneur who promises to pay the property owner, for his farm or land, a fixed sum of money (generally assumed to be equal in value to a third of the production) without assurance of the profit he will derive from this enterprise...,he conducts the enterprise of his farm with uncertainty." in Cantillon, R. (1755), *Essai sur la Nature du Commerce en Général*, English translated published in 2010 as *An Essay on Economic Theory*, Alabama: Ludwig von Mises Institute, p. 74.

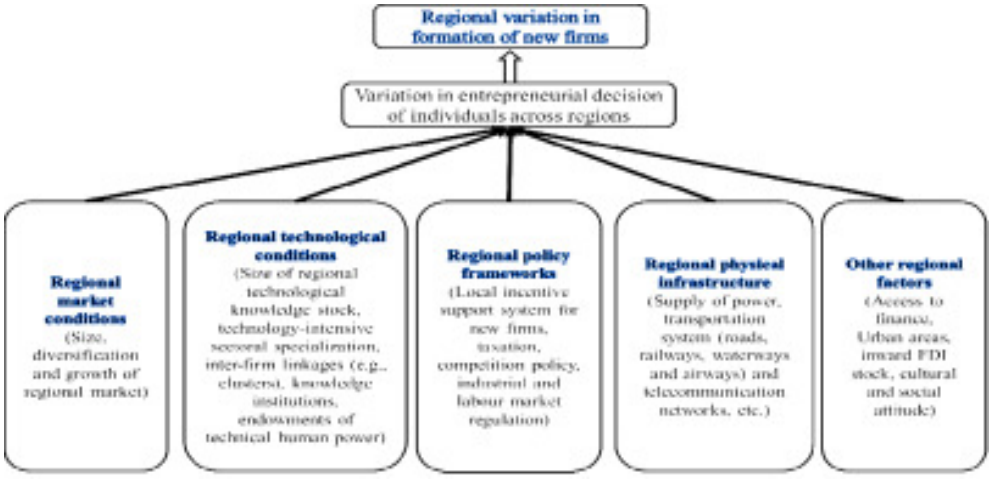
4 "…the occupation of adventurer is ... necessary for the setting in motion of every class of industry whatever; that is to say, the application of acquired knowledge to the creation of a product for human consumption." in Jean-Baptiste Say, J. B. (1803), *Traité d'économie politique ou simple exposition de la manière dont se forment, se distribuent et se composent les richesses, (*p. 103) English translation published in 1834 as A Treatise on Political Economy; or The Production, Distribution and Consumption of Wealth, Philadelphia: Grigg & Elliot.

shape their entrepreneurial intentions (Begley et al., 2005; Kibler, 2013; Sternberg, 2009;). Regions with better situational factors may motivate more entrepreneurial action by individuals, who identify and pursue situational opportunities.

In the above context, the present study has proposed an analytical framework as summarized in Figure 3, which stresses various aspects of location like local market, technology, business supporting infrastructure and policy environments for a way to think about entrepreneurial activities and the formation of new firms on a regional context. Accordingly, the regional variation in new firm formation is proposed to be rationalized by spatial differences in the above-mentioned factors.

A number of empirical studies have shown the existence of substantial disparity in new firm formation across countries as well as within a country among its sub national regions (Armington and Acs, 2002; Reynolds et al., 1994; Reynolds, 2011). Reynolds et al. (1994) drawing upon findings from seven developed economies (France, Germany, Ireland, Italy, Sweden, United Kingdom and the United States) during the late 1980s concluded that the new firm birth is positively determined by demand growth reflected by population growth and income growth, an industrial base dominated by small firms and a strong urbanization context representing the advantages of agglomeration.

Figure 3: Conceptual Framework on Formation of New Firms



Source: Authors' construction.

Klapper et al. (2010) have observed a pronounced regional difference in the enterprise density with developed region possessing fifty-five firms for every 1000 active individuals during 2000–08, whereas all the other regions (Africa & Middle East, Asia, Eastern Europe & Central Asia, Latin America & Caribbean, Developing Region) shown a density lower than 40 firms. The enterprise entry rates for different regions are observed to be varying from 6.6 per cent to 10 per cent during this period. Results from random-effects generalized least squares (GLS) suggest that enterprise entry per capita is significantly and positively related to the access to finance (represented by the ratio of domestic credit to GDP) and GDP per capita while negatively related to entry barriers (proxied by the number of procedures to start a business). Thus, countries with higher levels of economic development, ease of access to finance and lower entry barriers have seen relatively higher magnitude of new firm formation.

Armington and Acs (2002) reported significant differences in new firm formation/birth rate across U. S. states/labour market areas during 1994–1996. The highest firm birth rates are all in the West or South while lowest birth rates are in the Northeast and the Midwest. Regional differences in industry intensity, population growth, income growth and level of human capital are observed to be significant determinants of variations in the firm birth rates among U.S. labour market areas.

For Turkey, Gaygýsýz and Köksal (2003) found a substantial regional variation in new firm formation with western Turkey having high firm birth rates while eastern Turkey is characterized by low firm birth rates[5]. The firm birth rate of Marmara region was 17 times larger than that of the Eastern Anatolian region in 1985. By 1990, the firm birth rate of Marmara region turns out to be 53 times larger than that of South Eastern Anatolian region, which is the region with the lowest firm birth rate. Moreover, regional variation in small and new firm formation across the regions of Turkey is observed to be positively and significantly related to regional demand growth, agglomeration, the share of technicians in the labor force, and low rates of unemployment.

[5] Firm birth rate is the number of new SMEs in a region per 100000 individuals in labour force.

Moènik (2010) investigated the determinants of new firm formations in Slovenia and found that the gross rate of entry of new firms is positively associated with GDP per capita, rate of unemployment and productivity growth. In case of India, quality of physical infrastructure, workforce education, household banking access, and agglomeration conditions (supplier and customer strengths) are found to have strongly positive effect in predicting district level entry employment while stringency of labour laws is observed with a strongly negative sign (Ghani, 2014).

Zoltan et al. (2009) formulated and tested the *knowledge spillover theory* suggesting that entrepreneurial opportunities arise because incumbent organizations are not able to fully commercialize the results from their strategic investments in knowledge and ideas. Empirical results from cross-country analysis shows that countries with higher knowledge stock, expenditures on education, economic growth, and lower regulatory barriers (measured in terms of public expenditures and personal tax rate) tend to possess greater entrepreneurial activity.

Theories of *New Economic Geography*, Cluster and *Regional Innovation System* also have significant predictive power in mapping inter-regional differences in new firm formation. Krugman (1991) proposed that regions with larger local markets and/or growing demand become attractive for entry of new firms as proximity to the larger customer base allow saving on transportation costs and realization of scale economies. Marshall (1890) has already noted the tendencies of specialized industries to get concentrated in particular localities because of external economies from availability of skilled labour, existence of supporting and ancillary trade and the specialization of firms in different stages and branches of production. Porter (1990, 1998) proposed, clusters reflecting spatial concentration of interconnected firms, suppliers, related industries, and specialized institutions as important sources for nation's competitive position. Localized knowledge spillovers, increased innovation and productivity are natural incentives for firms producing related products to be close to each other. Wennberg and Lindqvist (2010) provided evidence that the economic benefits offered by clusters to the participating firms are more crucial for newly started entrepreneurial firms. Thus, regions with more clusters may host increasing number of new firms.

As the identification and exploitation of opportunities by entrepreneurs is greatly shaped by the level of regional knowledge stock, disparities in

innovation performances of regions may explain the regional patterns of formation of new firms. The literature on *Regional Innovation System* describes innovation as a localised interactive learning process involving firms, local resources and supporting institutions (Asheim, 2001; Doloreux and Parto, 2004; Pradhan, 2011b). Therefore, regions which support higher knowledge creation activities by putting in place a well-developed innovation ecosystem may witness greater entry of new firms.

Based on the brief review of literature above, the following groups of regional factors are identified to be potentially important for regional variation in new firm formation:

3.1 Market Conditions

As entrepreneurship is largely an economic activity, specific regional market characteristics may offer more opportunities and returns to such activity. Markets in different regions vary in their size, growth and diversification. The large size of the regional market facilitates entry of new firms by providing them benefits from concentration of production with increasing returns and saving on transport costs (Fujita et al., 1999; Krugman, 1991), presence of specialized suppliers and labour pool. High growth of regional market represents expanding consumer demand with a preference for more diversification, which are likely to support creation of new firms. The regional gross state domestic product (*SDP*) and regional per capita SDP (*PSDP*) are respectively used as proxies for the absolute size of the regional market and the sophistication of regional demand for more product varieties.

3.2 Technological Conditions

The technological level of a region may be the most critical regional characteristics that influence the entry of new firms (Zoltan et al., 2009). Greater stock of technological knowledge of a region implies increased technological opportunities and significant intra-temporal knowledge spillover in a spatial proximity context, which are essential conditions for the emergence of new entrepreneurs. Since past ideas facilitate the formation of new ideas, innovative regions may witness a higher incidence of new technologies being introduced by new entrepreneurs. This is in addition to the formation of new firms as a result of spin-offs from existing innovative firms in the region. Following this argument, it is postulated that regions

possessing greater stock of technological knowledge (*STKS*) represented by patent stock are expected to facilitate the entry of new firms.

The technological structure of the industrial base of a region is another regional factor relevant for exploring inter-regional variation in the emergence of new firms. The growing specialization in technology-intensive manufacturing activities manifests itself in local technological development and productivity growth in dynamically linked industries while it also generates extensive knowledge spillovers (Guerrieri and Milana, 1995; Pradhan and Das, 2013;). These factors may in turn be associated with increased firm entry. Therefore, the size of technology-driven manufacturing industries relative to total manufacturing sector of a region (*SPL*) is expected to have a positive role in the formation of new firms.

3.3 Spatial Agglomeration

A vast body of literature suggests that economic activities are spatially concentrated (Krugman, 1991; Marshall, 1980; Porter, 1990). Regions successful in boosting the extent of spatial concentration of productive units are likely to benefits from localized knowledge flows and spillovers, labour market pooling, input sharing, and demand proximity (Das, 2005; Muro and Katz, 2010; Pradhan and Das, 2015). These advantages are stronger for clusters, the product-specific spatial agglomeration of production. In clusters, firms producing same products are engaged in locally embedded exchanges and knowledge spillovers. Urban centres/cities have become another form of spatial agglomeration as they offer a number of agglomeration related advantages to the incumbent as well as new firms, namely, proximity to demand, variety and access to urban assets that provide conducive environment for innovation (Athey et al., 2007). Thus, it is proposed that regions possessing higher spatial density of firms (*SCON*) and greater number of urban locations (*TWN*) are likely to host increased entry of new firms.

3.4 Factor and Infrastructural Conditions

The regional disparities in the formation of new firms may also be related to the inter-regional differences in the endowment of skills and availability of quality infrastructure, such as reliable supply of power, transportation system (roadways, railways and airways), ports, and telecommunication networks. A higher level of human capital in a location affects new firm

formation in two ways, firstly it gives business start-ups access to the required endowment of skilled workforce and secondly it increases the entrepreneurial likelihood of more educated individuals by enhancing returns to entrepreneurship. Jiménez et al. (2015) reported that the tertiary education rate has a positive impact on formal entrepreneurship in a cross-national study for the period 2000–2007. It was inferred that this type of education enhances entrepreneurial capabilities by increasing individuals' self-confidence, reducing perceived risk and improving their abilities to identify, evaluate and exploit business opportunities. Hence, we have hypothesized that regional higher education enrolments (*SKL*) are likely to have a favorable effect on the entry of new firms.

Levels of physical infrastructure available in a region can contribute to thestart-up activity (Audretsch et al., 2015). In location theories, firms choice of plant location is to minimize the distances to market and raw materials (Weber, 1929) or to seek agglomeration economies offered by spatial concentration of production (Krugman, 1991). Local development of transport infrastructure in the form of better roads and railway networks tend to bring firms closer to markets and lower transportation costs. Smith and Florida (1994) and Melo et al. (2010) have provided empirical support for a positive relationship between the transport networks and location choice of plants or firm formation. The availability of telecommunication infrastructure will lower telecommunication costs providing access to information, networking and better processes and organizational coordination, which are expected to increase the likelihood of firm formation. Similarly, the availability and reliability of *energy supply* such as *electricity* is essential for the development of *entrepreneurship (*Ogbor, 2009).

3.5 Loan Finance

A number of studies has suggested that entrepreneurship is promoted by financial development and increases in credit availability (Cetorelli and Strahan, 2006; Evans and Jovanovic, 1989; Guiso et al., 2004; Hurst and Lusardi, 2004). As most enterprises in developing countries like India comprise SMEs having inadequate access to loan finance (Morris et al., 2001), enhancing the accessibility to finance could be another important regional factor relevant to the creation of new firms. Regions with higher spatial density of financial institutions and supply of credit may provide greater incentives for the start-up enterprises.

3.6 Regional Entrepreneurial Culture

Inter-regional variation in the creation of new firms may stem from differences in entrepreneurial culture across regions. The significance of cultural factors in entrepreneurship has often been emphasized in the literature (Berger, 1991; Thornton et al., 2011). Regions possessing specific socio-cultural tradition involving shared norms, beliefs and values that provides impetus for risk taking attitudes and entrepreneurial behavior of individuals may be predicted to present greater number of new firms. As youths coming from a business family background show a positive attitude towards entrepreneurship (Goel et al., 2007), most dominating regions in hosting existing firms are likely to reveal more positive cultural attitude for entrepreneurship. In India, West India, South India and North India are known to be more enterprising regions than East India, Central India or Northeast India. Thus, the regional disparities in the number of incumbent enterprises employed to capture regional heterogeneity in entrepreneurial culture (*REC*) is likely to be related with higher formation rates of new firms.

3.7 Regional Distribution of FDI

Regional distribution of foreign direct investment (FDI) may also explain the disparities in regional propensity to form new enterprises. In a given region, the presence of increasing number of foreign firms, with their superior knowledge and tangible assets, will expand supply capacities and increase competition in the local market. This may reduce market opportunities for start-up businesses. However, as foreign firms get more embedded in the host region by creating forward and backward linkages and knowledge-spillovers, these firms may also contribute to conducive environment for new firms. The net influence of FDI inflows on new firm formation is thus appears theoretically ambiguous.

4.Econometric Specification, Estimation Method and Data Sources

The theoretical discussion in the preceding section on the determinants of regional disparities in the formation of new firms can be summarized in the econometric relationship formulated in Equation1. As our basic objective is to explain regional variation in new SME formation in the Indian context, Indian states are taken as the sub national regional units for our analysis.

$$FNF_{kt} = \beta_0 + \beta_1 SDP_{kt} + \beta_2 SDPG_{kt} + \beta_3 PSDP_{kt} + \beta_4 STKS_{kt} + \beta_5 SPL_{kt} + \beta_6 SCON_{kt} + \beta_7 TWN_{kt} + \beta_8 SKL_{kt} + \beta_9 SPWR_{kt} + \beta_{10} STRP_{kt} + \beta_{11} STI_{kt} + \beta_{12} SFN_{kt} + \beta_{13} SEC_{kt} + \beta_{14} SFDI_{kt} + \varepsilon_{it} \quad \text{.....(1)}$$

Where explanatory variables are as measured in Table-3 and $å_{it}$ is the random error term.

The specific measurement of the dependent variable (*FNF*) adopted in the study requires some clarification. In the literature, the regional rate of new firm formation has been estimated from two different perspectives (Audretsch and Fritsch, 1994). In the ecological approach, the entry rate was calculated by standardizing the number of new firms to the population of incumbent firms in the region. This approach views the activities of existing firms as impetus for creation of new firm. In the labour market approach, the entry rate is measured by standardizing the number of new firms to the size of regional labour force. This approach treats the creation of new firms as a result of individual action. As it is the individuals and not the firms that start new firms, labour market approach has been largely preferred in the empirical studies. The present study too has taken a labour market approach and used the size of labour force as the relevant group for standardizing the number of new firms.

Table 3: Description and Measurement of Variables

Variables	Symbols	Measurements
Dependent Variable		
Formation of New Firms	FNF_{kt}	Natural log of number of new SMEs formed per one lakh (i.e. 1,00,000) working-age population (ages 15-59) in *k*th Indian state in the year t.
Independent variables		
Demand Conditions		
State Domestic Product	SDP_{kt}	Natural log of net state domestic product (constant 1999-2000 Indian Rs.) of *k*th Indian state in year t.
Growth of SDP	$SDPG_{kt}$	Annual percentage change in NSDP (constant 1999-2000Indian Rs.) of *k*th Indian state in year t.
Per capita SDP	$PSDP_{kt}$	Natural log of per capita NSDP (constant 1999-2000 Indian Rs.) of *k*th Indian state in year t.

Regional Technology		
State Technological Knowledge Stock	$STKS_{kt}$	Number of cumulative patent applications from *k*th Indian state since 1989 1990) per one billion Rs. of NSDP (current price) in year t.
State's Technological Specialization in Manufacturing Sector	SPL_{kt}	Net Value Added (NVA) of high technology manufacturing sectors as a per cent of NVA of total manufacturing sector of *k*th Indian state in year t.
Spatial Agglomeration		
Spatial Concentration of Firms	$SCON_{kt}$	Natural log of number of organized sector factories per 1000 sq km of area of *k*th Indian state in year t.
Towns	TWN_{kt}	Number of towns per 1000 sq km of area possessed by *k*th Indian state in year t.
Factor and Infrastructural Conditions		
State Skills Availability	SKL_{kt}	Number of higher education enrolments per organized sector factory in *k*th Indian state for *t*th year.
State Power Availability	$SPWR_{kt}$	Power generated (GWh) per one lakh population of *k*th Indian state for *t*th year.
State Land Transport Infrastructure	$STRP_{kt}$	Total road and railway line length (km) per square km area of *k*th Indian state for *t*th year.
State Telecom Infrastructure	STI_{kt}	Telephones per 100 population in *k*th Indian state for *t*th year.
Loan Finance		
State Finance Availability	SFN_{kt}	Credit advances in Indian Rs. croreby scheduled commercial banks per organized sector factory in*k*th Indian state for *t*th year.
Entrepreneurial Culture		
Regional Entrepreneurial Culture ***FDI Location***	REC_{kt-1}	Number of existing SMEs per one lakh working-age population in *k*th Indian state in the year t-1.
State's Inward FDI	$SFDI_{kt}$	Cumulative FDI inflows since 1982 83 into*k*th Indian state as a per cent of NSDP (current price) of *k*th Indian state in year t.

Notes: (i) High-technology manufacturing sectors include chemicals, pharmaceuticals, electrical and optical equipment, machinery and equipment and transport equipment;

(ii) Dependent variable and all the independent variables, except $SDPG_{kt}$ and SPL_{kt}, are expressed in natural logarithm. While taking natural log of the entry rate, cumulative patent per one billion rupees. of NSDP and cumulative FDI inflows as a per cent of NSDP we have added 1 to these series due to presence of zero values in these series.

4.1 Method of Estimation

Given the panel structure of the dataset, the study has considered panel estimation of fixed-effects and random-effects as such methods allows for controlling unobservable individual-specific effect. The panel regression has the following form (Baltagi, 2008):

$$y_{it} = \propto + X'_{it}\,\beta + v_i + \varepsilon_{it} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (2)$$

Where *â* is $K \times 1$ and X_{it} is the *i* th observation on *K* explanatory variables. *á* is a constant. v_i which differs between units is the unit-specific residual and $_{it}$ denotes the usual residuals. Subscript *t* denotes time while *i* denotes individuals.

The study employed the Sargan-Hansen statistic, which is robust to arbitrary heteroskedasticity and within-group correlation to choose between fixed effects and random effects estimators (Schaffer and Stillman, 2010). The traditional Hausman specification test presently only handles non-robust standard errors. The Breusch and Pagan Lagrangian Multiplier (LM) test was also used to check the suitability of random effects vis-à-vis pooled OLS. For our data, the Breusch and Pagan test consistently suggested the use of random effects estimator over pooled OLS estimator while Sargan-Hansen statistic suggested the use of fixed effects as more appropriate than random-effects (Table 4). As a result, the study has used fixed effects estimation for the empirical analysis.

Theoretically, fixed effects is amount to use of OLS on the following equation:

$$(y_{it} - \bar{y}_i) = (X_{it} - \bar{X}_i)\beta + (\varepsilon_{it} - \bar{\varepsilon}_i) \ldots\ldots\ldots\ldots\ldots \qquad (3)$$

Where $\bar{y}_i = \sum_t y_{it}/T_i$, $\bar{X}_i = \sum_t X_{it}/T_i$, and $\bar{\varepsilon}_i = \sum_t \varepsilon_{it}/T_i$

4.2 Data Sources

The data, on state-wise number of new SME formation by years, has been estimated from registered sector unit level dataset of the *4th All India Census of MSME, 2006-07*[6].Under the Micro, Small and Medium Enterprises Development (MSMED) Act, 2006, firms with an accumulated value of plant and machinery up to 100 million in the case of manufacturing and up to 50 million in the case of services are taken to constitute the MSME sector. The 4th MSME Census surveyed a total of 1552491 working MSME units in the registered sector. For determining the establishment year of the enterprises, we have used the installation year of initial plant and machinery or equipment. In case this information is missing, the year of initial production was used instead. While the formation year of Indian SMEs in the registered sector could be traced back to 1901, the study focuses on the period 1989-1990 to 2006-2007 for descriptive analysis and the period 1990-1991 to 2006-2007 for econometric study. The restriction of the period for the econometric analysis is dictated by the availability of state-level explanatory factors and SME formation data, which is available up to 2006-07.

Three Indian states Bihar, Uttar Pradesh and Madhya Pradesh got bifurcated in 2000. Bifurcated period data for newly created states were merged (Jharkhand with Bihar, Uttarakhand with Uttar Pradesh and Chhattisgarh with Madhya Pradesh) so that we have consistency of dealing with the combined states only. Dependent and explanatory variables for newly divided states, such as Uttarakhand and Uttar Pradesh, Jharkhand and Bihar, and Chhattisgarh and Madhya Pradesh for years after 2000, were appropriately weighted by population shares or area shares or GDP shares of divided states to arrive at series for the combined entities.

The information related to the labour force or the working-age population for Indian states were obtained from various decadal population Census conducted by the Office of the Registrar General & Census Commissioner.

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[6] The registered MSME sector covers enterprises registered with District Industries Centres, Khadi and Village Industries Commission/ Khadi and Village Industries Board, Coir Board and ASI (Annual Survey of Industries) factories falling under the coverage of Section 2m(i) and 2m(ii) of the Factories Act, 1948 but within the investment limit for MSMEs as per MSMED Act, 2006.

People aged 15-59 years are taken as the group of working-age population. As the Census data for working population is available at every 10 years, namely at 1981, 1991, 2001 and 2011, the values for the intermediate years are obtained by interpolation on the basis of growth rate over the 10-year period[7].

The Central Statistical Organization (CSO) has been the primary source for derivation of data related to state level real Net State Domestic Product (NSDP), growth of real NSDP, and real per capita NSDP. State-wise origin of patent applications has been obtained from various annual reports of the Controller General of Patents, Designs & Trademarks. For calculating state level technological specialization of manufacturing sector, data on net value added for total manufacturing and high technology industries were compiled from various reports of *Annual Survey of Industries* (*ASI*), CSO. High-technology manufacturing segment is defined to include chemicals, pharmaceuticals, electrical & optical equipment, machinery &equipment, and transport equipment. The number of organized sector factories per state and number of towns per state were, respectively, collected from the *ASI* and *Census of India* 1991 and 2001.

Higher education enrolments of Indian states have been drawn from various issues of the *Selected Educational Statistics* published by the Department of Higher Education under the Ministry of Human Resource Development (MHRD), Government of India and various annual reports of the MHRD and[8]. The *Compendium of Selected Indicators of Indian Economy* (Volume I) of the CSO (2009) provided teledensity data for Indian states. Total road and railway route length information were compiled respectively from various issues of *Basic Road Statistics of India*, Ministry of Road Transport and Highways and *Indian Railway Yearbook*, Ministry of Railways. Statistics on gross power generation by states is taken from the *Annual Report on the*

[7] The methodology of mid-year estimation of population has been used for interpolation. Let the working-age population is denoted by WP. The study has calculated an arithmetic growth rate for WP, Growth = $[((WP_{t+10}-WP_t)/ WP_t)*(1/10)]$ and then used this growth rate to estimate values for intermediate years. For example, $WP_{t+1} = [WP_t +(Growth* WP_t)]$.

[8] Higher education enrolments include enrolments in universities, deemed universities, institutions of national importance, research institutes, colleges for professional education (e.g. engineering, technology, architectural and medical colleges), colleges for general education and polytechnics.

Working of State Electricity Boards & Electricity Departments of the Planning Commission (Power and Energy Division) and various General Reviews published by Central Electricity Authority, Ministry of Power, Government of India. Credit advance by commercial banks by states is sourced from various volumes of *Handbook of Statistics on Indian States* brought out by the Reserve Bank of India (RBI).

State-wise FDI stock was calculated by accumulating FDI inflows data since 1982-83. While the FDI inflows data from 1982-83 to 2003-04 are on approval terms, those from 2004-05 onwards are on actual basis. Figures on foreign collaboration wise FDI inflows during 1982-83 to 2003-04 came from various *Monthly Newsletter* of erstwhile Indian Investment Centre with supplementary information from *SIA Newsletter* and annual compilations of Foreign Collaborations by the Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology. Data on FDI inflows from 2004-05 onwards was obtained from *SIA Newsletter* (Annual Issue) various years. It needs to be noted that the data related to the sub-period since 2004-05 is actual FDI inflows data regionally classified as RBI regions like Delhi region (comprises Delhi and parts of Uttar Pradesh and Haryana), Mumbai region (comprises of Maharashtra, Dadra & Nagar Haveli and Daman & Diu), Chennai region (consists of Tamil Nadu and Puducherry), etc. Data on state-wise FDI inflows from 2004-05 to 2006-07 was arrived at by using member states average shares in RBI regional total during the period January 2001 to August 2004.

5. Empirical Results and Inferences

The regression equation-1 was estimated for a sample of 21 Indian states including union territories for the period 1990-91 to 2006-07. In the preliminary investigation, the sample reveals a strong multicollinearity problem. The mean value of variance inflating factor (VIF)for the independent variables in the sample comes out to be 5.38 while the condition number was 243.

The VIF for$SCON_{kt}$, TWN_{kt}, $STKS_{kt}$, $STRP_{kt}$, STI_{kt}, and SFN_{kt}respectively are 19.71, 8.39, 6.85, 6.77, 6.10 and 5.12. To address this problem, the study adopted a modified Gram-Schmidt orthogonalization procedure (Golub and Van Loan, 1996) to create a new set of orthogonal variables for those state-specific factors possessing a VIF of 5 or above. This is a successive

orthogonalization process where the list of variables should be arranged in accordance with their importance. For determining the importance of different regional factors in the state-wise rate of formation of SMEs, the study relied on the size of the absolute value of the partial correlation between each of these regional variables and the formation rate of SMEs in Indian states. Hence, the independent variables for orthogonalization were arranged according to the size of their partial association with the states' entry rate of new SMEs[9].

A re-examination of multicollinearity test on the new matrix of transformed explanatory variables reveals a mean VIF of 2.74 and a maximum VIF value of 4.8 for individual explanatory variables. This indicates that orthogonalization of concerned explanatory variables has been successful in addressing the severity of multicollinearity in the sample.

Findings

Empirical results obtained from fixed effects estimation with robust standard errors are summarized in Table 4. The estimation was conducted for the state-wise entry rates of new SMEs in all the sectors and then separately for entry rates of SMEs in the primary sector, tertiary sector, and the manufacturing sector. As manufacturing covers wide variety of products, the estimation further divides the manufacturing sector into three technological sub-categories, namely high-technology manufacturing, medium-technology manufacturing, and low-technology manufacturing[10]. The special focus on manufacturing is due to the fact that it is the key sector for industrialization and currently it is under the policy focus of both the central and state governments to improve national and global

[9] The order of regional variables for orthogonaliztion used in the study is SFN_{kt}, STI_{kt}, $SCON_{kt}$, $STKS_{kt}$, TWN_{kt}, and $STRP_{kt}$.

[10] This is following the OECD classification of the manufacturing sector where high-technology segment is assumed to include chemicals, pharmaceuticals, electrical & optical equipment, machinery & equipment and transport equipment. Industries like pulp and paper products, publishing and printing, textiles and textile products, food including beverages and tobacco, wood and wood products, leather and leather products, other manufacturing, and diversified are categorized as low technology manufacturing. Medium-technology manufacturing consist of coke and refined petroleum products, rubber and plastic products, other non-metallic mineral products, and basic metal and metal products.

competitiveness. The 'Make in India' programme of the Government of India is clearly targeted at the manufacturing sector.

The F-values for all the estimated models are observed to be statistically different from zero, which indicates that the fitted specifications are quite significantly explaining the regional profile of entry rates of new SMEs and relevant spatial factors are included. R-squared for all sector shows that the fitted model (i.e., all explanatory variables taken together) accounts for about 34 per cent variation in SME entry rate within each of the states overtime. In the disaggregated level estimations, the variation in the SME entry rate captured by estimated models for tertiary and manufacturing sector is about 32-33 per cent but the same is quite modest at 19 per cent for the primary sector. Explanatory powers of the estimated models in case of technological subsample estimations of the manufacturing ranges between 28 29 per cent of the changes in SME entry rate within Indian states.

Among the regional market related factors, SDP_{kt} turns up with a positive coefficient across estimations and assumed statistical significance for SMEs entry rates in all the sectors combined, tertiary sector, total manufacturing, medium-technology and low-technology manufacturing. Thus, states offering relatively larger size of local markets are better placed in achieving higher rate of new SMEs formation. This fact holds for all the economic sectors taken together while it is specifically the case for tertiary and total manufacturing sectors. The coefficient of $SDP_{kt}$is, however, statistically not different from zero in the case ofprimary sector.

$SDPG_{kt}$ has a negative coefficient throughout and becomes statistically significant only in the estimations for the tertiary sector and high-technology manufacturing. This finding is contrary to our expectation as high growth is often treated as an indicator of expanding business opportunities. A possible reason that could have led to this contrarian outcome is that expanding employment opportunities from high growth in services and high-technology manufacturing may be inducing individuals to take up jobs than opt for self-employment through entrepreneurship in these sectors. Also, high growth of service sector and high-technology manufacturing products during the liberalized business environment may be assuring incumbent and rapidly growing firms an increasing market share, which may allow them to erect entry barriers for new start-ups.

Except the primary sector and high-technology subsample, $PSDP_{kt}$ has a strongly negative effect on the entry rates of new SMEs, indicating that states with predominately lower per capita NSDP have a higher formation rate of new SMEs than states with higher per capita NSDP. This result contradicts our proposed hypothesis that states with sophisticated demand proxied by per capita NSDP may host greater number of new SMEs. A reasonable explanation would be that SME start-ups in India are more concerned with supplying to a less sophisticated local demand than a highly sophisticated local demand. States, with high per capita income, are likely to show local demand, which is more inclined for differentiated products whereas SMEs are known to be operating more in the case of standardized and simple products.

Table 4: Regional Determinants of New SMEs Formation across Indian States

Dependent Variable: Natural log of SME entry rate

Independent Variables	Coefficients (Robust t-statistics)						
	All Sectors	Primary Sectors	Tertiary Sector	Manufacturing			
				Total	High -tech.	Medium -tech.	Low-tech.
SDP_{kt}	2.992** (2.842)	0.529@ (1.621)	2.249** (2.300)	2.774** (2.802)	1.058 (1.436)	1.916** (2.557)	2.704** (2.516)
$SDPG_{kt}$	-0.00608 (-1.462)	-0.000649 (-0.616)	-0.00665** (-2.217)	-0.00478 (-1.239)	-0.00555* (-1.750)	-0.00291 (-1.031)	-0.00270 (-0.824)
$PSDP_{kt}$	-2.781** (-2.285)	-0.560 (-1.503)	-2.311** (-2.280)	-2.568** (-2.239)	-0.915 (-1.345)	-1.808** (-2.514)	-2.602* (-2.049)
$STKS_{kt}$	0.0358 (0.245)	0.00512 (0.135)	-0.0337 (-0.354)	0.0419 (0.290)	-0.0318 (-0.343)	-0.00968 (-0.0858)	0.0486 (0.359)
SPL_{kt}	0.00508* (1.772)	0.00262* (1.821)	0.00180 (0.811)	0.00516* (1.849)	0.00497*** (3.058)	0.00545** (2.681)	0.00333 (1.192)
$SCON_{kt}$	0.0810 (0.164)	0.0818 (0.890)	0.275 (0.727)	0.0194 (0.0424)	0.121 (0.456)	0.221 (0.664)	-0.0770 (-0.193)
TWN_{kt}	0.0320 (0.438)	0.0157 (0.805)	0.0858 (1.431)	0.0244 (0.356)	0.00753 (0.152)	0.0193 (0.402)	0.0606 (0.827)
SKL_{kt}	0.361** (2.598)	0.0790** (2.787)	0.224* (1.929)	0.328** (2.535)	0.139 (1.494)	0.223** (2.247)	0.281** (2.270)
$SPWR_{kt}$	0.0719 (0.659)	-0.0269 (-0.875)	0.115 (1.385)	0.0627 (0.597)	-0.0102 (-0.183)	-0.0296 (-0.467)	0.120 (1.092)

$STRP_{kt}$	0.102* (2.026)	0.0160 (1.544)	0.109*** (2.969)	0.0867* (1.820)	0.0419 (1.540)	0.0438 (1.396)	0.0987* (2.015)
STI_{kt}	-0.620* (-1.896)	-0.0428 (-0.640)	-0.313 (-1.431)	-0.602* (-1.908)	-0.153 (-0.843)	-0.197 (-0.888)	-0.661** (-2.275)
SFN_{kt}	-0.677*** (-5.146)	-0.0390 (-1.113)	-0.467*** (-4.792)	-0.634*** (-4.714)	-0.350*** (-3.420)	-0.397*** (-3.731)	-0.555*** (-4.544)
$SFDI_{kt}$	-0.00223 (-0.510)	-0.00122@ (-1.625)	0.00146 (0.468)	-0.00214 (-0.520)	-0.000413 (-0.182)	-0.00158 (-0.634)	-0.000251 (-0.0605)
REC_{kt-1}	1.182*** (6.898)	0.152** (2.173)	0.935*** (6.540)	1.067*** (6.362)	0.508*** (5.075)	0.552*** (5.787)	1.011*** (5.390)
Constant	-58.02*** (-3.215)	-9.525* (-1.758)	-42.41** (-2.534)	-53.72*** (-3.119)	-21.62 (-1.534)	-36.14** (-2.528)	-51.64*** (-2.892)
F(14,24)	30.23	5.87	17.07	27.93	17.0	77.05	12.03
Prob > F	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	356	356	356	356	356	356	356
R-squared	0.338	0.188	0.321	0.328	0.283	0.290	0.290
No. of Indian states	21	21	21	21	21	21	21
Test of over identifying restrictions: fixed vs random effects!							
Chi-sq(14)	83.929	183.809	349.870	94.891	97.682	176.513	120.839
Prob > Chi-sq	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Breusch and Pagan Lagrangian Multiplier test for random effects							
Chibar2(01)	75.07	23.26	274.02	71.48	64.81	3.19	179.75
Prob > Chibar2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0371	0.0000

Source: Authors' estimation based on STATA software.

Notes: Robust t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1; @ p<0.12, R-squared is within R-squared; !- Sargan-Hansen statistics estimated using xtoverid STATA ado(Schaffer and Stillman, 2010); SFN_{kt}, STI_{kt}, $SCON_{kt}$, $STKS_{kt}$, TWN_{kt}, and $STRP_{kt}$ are orthogonalized variables as described in the text.

Therefore, results on regional market related factors suggest that potential SMEs' decision to enter into a state is positively determined by the size of local demand while the growing sophistication of local demand may in fact reduce their entry rate. Further, higher economic growth may witness

diminishing scope for entry of new start-ups when expanding work opportunities promote individuals to choose jobs over entrepreneurial opportunities and when high growth in the liberalized period ends up disproportionately rewarding large incumbent firms with increasing market share.

The role of regional technological variables in explaining the inter-state patterns of entry rate of new SMEs is found to be mixed. Technological knowledge stock measured by cumulative patents, $STKS_{kt}$ has mixed signs of its coefficient across estimations but none attained any acceptable level of statistical significance. The specialization of Indian states on technology-intensive manufacturing activities represented by SPL_{kt} turns up with a positive sign throughout. This positive relation between technology-intensive specialization of the manufacturing sector and SME entry rate has attained modest statistical significance embracing all the sectors together, the primary sector, total manufacturing and its sub-sample estimations for high- and medium-technology industries.

The insignificant effect of $STKS_{kt}$ suggest that states' higher stock of technological knowledge plays diminutive role in causing any significant change in entry rate of new SMEs. One has to take into consideration the fact that patent activities are undertaken by organized sector and comparatively large-sized enterprises and, hence, their relevance for formation rate of SMEs is pretty low. As SMEs predominantly form a part of the unorganized sector of the economy, an alternative measure of regional technological knowledge stock like cumulative R&D investments might have performed differently. Moreover, irrespective of the technological nature of the industries, it may be that incumbent large firms in these industries are more efficient at exploiting R&D, thus, leaving less possibilities for entry of new SMEs. This is similar to the finding reported by Zoltan et al. (2009) that extensive knowledge exploitation by incumbents reduce entrepreneurial activity.

Moderately effective positive sign of SPL_{kt} indicates that states with higher technology-intensive structure of manufacturing sector tend to possess greater entry rate of new SMEs in general and also in the case of total manufacturing and its two technological sub-groups of industries. It may be because the technology-intensive manufacturing sector of a state may be generating knowledge spillovers on residual sectors like the primary sector, thus, creating more favourable conditions for the entry of new SMEs.

Among the agglomeration related factors, $SCON_{kt}$ and TWN_{kt} both consistently appeared with a positive coefficient across estimations, except a negative sign of the former in the sub-sample of low-technology manufacturing industries. Invariably both of their coefficients are statistically not different from zero for all the estimations. These results indicate that greater spatial density of existing firms and greater number of urban locations in a state may not affect the formation rate of new SMEs. Overall, SMEs compared to larger firms tend to be geographically more dispersed in a state to reduce inter-regional and rural-urban disparities in growth (Das, 2008). The 4th All India Census of MSMEs shows that above 45 per cent of MSMEs are in rural areas. It is possible that states with higher geographical concentration of firms of the same and related subsectors (i.e., clustering) could have been a better measure of agglomeration for examining formation of new SMEs.

SKL_{kt}, representing the availability of human capital, consistently has a positive coefficient and turns significant for all the estimations, except in the subsample of low-technology industries. This would confirm that Indian states, possessing higher endowments of skilled human-power, are able to maintain higher entry rate of new SMEs in primary sector, tertiary sector and manufacturing sector.

The performance of physical infrastructure variables in explaining inter-state patterns of new SMEs formation is, however, observed to have mixed role. $SPWR_{kt}$ has an insignificant coefficient throughout the estimations while $STRP_{kt}$ has a positive coefficient and significantly different from zero in the estimations for all the sectors combined, tertiary sector, manufacturing sector and sub-sample of low-technology manufacturing industries. Clearly, the availability of electricity is less related to the regional emergence of new SMEs in India while the availability of widespread land transportation networks tends to possess a positive impact on the entry of new SMEs. Again, on the contrary to the expectation, STI_{kt} is observed with a significantly negative sign across estimations and turns modestly significant for all the sectors taken together, manufacturing sector and sub-sample of low-technology manufacturing industries. Apparently, states having relatively lower levels of local telephone density have seen relatively higher entry rate of new SMEs. Firm size is known to matter in firm's adoption of new technologies, such as information and communication technologies

(ICTs); specifically small firms tend to have lower rates of adoption as compared to large firms (Commander, et al., 2011). Thus, telephone density might be more important for large firms than SMEs.

Institutional credit SFN_{kt} has a strong negative effect, except for the primary sector estimation. Apparently, states possessing relatively higher levels of per capita credit advancement by commercial banks have seen lower entry rates of new SMEs. In the liberalized regime, the growth rate in institutional credit to MSMEs almost halved during the first half of the 2000s compared to 1990s (Nair and Das, 2019). As indicated by the 4th MSME Census, only 11.71 per cent of Indian MSMEs have availed institutional credit while 87.23 per cent were self-financed entities. Further, credits by commercial banks in a state often come with several problems, such as inadequate credit limit sanction, delay in disbursement of long-term loans, hesitation of bankers in providing fresh working capital and collateral guarantee (Morris et al., 2001). These are likely to discourage new SMEs from accessing institutional credit. As greater portion of credit advancement by commercial banks has gone to non-MSMEs in states while MSMEs remained predominantly self-financed, entry rate of new SMEs is inversely related to bank credit.

$SFDI_{kt}$ is largely found to have a negative effect but insignificant. So, the increasing presence of foreign companies in a state is unlikely to impact business opportunities for potential SME start-ups. This insignificant effect of foreign firms might be because foreign affiliates operate in the organized sector of the economy and provide differentiated goods and services that might be targeted at different customer base than the types of goods and services offered by SME sector.

As hypothesized,REC_{kt-1}, representing entrepreneurial culture of the state is found to have exerted a positive effect on the entry of new SMEs into Indian states. Therefore, states which possess greater proportion of its working-age population taken to entrepreneurship in the past are likely to have higher rates SME entry in the current time period. This finding is in tune with earlier research that entrepreneurial culture exerts a significant positive effect in explaining cross-country differences in entrepreneurship rates (Suddle et al., 2010).

6. Conclusion and Policy Implications

This study has made a preliminary analysis of the regional patterns of formation of new SMEs in India. Based on the unit level data from the 4th MSME Census 2006-07, it estimated the number and entry rate of new SMEs across regions, states and periods. In general, the formation of new SMEs in Indian economy is found to be characterized by several distinctive facts.

The number and entry rate of new SMEs formed have increased since the early 1980s to the early 2000s, but both with successively slowing growth rate. This is generally true for most Indian regions. Moreover, the formation of new SMEs took place disproportionately across the space and its predominant share comes from a few Indian regions and states. The top three regions in terms of the number of new SMEs formed include South India, West India and North India. For recent periods, leading states for creation of new SMEs are Tamil Nadu, Uttar Pradesh, Gujarat, Karnataka and Kerala. The regional disparities are also visible when one considers the inter-state patterns of entry rate of new SMEs. The range of entry rates of new SMEs among Indian states has increased over time before showing a reduction during 2005-07.

These trends suggest the importance of examining regional heterogeneity among Indian states in terms of formation of new SMEs. The fixed effects estimation on the determinants of state-wise SME entry rates confirm that regional factors do exert strongly distinctive effects on the entry rate of new SMEs among Indian states. While the absolute size of the market facilitates higher entry rate, its higher growth and growing sophistication of local demand (proxied by per capita NSDP) create conditions for success of incumbent firms in the differentiated product market, which ultimately reduce entry opportunities for SMEs.

Indian states, possessing relatively technology-intensive manufacturing sector, are found to be successful in achieving higher entry rate of new SMEs. It goes without saying that technology-intensive manufacturing industries spur innovation, generate higher productivity and cause knowledge-spillovers to the rest of the economy. Such technology-intensive industries are the critical factors for Indian states not just to attain greater industrialization but also formation of SMEs.

Further, states with higher endowments of skilled human-power and better land transportation networks are found to be outperforming other states in terms of SMEs formation. Strong entrepreneurial culture of the state also acts as an incentive for individuals to choose the path of entrepreneurship and, hence, promote greater entry of new SMEs.

The study offers several policy implications. State policy makers can expand the entry rates of SMEs by focusing on the improvement in the supply of skilled labour force through expansion of higher education, enlargement of road and railway networks, increasing manufacturing specialization on technology-intensive activities and promotion of entrepreneurial culture of the state. It is also vital that problems faced by SMEs in accessing institutional credits must be addressed by removing systemic bias and procedural hurdles as shortage of working capital. Institutional credit flow to SME sector, particularly those in the manufacturing sector, is required to be strengthened. Adoption of ICTs by SMEs may be promoted so that like their large counterparts, SMEs could also reap the ICT-enabled productivity gains.

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Article

Estimating and Decomposing Output and Productivity Growth of Metal Products and Machinery Equipment in India: An Inter-State Analysis

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Prasanta Kumar Roy

Abstract

The paper decomposes output and productivity growth of the 2-digit level metal products and machinery equipments for All-India and 15 major industrialized states for the period 1981-2011 using stochastic frontier approach and with a translog production specification. Empirical results show that input growth effect is the major contributor to output growth and total factor productivity growth (TFPG) has also a positive and significant contribution on output growth of the same. Of the components of TFPG, technological progress (TP) is found to be the major contributor to TFPG while the adjusted scale effect (ASC) has no significant contribution on TFPG of the same. The relevant policy implication for the growth of the organized manufacturing industries of metal products and machinery equipments in India is the need to improve ASC of the same during the forthcoming years so that per unit cost of production declines and price tends towards marginal cost.

Keywords: Metal products and machinery equipments, Stochastic frontier approach, Productivity growth, Technological progress, Scale effect

Prasanta Kumar Roy, Associate Professor of Economics, Midnapore College (Autonomous), Midnapore (W.B.). Email: prasanta.roy@midnaporecollege.ac.in

1. Introduction

Metal sector meets the requirements of a large number of important industries. Demand for non-ferrous metals comes from agriculture, automobiles, railways, telecommunications, construction and chemicals, whereas demand for ferrous metals (primarily incorporates iron and different types of steel) comes from construction and automobile sectors. Further, growth in manufacturing and infrastructure is fuelling demand for metal products, thereby driving growth within the sector. Basically the demand drivers for the metal industry are being fuelled by increase in the activities of the automobiles industry, real estate industry, transportation system, aircraft industry, ship building industry, etc. The backbone of developed economies was laid on the strength and inherent uses of metal.

Post independence, India's leaders identified metal as the foundation for the nation's future development. True to their vision, most of India's modern infrastructure was built using metal, which cemented the industry's key position in the nation's growth story. Today, India has replaced Japan as the second largest metal producing country, and it is on course to become the second largest consumer of metal products globally. However, India's domestic metallic industry is especially vulnerable to cheaper imports and demand fluctuation. The slump in domestic metal products consumption and decrease in investment across sectors have affected the overall growth and productivity of the metallic industry. The current wave of protectionism and trade wars is further impacting the industry. However, we tend to believe that this is a temporary phase. The present situation calls for quick policy initiatives to insulate the sector from global pressure and stimulate demand. Although corporate tax cuts are a positive step towards driving investment, they are not enough to boost demand. Measures are needed to increase consumer confidence and the credibility of the financial sector. Moreover, the metal industry needs to evaluate the digital disruption taking place in other industries and how some of its challenges can be mitigated by its productivity growth.

Neo classical growth accounting approach provides a breakdown of ascertained economic growth into components related to changes in factor

inputs and a residual that reflects technological progress and other constituents like better utilization of capacities, learning by doing, improved skills of labour etc. reflecting the "efficiency" with that the well-known technology is applied to production (Nishimizu and Page, 1982). By efficiency of a production unit, it means a difference between the ascertained and best values of its output and input (Lovell, 1993). Efficiency is of three types. "Allocation efficiency" which studies the process and policies that distribute resources among activities and sectors so they are put to their best uses (Caves and Bailey, 1992). It is measured by the gap between factor prices and marginal productivities of the factors, that is, the gap between factor elasticities and factors share. The second one is "scale efficiency" which encompasses producing an output level by equating the production price with marginal cost in the profit maximizing framework (De, 2004). The third is "technical inefficiency" or "productive inefficiency" in which the analysis is based on measuring the distance between the actual and the frontier production function (Caves and Bailey, 1992; Greene, 1997).

The measurement of efficiency formally began with the pioneer work of Farrell (1957), before which the average labour productivity, efficiency indices, cost comparisons (Farrell, 1957) were popularly used for measuring efficiency. However, Farrell's approach was based on "deterministic" frontiers which do not allow for random shocks in the production process which are outside the control of the firm and as such few extreme observations determine the frontier and exaggerate the maximum possible output given inputs (Lee, 1983). However, Aigner, et al. (1977) and Meeusen and van den Broeck (1977) handled this problem with a more satisfactory conceptual basis by explicitly including an error component which is "stochastic", to capture the inefficiency error component across the production unit (Lee, 1983). Thus, there is a choice amongst the two basic methodologies for estimating inefficiency, that is, the former "deterministic" or the latter "stochastic" frontier approach. However, the latter seems more superior on theoretical grounds due to the inclusion of "statistical noise" resulting from events outside the firm's control such as luck and weather (Bauer, 1990). But choosing the latter, poses another problem of choosing the appropriate type of functional distribution amongst the four types of one sided distributional error components viz. half-normal, exponential,

truncated normal distribution and gamma distribution; as the different specifications do give different estimates (Lee, 1983).

However, with the development of techniques to use panel data to estimate frontier functions following the study by Pitt and Lee (1981), it was found that the specific distributional assumptions may be avoided, although then a model of time varying efficiency must be imposed (Bauer, 1990). The "time-varying inefficiency" models follow the untenable time-invariant inefficiency models in which the inefficiency could be modeled as being statistically independent over time. Cornwell, et al. (1990) were first to develop an approach in which the intercept as well as slope coefficients are allowed to vary over time. The next in line is to make a choice between the appropriate functional form, that is the choice between the Cobb-Douglas and the translog functional form. However, Bauer (1990) has found that if one moves very much beyond the former, statistical efficiency is lost by estimating an overly flexible functional form. Further, maximum-likelihood estimates for the parameters of the stochastic frontier production function for the manufacturing industries may provide more significant results. That is why the stochastic frontier approach (SFA) is applied to decompose output and productivity growth of the 2-digit manufacturing industries of metal products and machinery equipments in India and in its fifteen major industrialized states instead of the "Deterministic" approach or the data envelope analysis (DEA). Fifteen major industrial states of metal product industries are determined by the revenue they obtained from the aforesaid industries under study during the study periods.

2. Literature Review

Many studies so far have measured output and productivity growth of Indian manufacturing industries both at aggregate and disaggregate levels (Goldar, 1986; Ahulwalia, 1991; Unel, 2003; Goldar, 2004; Misra, 2006; Manjappa and Majesha, 2008). There are several studies that tried to analyze the inter-state variations with respect to growth and productivity performance (Ray, 1997; Ray, 2002; Trivedi, 2004; Kumar, 2004; Goldar and Veeramani, 2005). However, the review of literature suggests that there is a dearth of studies to examine different dimensions of output and

productivity growth and their components and related issues at the regional and disaggregated levels.

Aigner, et al. (1977) and Meeusen and van den Broeck (1977) allow decomposing the total factor productivity growth (TFPG) into various components using stochastic frontier approach (SFA). Nishimizu and Page (1982) were the first to propose the decomposition of TFPG into efficiency changes and technological progress. They used a deterministic translog production frontier to decompose productivity growth in Yugoslavia into two aforementioned components. Bauer (1990) estimated a translog cost frontier using data on the US airline industry to decompose TFPG into efficiency changes, technological progress, and scale effects. By applying a flexible translog stochastic frontier production function, Kumbhakar and Lovell (2000), Kim and Han (2001) and Sharma et al. (2007) have decomposed TFPG into four components: technological progress, changes in technical efficiency, and changes in allocation efficiency and scale effects.

Later Li and Liu (2011) decomposed output and productivity growth of 30 provinces in China's post-reform economy. The four attributes of economic growth were input growth, adjusted scale effect, technical progress, and technical efficiency effect. The empirical results show that input growth effect is the major contributor to economic growth and human capital is inadequate even though it has a positive and significant effect on economic growth. Technological progress is the main contributor to productivity growth and the scale effect has become important in recent years. However, the impact of technical inefficiency becomes statistically insignificant in the sample period. The relevant policy implication for a sustainable post-reform Chinese economy is the need to promote human capital accumulation and improvement in technical efficiency as the study showed.

Roy (2018) decomposed output and TFPG of the aggregate manufacturing industries of 15 major industrialized states and all India for the period 1981-2011, during the pre-reform period (1981-1991), post-reform period (1991–2011), and also during two different decades of the post-reform period, that is, during 1991-2001 and 2001-2011. The empirical results show that input growth effect is the major contributing factor to output growth of

the aggregate manufacturing industries in India and in its major industrialized states, whereas technological progress is found to be the major contributor to TFPG of the same and the decline in TFPG of them during the post-reform period is mainly responsible for the decline in technological progress of the same during that period.

2.1 Objectives of the Study

The specific objectives of the study are:

1. To estimate the output and productivity growth of the 2-digit manufacturing industries of metal products and machinery equipments in India and 15 major industrialized states over the period from 1981-82 to 2010-11, pre-reform period (1981-82 to 1990-91), post-reform period (1991-92 to 2010-11) and over the two decades of the post-reform period (1991-1992 to 2000-2001 and 2001-2002 to 2010-2011) using SFA.

   It is to be noted that the study is a decadal analysis. We have considered three complete decades in the study starting from 1981-82 to 2010-11. Although ASI data up to the year 2017-18 are available, we did not consider those in our study as another three years' data are required to make it a complete decade (i.e., 2011-12 to 2020-21).

2. To decompose output and productivity growth of the industries under study into several components and discuss their relative performances during the aforementioned study periods using this approach.

3. To analyze the impact of economic reforms on output and productivity growth and on their different components of the same using the same approach.

The paper is organized as follows. The next section outlines the stochastic frontier production function and the methodology that involves decomposition of output and productivity growth. The econometric specifications of the stochastic frontier production function and the time-varying technical inefficiency function are also mentioned in this section.

Data sources and the measurement of variables are presented in this section too. Section 4 presents the results of estimation and tests of hypotheses and the other empirical findings and their analyses. The final section contains concluding remarks.

3. Methodologies

The existence of technical inefficiency in a production function can be shown by using a stochastic frontier production function (Aigner, et al., 1977; Meeusen and van den Broeck, 1977; Battese and Coelli, 1988 and 1992; Greene, 2005):

$Y_t = F\ (X_{1t}, X_{2t}, \ldots, Xnt, t)\ e^{-u_t}$ ---------- (1)

where Y is output; F is the potential production function with 'n' inputs; Xit denotes i^{th}input; and 'u' is a normally distributed random variable with a positive mean. The inclusion of 't' in 'F' allows for the production function to shift overtime due to technological progress. The last term e^{-u_t} measures technical inefficiency.

Computing Li and Liu (2011), we have,

$$\dot{Y}_t = \sum_i s_{it} \dot{X}_{it} + (et - 1)\sum_i s_{it} \dot{X}_{it} + \dot{A}_t + \dot{TE}_t \text{ ---------- } (2)$$

That is, output growth is decomposed into: input growth effect, adjusted scale effect, technological progress, and technical efficiency effect, respectively.

Where TFP growth is composed of:

$$\dot{TFP}_t = (e_t - 1)\sum_i s_{it} \dot{X}_{it} + \dot{A}_t + \dot{TE}_t \text{ ---------- } (3)$$

That is, TFP growth has three components: adjusted scale effect, technological progress, and technical efficiency effect, respectively (Bauer, 1990; Kumbhakar and Lovell, 2000, p. 284)[1].

[1] Kumbhakar and Lovell (2000) include the allocative inefficiency component in their decomposition. In this model allocative inefficiency does not exist as the cost minimization programme is used.

3.1 Model Specification

A time-varying stochastic frontier production function in translog form with two inputs labour (L) and capital (K) can be written as:

$$Lny_{it} = \beta_0 + \beta_L lnL_{it} + \beta_K lnK_{it} + \beta_t t + 1/2\beta_{LL} L_{it}^2 + 1/2\beta_{KK} K_{it}^2 + 1/2\beta_{tt} t^2 + \beta_{LK} lnL_{it} lnK_{it} + \beta_{Lt} L_{it} t + \beta_{Kt} K_{it} t + v_{it} - u_{it} \quad (4)$$

where y_{it} is the level of output, K and L are two primary inputs capital and labour, respectively. The inefficiency error, u_{it} represents production loss due to industry-specific technical inefficiency; thus, it is always greater than or equal to zero ($u_{it} \geq 0$) , and it is assumed to be independent of the statistical error, v_{it}, which is assumed to be independently and identically distributed as $N(0, \ ^2_v)$.

The distribution of technical inefficiency effects, u_{it}, in Equation 4, is taken to be non-negative truncation of the normal distribution $N(\mu, \sigma^2 u)$, modeled, following (Battese & Coelli 1992. Greene 1997: p. 119) to be the product of an exponential function of time as:

$$u_{it} = \eta_t u_i = u_i \exp(-\eta\,[t-T]),\ i = 1,\ldots, N;\ t = 1, \ldots, T \quad (5)$$

where the unknown parameter 'η' represents the rate of change in technical inefficiency, and the non-negative random variable u_i, is the technical inefficiency effect for the i^{th} production unit in the last year of the data set.

Technical efficiency of the i^{th} production unit at time t (TE_{it}), defined as the ratio of the actual output to the potential output, determined by the production frontier, can be written as:

$$TEit = \exp(-u_{it}) \quad (6)$$

and technical efficiency change (TEC) is the change in TE, and the rate of technological progress (TPit) is defined by:

$$TP_{it} = \partial \ln f(x_{it}, \beta, t)/\partial t = \beta t + \beta_{tt} t + \beta_{Lt} lnL_{it} + \beta_{kt} lnK_{it} \quad (7)$$

where βt and β_{tt} are 'Hicksian' parameters and β_{Lt} and β_{kt} are 'factor augmented' parameters. It is noted that when technological progress is non-neutral, the change in TP will vary for different input vectors. To avoid this problem, Coelli et al. (1998) suggest that the geometric mean between

the adjacent periods be used to estimate the TP component. The geometric mean between time 't' and t+1 is defined as:

$$TPit = [1+\partial \ lnf(x_{it},\beta,t) / \partial t]*[1+\partial \ lnf(x_{it+1},\beta,t+1)/\partial t+1]^{1/2}-1 \quad (8)$$

So that both TE_{it} and TP_{it} vary over time and across the production units. The associated output elasticities of inputs labour and capital can be defined as:

$$\varepsilon^{L} = lnf(x_{it},\beta,t) / \partial lnL_{it} = \beta_{L}+\beta_{LL}lnL_{it}+\beta_{LK}lnK_{it}+\beta_{Lt}t \quad (9)$$

$$\varepsilon^{K} = lnf(x_{it},\beta,t) / \partial lnK_{it} = \beta_{K}+\beta_{KL}lnL_{it}+\beta_{KK}lnK_{it}+\beta_{Kt}t \quad (10)$$

These two factor elasticities are used to estimate the returns to scale component (RTS), where $RTS=\varepsilon^{L}+$ $_{K}$.

3.2 Data and Variables

The study is based on panel data collected from various issues of *Annual Survey of Industries* (ASI) published by, Central Statistical Organization (CSO), Ministry of Statistics and Program Implementation, Government of India, New Delhi, for the period from 1981-82 to 2010-11. The variables used in this exercise are output and labour and capital inputs. Deflated value added has been taken as the measure of output. The ratio of nominal and real GDP, the values of which are obtained from different volumes of National Account Statistics (NAS) is treated as a deflator. Total number of persons engaged in production is used as the measure of labour input. Since working proprietors, owners and supervisory and managerial staff have a significant influence on the productivity of industries, the number of persons engaged is preferred to the number of workers. Price of labour is obtained by dividing the total emoluments by the total number of persons engaged. Net fixed capital stock at constant prices has been taken as the measure of capital input. The net fixed capital stock series has been constructed from the series on gross fixed capital formation (at constant prices) using the perpetual inventory accumulation method (PIAM) (Goldsmith, 1951). The annual rate of depreciation of fixed assets has been taken as 5 per cent. Rental price of capital equals the ratio of interest paid and capital invested (Jorgenson and Griliches, 1967) is treated as price of capital.

4. Empirical Results

The empirical analysis specifies a translog-stochastic frontier production function for these industries, with non-neutral technological change. The u_{it}s are assumed to be i.i.d.$N^{+}(0, \ ^{2}_{u})$ random variables. Thus, the model assumes that technical inefficiency is time variant in nature. This permits the greatest degree of flexibility in the possible patterns of technical efficiency in the said industries.

The maximum-likelihood estimates of the parameters of the translog stochastic frontier model are obtained by using the computer program, FRONTIER Version 4.1 (Coelli 1996). These estimates are presented in Table 1. Significance levels are mentioned in the parentheses under each estimate. Also note that the data were mean corrected prior to estimation. Hence, the first-order parameters are interpreted as the elasticities at the sample means. The model also includes a time-squared variable, to allow for non-monotonic technological change, plus time interacted with each (log) input variable, to allow for non-neutral technological change.

σ

Table 1: Parameter Estimates of the Stochastic Production Frontier and Technical Inefficiency Model in the 2-Digit Manufacturing Industries of Metal Products and Machinery Equipment in India

Variables	Parameters	Coefficients
Constant	β_0	3.16** (1.86)
lnL	β_L	0.97** (0.47)
lnK	β_K	-0.91*** (0.26)
t	β_t	0.93*** (0.02)
lnL^2	β_{LL}	-0.14*** (0.04)
lnK^2	β_{KK}	-0.11*** (0.03)
t^2	β_{tt}	-0.0004* (0.0003)
lnL*lnK	β_{LK}	0.295*** (0.067)
lnL*t	β_{Lt}	-1.58*** (0.006)
lnK*t	β_{Kt}	0.01** (0.005)
Sigma squared	σ	0.86* (0.60)
Gamma		0.96*** (0.03)
Mu	μ	-1.81*** (1.43)
Eta	η	-0.015*** (0.005)
Log-Likelihood		76.48

λ

Notes : Standard errors are mentioned in the parenthesis
***,** & * denote statistical significance at the 1%, 5% and 10% levels, respectively
Source : Author's own calculation

Table 1 shows that almost all the included variables are statistically significant at less than 5 per cent probability level. However, as under translog specification there may exist high levels of multicollinearity due to the interaction and squared terms, certain estimated coefficients are found to be statistically insignificant. The estimate of parameter ã that tests for the validity of technical inefficiency effect is found to be statistically significant at less than 1 per cent probability level which confirms the presence of technical inefficiency effect in the output residual. The estimated value of gamma (ã) is found to be 0.96. This implies that output variation is significantly dominated by inefficiency error (u_{it}). However, statistical test (Table 2) suggests that technical inefficiency remains absent or it becomes time invariant in nature.

4.1 Testing of Hypotheses

Various tests of hypotheses of the parameters in the stochastic frontier model can be performed using the generalized likelihood ratio-test statistic, defined by

$$\lambda = -2 [L (H_0)-L (H_1)]$$

where L (H_0) is the log-likelihood value of a restricted frontier model, as specified by a null hypothesis, H_0; and L (H_1) is the log-likelihood value of the general frontier model under the alternative hypothesis, H_1. This test statistic has approximately a Chi-Square distribution (or a mixed chi-square distribution) with degrees of freedom equal to the difference between the parameters involved in the null and alternative hypotheses. If inefficiency effects are absent from the equation, as specified by the null hypothesis H_0: λ =0, then the statistic λ is approximately distributed according to a mixed chi-square distribution. Table 2 presents the test results of various null-hypotheses as shown below:

Table 2: Tests of Hypotheses for Parameters of the Distribution of Technical Inefficiency Effects and Appropriateness of the Functional Form of 2-Digit Manufacturing Industries of Metal Products and Machinery Equipment in India

	Log-likelihood Value		Test statistics	Critical value		Decision
Null Hypothesis	**$L(H_1)$**	**$L(H_0)$**	**$\lambda = -2[L(H_0)-L(H_1)]$**	**At 1% level**	**At 5% level**	**Reject H_0/ Accept H_0**
Cobb-Douglas Production Specification H_0: $\beta_{LL}=\beta_{KK}=\beta_{LK}=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$	76.48	41.37	70.22	16.81	12.59	Reject H_0
No technological change H_0:$\beta_t=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$	76.48	-4.61	162.18	13.28	9.49	Reject H_0
Neutral technological change H_0: $\beta_{Lt}=\beta_{Kt}=0$	76.48	69.68	13.60	9.21	5.99	Reject H_0
No technical inefficiency H_0: $\sigma=\mu=\eta=0$	76.48	72.73	7.50	11.34	7.81	Accept H_0

Source: Author's own calculation

The first likelihood test is conducted to test the null hypothesis that the technology in the 2-digit manufacturing industries of metal products and machinery equipments is a Cobb-Douglas (H_0: $\beta_{LL}=\beta_{KK}=\beta_{LK}=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$), is rejected. This is shown in Table 2 where a likelihood ratio value of 70.22 indicates the rejection of null hypothesis at 1 per cent level of significance. Thus, Cobb-Douglas production function is not an adequate specification for the manufacturing industries of metal products and machinery equipment, given the assumption of the translog stochastic frontier production model, implying that the translog production function better describes the technology of the said manufacturing industries.

The second null hypothesis, that there is no technological change over time (H_0: $\beta_t=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$) is also strongly rejected. The value of the test statistic as shown in Table 2 is 162.18 which is significantly larger than the critical value of respectively 9.49 and 13.28 at 5 per cent and 1 per cent probability level. This indicates the existence of technological change over time in the manufacturing industries of metal products and machinery equipment,

given the specified production model.
The third null-hypothesis is that the technological change is Hicks neutral (H_0: $\beta_{Lt}=\beta_{Kt}=0$). The value of the test statistic in this case becomes 13.60 which is also larger than the critical value of 5.99 and 9.21 respectively at 5 per cent and 1 per cent probability level. This indicates that the translog parameterization of the stochastic frontier model does not allow for neutral technological change.

Fourth, the null-hypothesis that technical inefficiency effects are absent (H_0: $\gamma=\mu=\eta=0$) is accepted. This implies that technical inefficiencies in the 2-digit manufacturing industries of metal products and machinery equipment remain absent or they are time invariant in nature.

4.2 Estimation and Decomposition Analysis

Average annual percentage change measures of TP, scale change (SC), TFPG and output growth calculated for each industry using SFA over the total study period 1981-82 to 2010-11, pre-economic reforms period post-economic reforms period and two decades of the post-reforms are presented in Table 3, Table 4 and Table 5 respectively. Because the translog specification is used, the performance of these measures varies depending on states and years under study.

For the four sources of the output growth (TP, SC, TFPG and input growth effect), Table 3, Table 4 and Table 5 show that the major contributor to the output growth is the primary factor inputs, while TP is the major contributor to TFPG in most of the states in India as well as in All-India during the whole study period and during both the pre-and the post-reform periods.

So far as the estimates of TFPG are concerned it is found that the components of TFPG of the 2-digit manufacturing industries of metal products and machinery equipment in almost all the states and All-India have increased during the post-reform period. However, the contribution of TE in the said manufacturing industries in all the states in India vis-a-vis All-India are found to be absent (as statistical tests suggest) during the entire study periods. Further, the contribution of SC is also found to be very low in many states during the aforementioned study periods. It is also found that

TP is the main driver of TFP growth of the organized manufacturing industries of metal products and machinery equipments in all the states in India as well as in All-India and the contribution of TP to TFPG is so high that the increase in TFPG of the said industries during the post-reform period is mainly accounted for by the increase in TP of the same during this period.

Again, so far as the rates of output growth are concerned it is found that Gujarat, Rajasthan, Tamil Nadu and Uttar Pradesh achieved more than 9 per cent average annual growth rate of output during 1981-82 to 2010-11. ndhra Pradesh and Karnataka and India as a whole have achieved average annual growth rate of output in the range of 8 per cent to 9 per cent; Haryana, Madhya Pradesh, Maharashtra and Punjab have achieved average annual growth rate of output in the range of 6 per cent to 8 per cent and Bihar, Kerala, Odisha and West Bengal have experienced average annual growth rates of output in the range of 4 per cent to 6 per cent during this period.

Considering the shares in the average annual growth rates of output of the four components of output growth are concerned, the primary inputs, i.e., labour and capital taken together, are found to have the maximum share in as many as seven states in India and in India as a whole, while the rate of change in TP have been the highest contributor to the output growth of the remaining states during this period. The share of other components of the TFPG, say, SCs are very insignificant. Be it further mentioned that TECs remain absent as statistical tests suggest. So what we see is that the average annual rates of output growth of the 2-digit manufacturing industries of metal products and machinery equipment, during the period from 1981-2011, is accounted for by only two factors the primary input factors consisting of labour and capital and the TP. The SCs are very negligible in most of the states and their effects have been negative too in many cases.

A comparison of the performance of output growth and the share of the four components of output growth during the pre-and post-reform periods show that only Gujarat and Tamil Nadu and India as a whole have achieved higher output growth rates (more than 10 per cent) during the post-reform period. The share of primary inputs (labour and capital) in the total output

growth becomes the maximum (6 per cent and above) in Gujarat and Tamil Nadu in contrast to only one state Odisha during the pre-reform period. Further, as in the case of the whole study period during the pre-and post-reform periods, the share of technological progress has been far greater than the shares of SC in all the states under study and in India as a whole.

A further division of the post-reform period into two sub-periods of 1991-92 to 2000-01 and 2001-02 to 2010-11 is made to estimate the relative contribution of the output growth components during these two sub-periods of one decade each. From Table 3, Table 4 and Table 5, we see that all but one state (Haryana) have registered less than 9 per cent growth rates during the first half of the post-reform period. The share of primary inputs in the total output growth in as many as 14 states have been lower than that of TP during the same period of time, while in the second decade of the post-reform period the contribution of primary inputs have been lower than that of TP in six states only. The contribution of primary inputs to the output growth has been negative in Assam in the second decade of the post-reform period while in the first decade of the post-reform period it has become negative in five states (Bihar, Karnataka, Madhya Pradesh, Odisha and West Bengal) under study. The contribution of the TP and so TFPG in the second decade has been quite high compared with the first decade in all the states under study including that in All-India except in Odisha. However, the contribution of adjusted scale effects has been negative in many states during both the decades after reforms.

Table 3: Average Annual Rates (%) of Output and Productivity Growth and their Components of the 2-Digit Manufacturing Industries of Metal Products and Machinery Equipment in India and in Its 15 Major Industrialized States during the Entire Study Period (1981-82 to 2010-11)

States	TP (1)	SC (2)	TFPG (3=1+2)	Input Growth Effect (4)	Rate of Output Growth (5=3+4)
Odisha	4.85	0.03	4.88	1.09	5.97
Rajasthan	4.42	-0.12	4.30	4.94	9.24
Assam	4.30	1.38	5.68	-6.51	-0.83
Bihar	4.25	0.46	4.71	-0.68	4.03
Kerala	4.20	0.02	4.22	0.68	4.90
M.P.	3.94	-0.01	3.93	2.65	6.58
U.P.	3.83	0.22	4.05	5.69	9.74
Haryana	3.75	0.15	3.90	4.00	7.90
Karnataka	3.71	0.53	4.24	4.21	8.45
Punjab	3.66	-0.02	3.64	4.08	7.72
A.P.	3.50	0.32	3.82	4.68	8.50
Gujarat	3.43	0.57	4.00	5.28	9.28
T.N.	3.23	0.62	3.85	5.54	9.39
Maharashtra	3.13	0.78	3.91	3.87	7.78
W.B.	3.12	0.08	3.20	1.09	4.29
India	2.12	1.68	3.80	4.98	8.78

Source: Author's own calculation

Table 4: Average Annual Rates (%) of Output and Productivity Growth and their Components of the 2-Digit Manufacturing Industries of Metal Products and Machinery Equipment in India and in Its 15 Major Industrialized States during the Pre- and Post-reform period

Pre-reform period (1981-82 to 1990-91)					
States	**TP (1)**	**SC (2)**	**TFPG (3=1+2)**	**Input Growth Effect (4)**	**Rate of Output Growth (5=3+4)**
Odisha	3.79	-1.09	2.70	7.85	10.55
U.P.	3.70	-0.03	3.67	5.82	9.49
Kerala	3.41	0.13	3.54	0.38	3.92
Assam	3.39	-1.78	1.61	5.90	7.51
Rajasthan	3.17	-0.30	2.87	4.89	7.76
M.P.	2.77	-0.03	2.74	3.79	6.53
Punjab	2.74	0.04	2.78	4.44	7.22
Bihar	2.69	0.06	2.75	3.05	5.80
A.P.	2.55	0.42	2.97	5.70	8.67
Karnataka	2.52	0.53	3.06	5.12	8.18
Haryana	2.51	0.04	2.55	2.42	4.97
T.N.	2.08	0.36	2.44	4.03	6.47
Gujarat	2.05	0.27	2.32	3.85	6.17
Maharashtra	1.90	0.34	2.24	1.83	4.07
W.B.	1.69	0.03	1.72	0.11	1.83
India	0.87	1.22	2.09	3.81	5.90
Post-reform period (1991-92 to 2010-11)					
Odisha	5.39	0.59	5.98	-2.29	3.68
Rajasthan	5.05	-0.03	5.02	4.96	9.98
Bihar	5.02	0.66	5.68	-2.54	3.14
Assam	4.75	2.95	7.70	-12.70	-5.00
Kerala	4.59	-0.04	4.55	0.83	5.38
M.P.	4.53	0.01	4.54	2.07	6.61
Haryana	4.37	0.20	4.57	4.79	9.36
Karnataka	4.31	0.53	4.84	3.76	8.59

Gujarat	4.13	0.71	4.84	6.00	10.84
Punjab	4.12	-0.05	4.07	3.90	7.97
A.P.	3.98	0.28	4.26	4.18	8.44
U.P.	3.89	0.35	4.24	5.62	9.86
W.B.	3.83	0.10	3.93	1.58	5.51
T.N.	3.80	0.75	4.55	6.35	10.9
Maharashtra	3.74	1.01	4.75	4.89	9.64
India	2.75	1.91	4.66	5.56	10.22

Source: Author's own calculation

Table 5: Average Annual Rates (%) of Output and Productivity Growth and their Components of the 2-Digit Manufacturing Industries of Metal Products and Machinery Equipments in India and in Its 15 Major Industrialized States during two Decades of the Post-reform Period

Decade I of the Post-reform period (1991-92 to 2000-01)					
States	**TP (1)**	**SC (2)**	**TFPG (3=1+2)**	**Input Growth Effect (4)**	**Rate of Output Growth (5=3+4)**
Odisha	4.91	1.64	6.55	-6.89	-0.34
Rajasthan	4.57	-0.01	4.56	1.94	6.50
Bihar	4.20	1.32	5.52	-7.69	-2.17
Kerala	4.16	-0.01	4.15	1.40	5.55
M.P.	4.08	0.11	4.19	-0.06	4.13
Haryana	3.88	0.21	4.09	4.95	9.04
Punjab	3.85	0.04	3.89	1.57	5.46
U.P.	3.81	0.12	3.93	3.33	7.26
Karnataka	3.73	0.21	3.94	-0.05	3.88
Gujarat	3.53	0.37	3.90	3.97	7.87

Assam	3.53	0.44	3.97	0.11	4.08
A.P.	3.48	0.10	3.58	0.36	3.94
Maharashtra	3.34	0.82	4.16	3.82	7.98
T.N.	3.32	0.24	3.56	2.13	5.69
W.B.	3.22	0.11	3.33	-2.60	0.73
India	2.22	1.04	3.26	2.99	6.25
Decade II of the post-reform period (2001-02 to 2010-11)					
States	**TP (1)**	**SC (2)**	**TFPG (3=1+2)**	**Input Growth Effect (4)**	**Rate of Output Growth (5=3+4)**
Assam	5.98	5.47	11.45	-25.50	-14.05
Odisha	5.87	-0.46	5.41	2.31	7.72
Bihar	5.85	0.01	5.86	2.61	8.47
Rajasthan	5.53	-0.06	5.47	7.98	13.45
Kerala	5.03	-0.08	4.95	0.26	5.21
M.P.	4.97	-0.10	4.87	4.21	9.08
Karnataka	4.89	0.85	5.74	7.56	13.3
Haryana	4.85	0.20	5.05	4.62	9.67
Gujarat	4.70	1.06	5.76	8.03	13.79
A.P.	4.48	0.46	4.94	8.00	12.94
W.B.	4.44	0.09	4.53	5.73	10.26
Punjab	4.39	-0.14	4.25	6.25	10.5
T.N.	4.28	1.27	5.55	10.5	16.05
Maharashtra	4.14	1.20	5.34	5.95	11.29
U.P.	3.97	0.58	4.55	7.92	12.47
India	3.28	2.78	6.06	8.13	14.19

Source: Author's own calculation

5. Concluding Observations

Our empirical results show that the two factor inputs (labor and capital) are the most important for output performances of the organized manufacturing industries of metal products and machinery equipment in India and the 15 major industrialized states. Where the two sources of the TFP growth are concerned, we found that the major contributor to the TFP growth is the TP and the rise in TFPG of the said manufacturing industries of the states under study during the post-reform period is mainly responsible for the rise in TP of the same during that period. The contributions of SCs, however, remained negligible.

Therefore, policies should be formulated to increase the scale of production so that per unit cost of production decreases and price tends towards marginal costs. Policy measures intended to improve output and TFP growth might be misdirected if they focus mainly on accelerating the rate of innovation and invention in circumstances where the low rate of TFP growth is brought about by suboptimal size of the industries which actually happened in the case of organized manufacturing industries in general. Governments should take policy initiatives to improve scale efficiency of the manufacturing industries of metal products and machinery equipment in India. Industries can achieve economies of scale by increasing production and lowering costs. This can happen if costs are spread over a large number of articles. Once scale efficiency increases, it will enhance further productivity growth by realizing full potentiality of output growth of the same.

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Article

Economics of Urban Wastewater-based Food Crops Cultivation: A Case Study in Karnataka, India

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D. Narasimha Murthy
S. Puttaswamaiah

Abstract:

Urban wastewater is becoming a major source of irrigation around urban areas. Farmers in several countries use urban wastewater, particularly in freshwater scare areas. Wastewater or discarded water by urban households, commercial establishments, and industries referred to as urban wastewater is a non-conventional source of irrigation. This necessitates an economic analysis of crop cultivation based on wastewater for understanding economic viability. This study has compared costs and returns associated with urban wastewater and freshwater-based agriculture. The study was conducted at a peri-urban area near Bengaluru City; farmers using wastewater and freshwater for agriculture were selected for data collection. The study analysed yield, costs, and returns of food crops, namely paddy and ragi, between the two systems of irrigation. It was observed that freshwater cultivation is more profitable than wastewater.

Keywords: Urbanization, Urban wastewater, Wastewater agriculture, Freshwater agriculture, Economic viability

D. Narasimha Murthy, Guest Faculty, University College of Law, Bangalore University, Bangalore. Email: narasimhaeco.bub@gmail.com

S. Puttaswamaiah, Associate Professor, Department of Economics, Bangalore University, Bangalore. Email: sputtaswamy@gmail.com

Section I

Introduction

In recent years, famers around urban areas, generally known as peri-urban areas, have been using wastewater flowing from urban areas to neighbouring rural areas, to irrigate fields. Urban wastewater is becoming a major non-conventional source of water for agriculture particularly in peri-urban areas, where freshwater sources are scarce. Use of non-conventional sources of water, which is minor at present (only 1 per cent of treated water), has been increasing in some regions and countries (FAO, 2011).

Application of urban wastewater in agriculture is an age-old practice. However, it has been gaining importance in recent years as source of water due to increased demand for agricultural output in urban areas and because of increased wastewater availability throughout the year, particularly in water scarce areas. Availability of market for agricultural products and wastewater has motivated farmers to use large quantity of wastewater generated in urban areas for agricultural activities. The World Health Organisation (WHO, 2006) states that various factors, such as rise in water scarcity and stress, decline in sources of freshwater due to increased pollution and over exploitation; increased population resulted rise in demand for food and fibre; increasing recognition of wastewater as a source of water for agriculture; and Millennium Development Goals (MDGs) attempting to ensure environmental sustainability and eliminating poverty and hunger, have been accelerating use of wastewater in agriculture. The report mentions that scarcity of freshwater is increasing over the years, as 31 countries were identified as water-stressed in 1995. In the years 2025 and 2050, 48 and 54 countries, respectively, are expected to face water scarcity problem. It is stated that India will face the problem in 2025. The demand for water has been increasing because of population growth, particularly in urban areas. More than 40 per cent of the world population would be facing water scarcity in another 50 years. It is to be noted that increased urbanization in developing countries, demand for food and other products have pushed farmers to use wastewater, for the following factors (1) more number of people in urban areas produce more wastewater; (2)

urban population use more water than rural people, (3) establishment of sewerage system in urban areas for carrying wastewater generated to outside urban areas; (4) urban and peri-urban agriculture assuming a major role as supplier of food and other materials to urban areas; and (5) in several water scarce, areas urban wastewater is becoming the major and only source of water (WHO, 2006).

It is known that agriculture uses mostly freshwater, which is scarce. As a result, in water scarce regions, farmers utilize wastewater from urban areas for their crops. As stated in WHO (2006), in California, approximately 67 per cent and in Israel approximately 75 per cent of wastewater was used in agriculture. The WHO report mentions that around 10 per cent of world population consume food produced by wastewater-based agriculture. MDGs stress on eliminating hunger and poverty, and in this direction wastewater use in agriculture is a contributing factor, besides promoting environmental sustainability. However, farmers ignore health and environmental problems of wastewater application in agriculture. Farmers, particularly in low-income countries, have been using wastewater without understanding associated costs and benefits (Scott et al. 2007). This necessitates a detailed analysis of economics of urban wastewater use in agriculture.

WHO (2006) defines wastewater as liquid waste discharged from homes, commercial premises and similar sources, to individual disposal systems or to municipal sewer pipes and which contains human excreta and used water. The Government of India (GoI, 2020) in Envistat 2020 defines wastewater as discarded water that is no longer required by the owner or user and contains dissolved or suspended waste materials. Wastewater produced mainly by household and commercial activities is called domestic or municipal wastewater or domestic sewage. Domestic sewage does not contain industrial effluents. But effluent from industrial units situated in urban areas also joins with domestic wastewater, which means urban wastewater is a combination of both. In this regard, urban wastewater usually refers to a combination of one or more of the following generated by various urban activities (Van der Hock as cited in Scheierling et al. 2010):

- Domestic effluent consisting of blackwater (feces, urine and associated sludge i.e., toilet water) and grey water (wastewater used in kitchen

and bathrooms).

- Institutions generated wastewater like commercial buildings, health facilities.
- Effluents produced in industrial units.

Wastewater generated in urban areas flows down to adjacent rural areas where it is used for irrigating crops, particularly in freshwater scarce areas in number of countries. In several arid and semi-arid countries wastewater has been the only economical and viable option available to people for their livelihood from agriculture (Stephine, 2007). For instance, in countries like Kuwait and Qatar, 10 per cent of treated wastewater is used for agriculture and the top five countries using highest annual per capita treated wastewater are Kuwait, United Arab Emirates, Qatar, Israel and Cyprus (FAO, 2011). However, quantity and quality of urban wastewater does matter as it has direct bearing on human health and environment.

1.1. Review of Literature

Use of wastewater in agriculture requires an analysis of economic impacts. Application of wastewater in agriculture in larger scale is a recent trend, and some studies have tried to analyse economic aspects of wastewater cultivation, which have been reviewed here. Segarra et al. (1996) examined a cropping pattern based on using wastewater and available nutrients, in order to increase revenue in Texas. Results of the study illustrated that crop mix such as wheat and corn; wheat and sorghum, cotton increased revenue. Authors opined that choosing profitable crops by farmers reduce wastewater treatment related activities for urban local bodies. The study observed that cooperation between urban administrative bodies and farmers in adjacent villages in using wastewater would be advantageous to both. Another study focused on practice of using wastewater in many peri-urban areas of Pakistan (Baig et al., 2011). The study found that the cost of production in wastewater irrigation was relatively less than fresh water irrigation and cash input per unit is high in wastewater irrigation.
Review of literature revealed that easy access to wastewater, less expenditure involved, etc. have motivated farmers to adopt wastewater agriculture.

Some studies tried to examine economic aspects in wastewater agriculture, but they have not carried out detailed analysis. Therefore, considering the need for using urban wastewater for agriculture in peri-urban areas and dearth of studies covering economic aspects of wastewater application, there is a need for detailed analysis of costs and returns involved in wastewater agriculture. Urban wastewater is being used in agriculture, which has both positive and negative impacts. In this background the present study attempted to address economics of wastewater agriculture vis-à-vis freshwater based agriculture by analysing costs and returns involved in cultivating food crops.

1.2. Data, Study Area and Approach

In order to examine costs and returns involved in wastewater and freshwater agriculture the study used primary data collected from the rural area adjacent to Bengaluru City in Karnataka,. Bengaluru City generates large quantity of wastewater, which flows down in several drains among which Vrishabavathi valley is important and farmers use wastewater for irrigating their crops. Hence, selection of rural area around Bengaluru City i.e. in Bengaluru Urban and Ramanagara districts, where farmers practice wastewater irrigation, was appropriate for the study. The setting of the study for primary data collection was villages across river Vrishabhavathi. Data collection units were households using wastewater for agriculture in selected villages. Four villages namely Gopahalli, Agara, Byramangala, and Byramangala Colony were chosen for data collection. These villages were selected purposively for canvassing schedule considering wastewater use for irrigation. This study considered a total of 150 households using wastewater, covering 70 small, 50 medium and 30 large farmers. Further, 50 households, including 25 small, 15 medium and 10 large farmers using freshwater for cultivation were also identified for collection of data on costs and returns of freshwater agriculture. Data were collected during the year 2019. In the study area, farmers have been cultivating different food crops, but among them paddy and ragi are grown by large number of farmers . Data have been analysed applying descriptive statistical tools such as per cent, average, etc. Data results have been presented using tabular and diagrammatic presentations. This paper has been structured in 5 sections – Section I presents the introduction, review of literature, data and method of data analysis; Section II illustrates profile of selected villages and

respondents; Section III presents details of production and yield, Section IV provides costs and returns involved and Section V presents the conclusion.

Section II

Profile of Selected Villages and Respondents

Information on demographic profile of selected villages (Table 1) illustrates that Agara village, situated in Bengaluru Urban district with a geographical area of 781.92 ha. has 7758 people of which 4070 are male and 3688 females. Population density of the village is 10 persons per hectare. The village has 1,886 households. Byramangala, Byramangala Colony and Gopahalli are situated in Ramanagara taluk, Ramanagara district of Karnataka. These three villages have population of 2480, 597 and 2707 persons, respectively, according to the 2011 Census. Gender-wise distribution of population shows that Byramangala village has 1244 females and 1236 males and has 638 households. In Byramangala Colony 309 are females and 288 are males within 154 households. In Gopahalli village, with combination of two hamlets, there are 2707 persons with geographical area of 644 hectares among which 1364 are male and 1343 are females. Social category wise details show the presence of households belonging to Scheduled Castes (SCs), Scheduled Tribes (STs) and Other Backward Classes (OBCs), among which OBCs are more in number.

During field work, it was observed that Byramangala and Gopahalli villages have more farmers using urban wastewater in agricultural activities. Farmers in selected villages use wastewater to grow food crops like ragi, paddy, jowar, maize, toor dal, etc; commercial crops such as baby corn, mulberry, coconut, areca, mango, banana; flowers like *kakada* (jasminum multiflorum), marigold, rose and vegetables like brinjal, tomato and beans. Majority of farmers use urban wastewater by connecting motor pump sets to the stream. Among these crops, ragi and paddy are major food crops, while mulberry and baby corn are major commercial crops. Farmers cultivate these two commercial crops as they provide cash income and fodder for livestock used in dairy farming.

Table 1: Demographic Profile of the Villages in Study Area

Description	Villages			
	Agara	Byramangala	Byramangala Colony	Gopahalli
Tehsil name	Bengaluru South	Ramanagaram	Ramanagaram	Ramanagaram
District name	Bengaluru urban	Ramanagaram	Ramanagaram	Ramanagaram
State name	Karnataka	Karnataka	Karnataka	Karnataka
Total area	782 (Hectares)	414 (Hectares)	133 (Hectares)	882 (Hectares)
Total no. of house holds	1886	638	154	644
Total population	7758	2480	597	2707
Total male	4070	1236	288	1364
Total Female	3688	1244	309	1343
Scheduled Cast person	2023	382	128	641
Scheduled Tribe Persons	51	4	0	0

Source: Census of India, 2011

Table 2 presents number of working people in terms of main workers, main cultivators, agricultural labourers, household industries and non-working population, according to the 2011 Census. In all the villages, it was observed that non-working persons were more than the total working population. Due to rapid growth of industrialization and expansion of urban areas the primary sector i.e., agriculture was of least importance while manufacturing and service sectors gained significance as sources of employment. As a result majority of working persons have been migrating towards urban areas in search of jobs. This movement led to higher proportion of main workers than main cultivators and agricultural labourers. Due to urbanization, villages in the study area witnessed shortage of labour to carry out agricultural activities.

Table 2: Working Population in the Study Area

Description	Agara	Byramangala	Byramangala colony	Gopahalli
Total Workers	3729	1103	329	1413
Main Workers	3061	1100	328	1345
Main Workers Cultivators	390	290	16	962
Agriculture Labourer	238	430	242	179
Household Industries	57	30	0	15
Other Workers	2376	350	70	189
Marginal Workers	668	3	1	68
Non-Working Persons	4029	1377	268	1294

Source: Census of India, 2011

Information on land holding size of farmers (Table 3) revealed that all farmers possess over 2.37 acres of land including both wastewater and freshwater cultivation. Farmers using wastewater for irrigation had an average land holding of 2.32 acres while freshwater based farmers reported over 2.5 acres of land. Among those using wastewater, small farmers had an average holding of 1.63 acres while medium and large farmers possessed 2.23 and 4.1 acres respectively. In case of freshwater irrigation small farmers reported 1.5 acres, medium farmers 2.67 acres, and large farmers 4.8 acres of land.

Table 3: Average Land Holding Pattern of Households

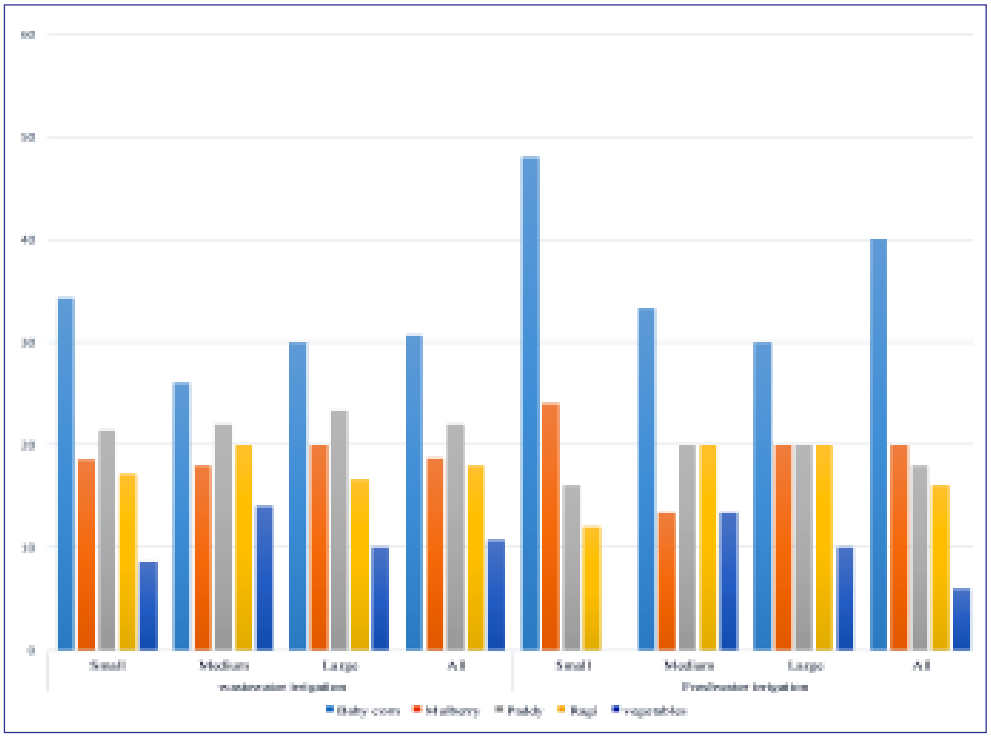
(in acres)

Types of Land	Small farmers	Medium farmers	Large farmers	All Farmers
Fresh water irrigated	1.50	2.67	4.80	2.51
Wastewater irrigated	1.63	2.23	4.10	2.32
Total	1.62	2.2	4.12	2.37

Source: Survey Data

Cropping pattern revealed that sample farmers cultivated different types of crops, such as food and commercial crops. Among food crops paddy and ragi were being cultivated, while in commercial crops baby corn, mulberry and vegetables were grown. According to Figure 1, large number of farmers cultivated baby corn in both wastewater and freshwater cultivation. Taking all farmers together under wastewater irrigation, over 30 per cent of farmers cultivated baby corn, while 22 per cent of farmers grow paddy followed by mulberry and ragi. It is to be noted that over 10 per cent of farmers applied wastewater to cultivate vegetables. Across categories, baby corn was grown by a large number of farmers compared to other crops under wastewater irrigation. In case of freshwater cultivation also baby corn was the major one adopted by large number of farmers. Mulberry, paddy and ragi were the other crops cultivated by farmers. Considering both forms of irrigation, baby corn, mulberry, paddy and ragi have been cultivated by farmers, which indicated diversification in cultivation ensuring commercial as well as food crop production as per farmers' requirement.

Figure 1: Cropping Pattern under Wastewater and Freshwater Irrigation (% of farmers)



Information on crops cultivated by categories of farmers (Table 4) showed that the number of small farmers was high compared to other groups of farmers in cultivating all crops in the study area. For instance, in case of baby corn, out of 46 farmers who used wastewater, over 52 per cent were small farmers and it was around 45 per cent in case of mulberry, paddy and ragi crops grown under wastewater cultivation. A similar scenario was also observed in case of freshwater irrigation where proportion of small farmers growing crops like baby corn, mulberry, paddy and ragi was more compared to medium and large farmers.

Table 4: Cropping Pattern Using Wastewater and Freshwater for Irrigation

(percentage of farmers)

Crops	Wastewater irrigation				Freshwater irrigation			
	Small	Medium	Large	All	Small	Medium	Large	All
Baby corn	52.17	28.26	19.57	100	60.00	25.00	15.00	100
Mulberry	46.43	32.14	21.43	100	60.00	20.00	20.00	100
Paddy	45.45	33.33	21.21	100	44.44	33.33	22.22	100
Ragi	44.44	37.04	18.52	100	37.50	37.50	25.00	100
Vegetables	37.5	43.75	18.75	100	0.00	66.67	33.33	100

Source: Survey Data

Area allocated by farmers for different crops (Table 5), revealed that all farmers allotted nearly 30 per cent of their land for baby corn under wastewater irrigation, followed by paddy and mulberry, respectively with 23 per cent and 19 per cent. All categories of farmers presented similar pattern of importance in land allocation for crops i.e., baby corn followed by paddy, mulberry and ragi. But, in terms of share of land allocated across crops small farmers put higher proportion for baby corn as compared to other two categories of farmers and also other crops. In case of freshwater cultivation, all farmers taken together devoted more area for baby corn i.e., about 34 per cent of 2.99 acres. All farmers as a whole allocated over 18 per cent of land for mulberry, paddy and ragi each under freshwater cultivation. Across categories of farmers, baby corn given more importance by all groups as they allocated higher share of land for this crop. It is to be noted that compared to other categories of farmers, small farmers devoted

48 per cent of their land for baby corn, followed by medium and large farmers with 33 and 30 per cent respectively. Allocation of land for various crops revealed diversification of cropping pattern by farmers in case of both wastewater and freshwater irrigation in the study area. This practice might be an attempt by farmers to meet household needs of cash and food.

Table 5: Crops Grown and Average Area Allocated in Irrigated Land

Name of Crops	Freshwater irrigated				Wastewater irrigated			
	Small	Medium	Large	All Farmers	Small	Medium	Large	All Farmers
Baby corn	0.72	0.9	1.44	1.02	0.56	0.58	1.23	0.79
	(48.00)	(33.71)	(30.00)	(34.11)	(34.36)	(26.01)	(30.00)	(29.92)
Mulberry	0.36	0.36	0.96	0.56	0.3	0.4	0.82	0.5
	(24.00)	(13.48)	(20.00)	(18.73)	(18.40)	(17.94)	(20.00)	(18.94)
Paddy	0.24	0.53	0.96	0.57	0.35	0.5	0.96	0.6
	(16.00)	(19.85)	(20.00)	(19.06)	(21.47)	(22.42)	(23.41)	(22.73)
Ragi	0.18	0.53	0.96	0.55	0.29	0.44	0.68	0.47
	(12.00)	(19.85)	(20.00)	(18.39)	(17.79)	(19.73)	(16.59)	(17.80)
Vegetables	0	0.35	0.48	0.27	0.13	0.31	0.41	0.28
	(0.00)	(13.11)	(10.00)	(9.03)	(7.98)	(13.90)	(10.00)	(10.61)
Total	1.5	2.67	4.8	2.99	1.63	2.23	4.1	2.64
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Survey data

Note: Figures in parenthesis are per cent to total

Section III

Production of Food Crops under Wastewater and Freshwater Irrigation

As discussed earlier farmers cultivated both food and commercial crops under both wastewater and freshwater irrigation. This study analysed production details of food crops in both forms of irrigation.

3.1. Total Production of Food Crops

Farmers cultivated paddy and ragi as major food crops under both wastewater and freshwater in the study area. Details of food crop production, presented in Table 6, showed that under wastewater cultivation total production of paddy was over 1835 quintals. However, across categories of farmers, total production is more for large farmers at 660 quintals followed by small and medium farmers. In freshwater cultivation total production of paddy is 628 quintals and it can be observed that large farmers obtained more paddy production. Similarly, ragi production was 829 quintals and in case of ragi relatively small farmers received higher total production under wastewater cultivation. In case of freshwater cultivation, ragi production was 353 quintals and here also large farmers reported more production as compared to other groups of farmers.

Table 6: Total production of food crops in irrigated area

(in quintals)

Name of Crops	Freshwater irrigated				Wastewater irrigated			
	Small	Medium	Large	All Farmers	Small	Medium	Large	All Farmers
Paddy	180	208.26	240	628.26	611.25	564.19	660.1	1835.54
	(28.65)	(33.15)	(38.20)	(100.00)	(33.30)	(30.74)	(35.96)	(100.00)
Ragi	81	128.16	144	353.16	293.4	289.9	246	829.3
	(22.94)	(36.29)	(40.77)	(100.00)	(35.38)	(34.96)	(29.66)	(100.00)

Source: Survey Data

Note: Figures in parentheses are percentages

3.2. Yield of Food Crops

Total production of food crops cultivated by farmers using wastewater and freshwater was presented above. However, difference in production across types of irrigation and also across categories of farmers could be presented by analysing average production or yield of different crops, which is presented in Table 7. Yield of paddy was over 23 quintals per acre taking all farmers together in wastewater irrigated land. Across categories, paddy yield was high for small farmers (25 quintals per acre), and 23 quintals for medium and large farmers. Under wastewater agriculture, farmers received yield of 13 quintals of ragi per acre and it varied inversely with size of holding across categories of farmers. Food crops grown using freshwater

depicted yield of 27 quintals per acre of paddy taking all farmers as a whole and small farmers reported higher yield compared to other two categories of farmers and also an inverse trend in yield across groups of farmers was observed. In case of ragi under freshwater cultivation, the average production was over 16 quintals per acre and in freshwater ragi also inverse relationship between yield and farm land holding was observed in the study area. Comparison of yield between wastewater and freshwater irrigation revealed higher yield for both paddy and ragi in freshwater cultivation. It can be observed that paddy cultivation using wastewater had given yield of over 23 quintals per acre while it was 27 quintals per acre in freshwater taking all farmers. Similarly, in case of ragi the yield was over 16 quintals per acre for freshwater and 13 quintals per acre for wastewater cultivation. Difference in yield between two types of irrigation systems illustrated that yield was relatively less in wastewater cultivation for both crops, which might be due to presence of contaminants in wastewater.

Table 7: Average Production of Food Crops under Wastewater and Freshwater Irrigation

(Yield in Quintals/acre)

Name of Crops	Freshwater irrigated				Wastewater irrigated			
	Small	Medium	Large	All Farmers	Small	Medium	Large	All Farmers
Paddy	30.00	26.00	25.00	27.00	25.00	23.00	23.00	23.66
Ragi	18.00	16.00	15.00	16.30	15.00	13.00	12.00	13.33

Source: Survey data

Section IV

4.1. Analysis of Cost of Production of Food Crops under Wastewater and Freshwater Cultivation

Data on cost of cultivation were collected from farmers, in 2019, through a structured schedule following concepts of Farm Management System. The analysis of cost of production is presented on per acre basis across categories of farmers. Table 8 presents details of cost of production of food crops, namely paddy and ragi, cultivated by selected households. On an average,

farmers spent Rs. 37,300 per acre for cultivating paddy under wastewater cultivation. Cultivation cost of paddy is more for large farmers, Rs. 43800 per acre, followed by medium and small farmers, which indicated a positive association between land holding size and cost of cultivation in the study area. Ragi cultivation under wastewater reported an average cost of Rs. 27726 per acre taking all farmers together. In case of ragi, also cost of cultivation was positively related with size of holding, showing more expenditure per acre for large farmers (nearly Rs. 31950 per acre). Food crops cultivated using freshwater showed an expenditure of Rs. 32233 per acre for paddy and Rs. 26176 per acre for ragi. Across categories of farmers in both paddy and ragi cultivation under freshwater irrigation also cost of cultivation per acre varies positively with size of holding depicting higher expenditure for large farmers.

Table 8: Cost of Production of Food Crops in the Irrigated Area

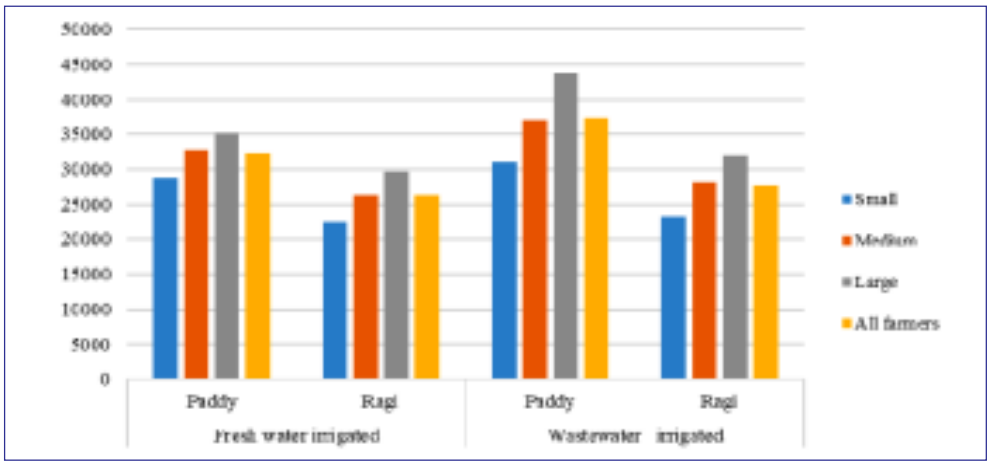
(Rs per acre)

Farmers groups	Freshwater irrigated		Wastewater irrigated	
	Paddy	Ragi	Paddy	Ragi
Small	28,850	22,550	31,000	23,160
Medium	32,700	26,260	37,100	28,070
Large	35,150	29,720	43,800	31,950
All	32,233	26,176	37,300	27,726

Source: Survey Data

Comparative scenario of cultivation cost involved in wastewater and freshwater irrigation, presented in Figure 2 shows that under wastewater farmers spent more per acre for both food crops as compared to expenditure in freshwater irrigation. Average cost of cultivating paddy was over Rs. 37000 per acre in wastewater irrigation while it was Rs. 32000per acre under freshwater. Similarly, for ragi per acre cost was Rs. 27726 in wastewater and Rs. 26176 in freshwater irrigation. Further, categories of farmers incurred more expenditure for cultivating both food crops under wastewater as compared to freshwater irrigation. The analysis revealed that food crops cultivation using wastewater involves more expenditure as compared to freshwater irrigation.

Figure 2: Comparison of Cost of Cultivation under Wastewater and Freshwater Irrigation (Rs. per acre)



4.2. Material and labour cost

Crop cultivation depends on different types of expenditure such as material inputs, labour, etc. In order to understand various expenditures incurred by farmers an analysis amount spent on materials and labour in both types of irrigation systems and also across food crops is discussed.

Table 9 depicted information on amount spent by farmers on materials and labour under wastewater irrigation for paddy cultivation, which showed that expenditure on labour was highest (over 72 per cent of total cost), while inputs cost was nearly 28 per cent taking all farmers together. Labour cost was high across all groups of farmers in paddy cultivation under wastewater irrigation. The results indicated that farmers require to spend almost the same amount on paddy crop under wastewater cultivation irrespective of size of holding.

Table 9: Costs in Cultivating Paddy Using Wastewater

(Rs per acre)

Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Input – materials	8,600 (27.75)	10,250 (27.62)	12,300 (28.08)	10,383 (27.83)
Labour	22,400 (72.25)	26,850 (72.38)	31,500 (71.92)	26,916 (72.17)
Total Cost	31,000	37,100	43,800	37,300

Source: Survey Data

Note: Figures in brackets are per cent to total cost

The amount spent by farmers in paddy cultivation under freshwater irrigation is presented in Table 10, which illustrates per acre expenditure on materials and labour. All farmers taken together incurred an expenditure of Rs. 32233 per acre of which nearly 60 per cent was on labour, while the remaining amount was on materials required for paddy cultivation. Across categories, small farmers spent relatively higher share on labour while large farmers spent on inputs.

Table 10: Costs in Freshwater-based Paddy Cultivation

(Rs per acre)

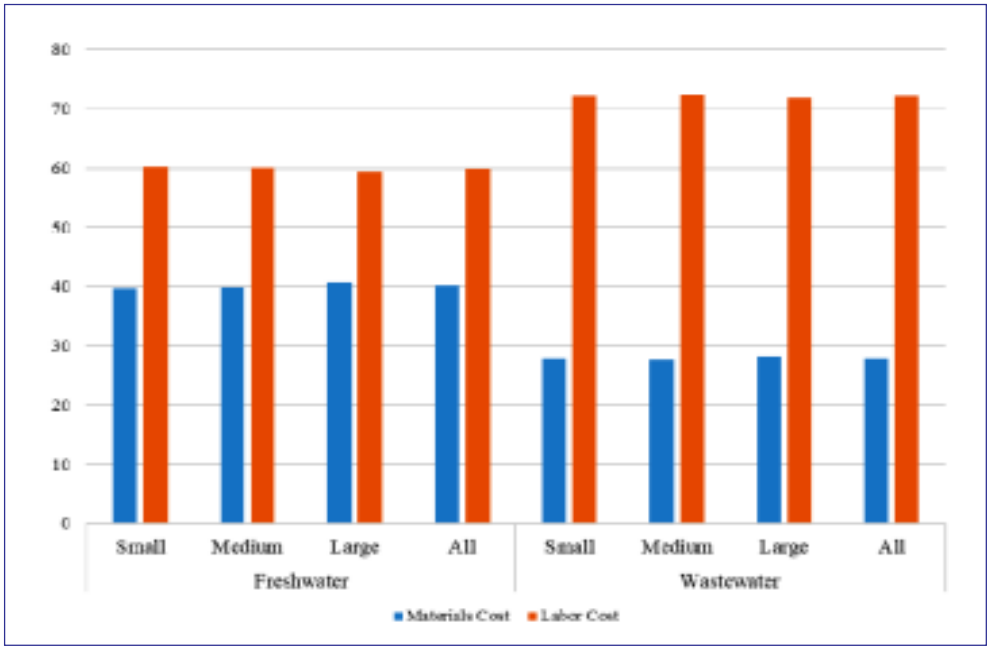
Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Inputs - materials	11450	13050	14300	12933
	(39.69)	(39.91)	(40.68)	(40.12)
Labour	17400	19650	20850	19300
	(60.31)	(60.09)	(59.32)	(59.88)
Total Cost	28850	32700	35150	32233

Source: Survey Data

Note: Figures in brackets are per cent to total

Comparison of materials and labour cost per acre for paddy between wastewater and freshwater cultivation is presented in Figure 3. Share of labour cost was more in wastewater irrigated paddy cultivation (72 per cent of total cost per acre) while it was nearly 60 per cent in freshwater paddy cultivation. Similarly, expenditure on inputs was more in freshwater, over 40 per cent and in wastewater paddy cultivation nearly 29 per cent of average cost. This scenario indicated that farmers spend more for inputs in case of freshwater cultivation, while simultaneously labour requirement was more in wastewater cultivation.

Figure 3: Comparison of Cost of between Wastewater and Freshwater Cultivation of Paddy (in per sent)



Inputs and activities in paddy cultivation under wastewater irrigation are shown in Table 11. Considering all farmers as a whole, higher share of expenditure was on land preparation, about 36 per cent, followed by pesticides, 26 per cent of materials cost per acre, for paddy cultivation. Similar amount of expenditure was also incurred across groups of farmers in terms of amount spent on different inputs. With regard to labour cost taking all farmers as a whole higher share of expenditure was on harvesting (26 per cent) followed by cleaning (about 17 per cent) while sowing and weeding took about 15 per cent in wastewater-based paddy cultivation. Among groups of farmers also the same trend of labour expenditure had been observed in the study area.

Table 11: Costs Involved in Paddy Cultivation under Wastewater Irrigation

(Rs per acre)

Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Materials				
Paddy seeds	1250 (14.53)	1400 (13.66)	1700 (13.82)	1450 (13.97)

Preparation of land	3,250 (37.79)	3,800 (37.07)	4,300 (34.96)	3,783 (36.43)
Chemical Fertilizers	1800 (20.93)	2300 (22.44)	3100 (25.20)	2400 (23.11)
Pesticides	2300 (26.74)	2750 (26.83)	3200 (26.02)	2750 (26.49)
Total	8600 (100.00)	10250 (100.00)	12300 (100.00)	10383 (100.00)
Labour				
Tilling	1800 (8.04)	3000 (11.17)	1800 (5.71)	2200 (8.17)
Planting paddy	3500 (15.63)	4200 (15.64)	4900 (15.56)	4200 (15.60)
Applying Manure	1350 (6.03)	1800 (6.70)	2250 (7.14)	1800 (6.69)
Removing weed	3600 (16.07)	4200 (15.64)	4500 (14.29)	4100 (15.23)
Irrigating	2450 (10.94)	2450 (9.12)	3850 (12.22)	2916 (10.83)
Harvest	6500 (29.02)	6000 (22.35)	9000 (28.57)	7166 (26.62)
Threshing	3200 (14.29)	5200 (19.37)	5200 (16.51)	4533 (16.84)
Total Labour	22400 (100.00)	26850 (100.00)	31500 (100.00)	26916 (100.00)

Source: Survey Data

Note: Figures in brackets are per cent to total

Details of amount spent by farmers for paddy cultivation under freshwater irrigation has been shown in Table 12, which show that among material cost higher expenditure was on fertilizer application followed by land

preparation taking all farmers as a whole. The share of expenditure on fertilizer was over 29 per cent and for land preparation 27 per cent, indicating farmers spend more for fertilizer application in freshwater farming. Among several inputs higher share of amount was spent on seeds, land preparation, fertilizer and pesticides application by large farmers, while small farmers incurred more on farmyard manure. This indicated that large farmers spend more on external inputs like fertilizer, while small farmers on domestic inputs like farmyard manure. In case of expenditure on labour under freshwater irrigation all farmers taken together spent more on harvesting (23 per cent of labour cost) followed by cleaning (18 per cent), sowing (15 per cent) and weeding and irrigation (around 14 per cent). Across categories almost similar trend was observed for all categories with respect to expenditure on labour for paddy cultivation under wastewater irrigation.

Table 12: Cultivation Costs Involved in Freshwater-based Paddy

(Rs per acre)

Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Materials				
Paddy seeds	1,000 (8.73)	1,200 (9.19)	1,500 (10.48)	1,233 (9.53)
Land preparation	3,000 (26.20)	3,600 (27.58)	4,000 (27.97)	3,533 2(7.31)
Farmyard manure	2,500 (21.83)	2,150 (16.47)	2,000 (13.98)	2,216 (17.13)
Chemical fertilizers	3,150 (27.51)	3,900 (29.88)	4,300 (30.06)	3,783 (29.25)
Pesticides	1,800 (15.72)	2,200 (16.85)	2,500 (17.48)	2,166 (16.74)
Total	11,450 (100.00)	13,050 (100.00)	14,300 (100.00	12,933 (100.00)

		Labour		
Tilling	1,500 (8.62)	1,500 (7.63)	1,500 (7.19)	1,500 (7.77)
Paddy planting	2,400 (13.79)	3,000 (15.26)	3,600 (17.26)	3,000 (15.54)
Applying manure	1,200 (6.89)	1,600 (8.14)	2,000 (9.59)	1,600 (8.29)
Removing weed	2,500 (14.36)	2,750 (13.99)	2,250 (10.79)	2,500 (12.95)
Irrigating	3,000 (17.24)	2,400 (12.21)	2,700 (12.94)	2,700 (13.98)
Harvest	4,000 (22.98)	4,800 (24.42)	4,800 (23.02)	4,533 (23.48)
Threshing	2,800 (16.09)	3,600 (18.32)	4,000 (19.18)	3,466 (17.95)
Total Labour	17,400 (100.00)	19,650 100.00)	20,850 (100.00)	19,300 (100.00)

Source: Survey Data

Note: Figures in brackets are per cent to total

Expenditure on inputs and labour incurred by farmers for cultivating ragi under wastewater and freshwater irrigation is illustrated below, where Table 13 presents information related to ragi grown using wastewater. Taking all farmers together nearly 78 per cent of total cost per acre was on labour. Across categories, small farmers reported to incur more expenditure on labour (nearly 80 per cent) while large farmers on inputs (over 23 per cent). It showed that large farmers apply more of external inputs while small farmers attempt to cultivate through available labour.

Table 13: Costs and Returns of Ragi Cultivation

(Rs per acre)

Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Inputs (materials)	4,660	6,320	7,450	6,143
	(20.12)	(22.52)	(23.32)	(22.16)
Labour	18,500	21,750	24,500	21,583
	(79.88)	(77.48)	(76.68)	(77.84)
Total Cost	23,160	28,070	31,950	27,726

Source: Survey Data

Note: Figures in brackets are per cent to total

In freshwater ragi cultivation, labour took major share of expenditure (Table 14), over 67 per cent of total cost per acre, considering all farmers as a whole, while for inputs it was 33 per cent. Materials applied for ragi cultivation under freshwater showed higher share for large farmers (over 33 per cent) while it was high (over 68 per cent) for labour in small farmers' case. It can be observed that share of expenditure on materials increased with increase in size of holding while on labour decreased with size of holding, indicating large farmers depend more on inputs while small farmers on labour for cultivation.

Table 14: Costs and Returns Ragi Cultivation Using Freshwater

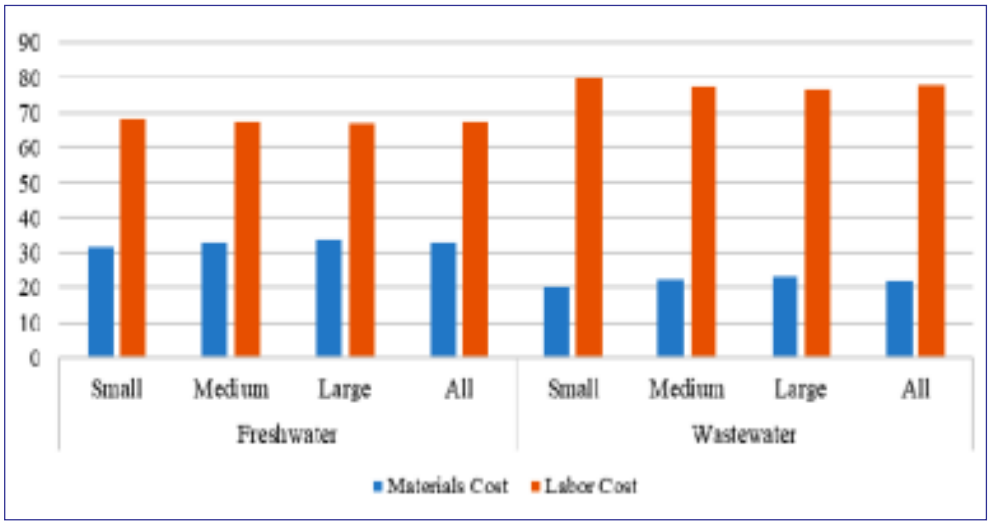
(Rupees per acre)

Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Inputs (materials)	7,150	8,560	9,920	8,543
	(31.71)	(32.60)	(33.38)	(32.64)
Labour	15,400	17,700	19,800	17,633
	(68.29)	(67.40)	(66.62)	(67.36)
Total Cost	22,550	26,260	29,720	26,176

Source: Survey Data

A comparative picture of inputs and labour cost of ragi cultivation in wastewater and freshwater irrigation, presented in Figure 4 clearly show that labour cost was high in ragi cultivated using wastewater as compared to that in freshwater. Meanwhile, expenditure incurred on inputs was more in freshwater versus wastewater based ragi cultivation. Further, across all categories of farmers share of labour cost was high under wastewater cultivation and similarly share of material cost was more for all categories in freshwater cultivation. This indicates that farmers do not apply more of external inputs for ragi cultivation in wastewater irrigation while it is more in freshwater case. A similar pattern was also observed in case of paddy cultivation.

Figure 4: Comparison of Cost of Ragi in Wastewater and Freshwater Irrigation (in per cent)



Expenditure incurred on different items of materials and labour for cultivating ragi using wastewater (Table 15) depicts that taking all farmers as a whole, over 66 per cent of material cost was on land preparation followed by nearly 27 per cent on fertilizer application. Farmers did not apply either farmyard manure or pesticide for ragi cultivation. Across categories, small, medium and large farmers spent around 66 per cent of material cost on land preparation, while in case of fertilizer application large farmers incurred relatively higher share. In case of labour harvesting, followed by cleaning activities reported higher per cent as compared to other labour related activities. This trend of labour cost was almost similar across categories of farmers.

Table 15: Costs Involved in Ragi Cultivation in Wastewater

(Rs per acre)

Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Materials				
Ragi seeds	360 (7.73)	420 (6.65)	450 (6.04)	410 (6.67)
Land preparation	3,100 (66.52)	4,250 (67.25)	4,900 (65.77)	4,083 (66.47)
Chemical fertilizers	1,200 (25.75)	1,650 (26.11)	2,100 (28.19)	1,650 (26.86)
Pesticides	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total materials	4,660 (100.00)	6,320 (100.00)	7,450 (100.00)	6,143 (100.00)
Labour				
Tilling	1,800 (9.73)	2,400 (11.03)	3,000 (12.24)	2,400 (11.12)
Ragi sowing	1,800 (9.73)	1,800 (8.28)	2,400 (9.80)	2,000 (9.27)
Applying manure	900 (4.86)	1,350 (6.21)	1,350 (5.51)	1,200 (5.56)
Removing weed	2,500 (13.51)	2,750 (12.64)	2,750 (11.22)	2,667 (12.36)
Irrigating	2,100 (11.35)	2,800 (12.87)	3,500 (14.29)	2,800 (12.97)
Harvest	5,400 (29.19)	5,850 (26.90)	6,300 (25.71)	5,850 (27.10)
Threshing	4,000 (21.62)	4,800 (22.07)	5,200 (21.22)	4,667 (21.62)
Total labour	18,500 (100.00)	21,750 (100.00)	24,500 (100.00)	21,583 (100.00)

Source: Survey Data

Note: Figures in brackets are percentages

Item-wise expenditure for ragi cultivation using freshwater irrigation has been presented in Table 16. In case of material cost land preparation activity had major share (42 per cent) of expenditure followed by fertilizer (30 per cent). Across categories of farmers, large farmers incurred higher per cent of material cost on land preparation and fertilizer as compared to other two groups, and the amount spent on farmyard manure was more by small farmers showing their dependence on domestically available inputs for ragi cultivation. Distribution of labour costs across different activities showed that harvesting and cleaning of ragi reported higher share of expenditure taking all farmers together and across all groups of farmers.

Table 16: Costs Involved in Ragi Cultivation with Freshwater

(Rs per acre)

Expenditure heads	Farmers' group			
	Small	Medium	Large	All Farmers
Materials				
Ragi seeds	300 (4.20)	360 (4.21)	420 (4.23)	360 (4.21)
Land preparation	2,600 (36.36)	3,800 (44.39)	4,500 (45.36)	3,633 (42.53)
Farm yard manure	2,300 (32.17)	1,800 (21.03)	1,700 (17.14)	1,933 (22.63)
Chemical fertilizers	1,950 (27.27)	2,600 (30.37)	3,300 (33.27)	2,616 (30.62)
Pesticides	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total materials	7,150 (100.00)	8,560 (100.00)	9,920 (100.00)	8,543 (100.00)
Labour				
Tilling	1,500 (9.74)	2,000 (11.30)	2,500 (12.63)	2,000 (11.34)
Ragi sowing	1,500 (9.74)	1,500 (8.47)	2,000 (10.10)	1,667 (9.45)

Applying manure	1,600 (10.39)	1,600 (9.04)	2,400 (12.12)	1,867 (10.59)
Removing weed	1,600 (10.39)	2,000 (11.30)	2,000 (10.10)	1,867 (10.59)
Irrigating	1,200 (7.79)	1,800 (10.17)	2,100 (10.61)	1,700 (9.64)
Harvest	4,000 (25.97)	4,400 (24.86)	4,400 (22.22)	4,267 (24.20)
Threshing	4,000 (25.97)	4,400 (24.86)	4,400 (22.22)	4,267 (24.20)
Total labour	15,400 (100.00)	17,700 (100.00)	19,800 (100.00)	17,633 (100.00)

Source: Survey Data

Note: Figures in brackets are per cent to total

4.3. Analysis of Total Costs and Returns Involved in Wastewater- and Freshwater- Irrigation-based Food Crops

Information presented in Table 17 illustrates that on an average farmers spent over Rs. 37300 per acre, including imputed cost, for cultivating paddy under wastewater agriculture, and the cost varied positively with size of holding. Total returns in paddy cultivation (paddy and fodder together) under wastewater reported was Rs. 59166 per acre for all farmers, and the total returns varied inversely with size of holding. Net returns after total cost (including imputed cost) was over Rs. 21866 per acre and the net return was high for small farmers for paddy cultivation under wastewater irrigation. However, the return-cost ratio was 0.59 indicating non-profitability of paddy taking all farmers as a whole. The return-cost ratio across categories of farmers shows a higher ratio for small farmers (1.02), depicting marginally higher net returns, but for other two categories paddy cultivation under wastewater irrigation was not profitable. Freshwater based paddy cultivation involved total cost of Rs. 32233 per acre and here also the cost moved positively with size of holding. The total returns for paddy using freshwater were over Rs. 67500 per acre taking all farmers as

a whole and across categories of farmers, total return of paddy declined with farm size showing higher returns for small farmers. The net return after deducting total cost (with imputed cost) reported Rs. 35267 taking all farmers together for paddy cultivation under freshwater and small farmers reported to have received higher net returns as compared to other two groups. The return-cost ratio in paddy cultivation under freshwater irrigation was 1.09 taking all farmers, illustrating a marginal profitability when all farmers considered together. The return-cost ratio indicate non-viability of paddy for large farmers. For small farmers, the return-cost ratio was 1.60, which reveals paddy cultivation under freshwater irrigation is more profitable for small farmers. Return-cost ratio between two types of irrigation exhibited that paddy cultivation was more profitable to farmers under freshwater irrigation. Further, the ratio is more for freshwater based paddy cultivation .

Table 17: Costs and Returns of Paddy Cultivation

(Rs per acre)

Costs and returns	Farmers' group							
	Freshwater				Wastewater			
	Small	Medium	Large	All	Small	Medium	Large	All
Cost (Total including imputed cost)	28,850	32,700	35,150	32,233	31,000	37,100	43,800	37,300
Cost (Total excluding imputed cost)	17,700	25,950	28,350	24,000	17,000	27,550	39,600	28,050
Total Returns	75,000	65,000	62,500	67,500	62,500	57,500	57,500	59,166
Net Returns (including imputed cost)	46,150	32,300	27,350	35,267	31,500	20,400	13,700	21,866
Net Returns (excluding imputed cost)	57,300	39,050	34,150	43,500	45,500	29,950	17,900	31,116
Return-cost ratio (including imputed cost)	1.60	0.99	0.78	1.09	1.02	0.55	0.31	0.59

Source: Survey Data

Total costs and returns of ragi cultivation under both wastewater and freshwater irrigation systems are presented in Table 18. The total cost of ragi under wastewater was Rs. 27726 per acre taking all farmers, and across categories of farmers, total cost increased with increase in size of holding where large farmers spent higher amount compared to other two categories of farmers. The cost and returns of ragi cultivation under freshwater involved respectively over Rs. 26176 and Rs. 66450 per acre taking all farmers. Across categories of farmers, cost varied positively with increase in farm holding, while total returns moved inversely with size of holding. Farmers received a return of Rs. 40274 per acre after deducting total cost taking all farmers under freshwater irrigated ragi, and net returns decreased with increase in land holding. Return-cost ratio illustrated that ragi cultivation under freshwater irrigation was more remunerative than that under wastewater irrigated one, as it is 1.54 in the former and 1.06 in the later. Even across groups of farmers also the ratio was more in freshwater ragi as compared to that in wastewater used ragi cultivation. However, it was noticed that in both forms of irrigation ragi cultivation was more profitable for small farmers, showing small farmers as more efficient in growing ragi in the study area.

Table 18: Costs and Returns of Ragi Cultivation

(Rs per acre)

Costs and returns	Farmers' group							
	Freshwater				Wastewater			
	Small	Medium	Large	All	Small	Medium	Large	All
Cost (Total including imputed cost)	22,550	26,260	29,720	26,176	23,160	28,070	31,950	27,726
Cost (Total excluding imputed cost)	12,050	19,560	24,820	18,809	10,910	21,570	27,400	19,959
Total Returns	71,700	65,400	62,250	66,450	62,250	55,950	52,800	57,000
Net Returns (including imputed cost)	49,150	39,140	32,530	40,274	39,090	27,880	20,850	29,274

Net Returns (excluding imputed cost)	59,650	45,840	37,430	47,640	51,340	34,380	25,400	37,041
Return-cost ratio (including imputed cost)	2.18	1.49	1.09	1.54	1.69	0.99	0.65	1.06

Source: Survey Data

Section V

Conclusion

A comparative analysis of food crops revealed that yield of paddy and ragi was high in freshwater than in wastewater cultivation. Costs and returns analysis showed higher expenditure for wastewater agriculture, compared to freshwater. Among different costs, expenditure on labour was more than that of materials in both forms of irrigation systems. The study illustrated that expenditure on external inputs was high for freshwater agriculture, while expenditure was more on labour for wastewater agriculture. Returns analysis showed that both paddy and ragi have higher returns in freshwater cultivation than wastewater agriculture. The return – to-cost ratio for paddy was 0.59 and 1.09, respectively, in wastewater- and freshwater- based irrigation, indicating higher profitability from paddy cultivated using freshwater. In ragi cultivation, the return -to cost ratio was 1.54 in freshwater and 1.06 in wastewater-based agriculture. It was observed that ragi cultivation using wastewater is more remunerative than paddy cultivation. This study illustrated that freshwater cultivation is more profitable to farmers as compared to wastewater agriculture. But scarcity of freshwater has compelled farmers in peri-urban areas to use easily available urban wastewater for irrigation and income.

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Research Note/Commentary

Pluralism: Stepping Stone for Economics Discipline

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Gobinda Padhan
Dasarathi Padhan

Whether you can observe a thing or not depends on the theory which you use. It is the theory which decides what can be observed. – ***Albert Einstein***

Abstract

In this short note, we discuss the importance of pluralism in the economics discipline. The economics curriculum of the state of Odisha has been scrutinized. We find that the economics syllabus of the state is not pluralistic enough. We should strive to make our economics education more plural and diverse.

Keywords: Pluralism, Economics teaching, Economics curriculum, Odisha

Introduction

The global financial crisis in 2007-08 was the largest economic predicament after the great depression of the 1930s. This unforeseen turbulence in the global economy raised questions on the management of the economy by experts and our understanding of the economy (Chang, 2010). It also

Gobinda Padhan, Lecturer in Economics, M. Rampur College, M. Rampur, Kalahandi.
Email: gpadhan024@gmail.com
Dasarathi Padhan, Ph.D. Scholar, School of Humanities and Social Sciences,
National Institute of Science Education and Research, Bhubaneswar, Odisha.
Email: dasarathi.padhan@niser.ac.in

sparked a revolution in economics education and training. The economics profession was questioned. Queen Elizabeth II, hinting at economists, on her visit to the London School of Economics in 2008 asked 'Why did nobody see it coming?'(Orrell, 2017). This question was regarding the crisis and economics profession. It was felt that there was a serious problem in the ongoing economics learning and teaching processes prevalent across universities. Birks and Chatterjee (2015) have discussed how the relevance of the economics discipline has been questioned because it failed to anticipate a crisis of this magnitude. This could be attributed to the narrowness of the discipline or as some would believe it to be a problem in pedagogy per se as we are not taught multiple ways of understanding the economy.

Since 2007, there has been a growing demand for change in the way economics is being taught. The rise of various organizations and study groups like the Institute for New Economic Thinking, Rethinking Economics, etc., is a testimony to that. These organizations are dedicated to bring changes to the economics curriculum and to make the economics discipline democratic. There have been also movements by students and teachers particularly in European countries to modify the economics syllabus. The urge to bring changes in the curriculum is, as De and Thomas (2018: 21) argue, due to "dissatisfaction amongst teachers and students with the orthodox and instrumental nature of economics education". What kind of changes? The change to make the discipline more pluralistic as the current discourse of economics is dominated by the neoclassical approach. The change to be open to alternative thoughts in economics and curtailing the monopoly of a particular thought. This demand for change is not a post-2008 phenomenon. It was there before as well. However, after 2008 it became loud and clear. In this commentary, we discuss how economics would be benefited by adopting a pluralistic approach. It does not suggest, in any way, removing the dominant neoclassical perspective from the study of economics.

Neoclassical Economics: A Dominant Force

Neoclassical economics is characterized by three core features as discussed in Earle et al. (2017), namely, Individualism, Optimisation, and Equilibrium. First, the unit of analysis in neoclassical theory is individual. And the

individual is a 'homo economicus' or 'economic man'[1] who makes economic decisions to fulfil self-interest. The economy is just a collection of individuals sans social relations. Individual decisions are used to understand the economy. Second, one of the most important tenets of the neoclassical approach is that the individual economic agents always try to optimize. Third, to maintain balance economic agents try to make a decision to reach equilibrium, a situation where no individual economic agent tries changing the decision. Omkarnath (2012: 266) observes "Neoclassical economics is a generalized demand-supply approach to all economic theory".

Neoclassical economics is called orthodox economics and is regarded as mainstream economics. Presently, while it is a dominant perspective or approach within the discipline of economics (Omkarnath, 2012; Earle et al., 2017), it, by no account, is the only approach in economics. Nevertheless, the sheer presence of neoclassical approach in economics curriculum across universities and the absence of other perspectives have given rise to a notion as if it is the *only* approach to understand the economy. De and Thomas (2018) argue that most of the foundation courses in economics like microeconomics and macroeconomics at the undergraduate level follow the neoclassical perspective of economics.

The foundation of neoclassical economics, as opposed to classical political economy, was laid by William Stanley Jevons, Karl Menger, and Leon Walras (Bharadwaj, 1994). Later on, it was strengthened by inputs from Alfred Marshall. Marshall's seminal work *Principles of Economics* became the first textbook of modern economics. In the nineteenth century, economics was known as political economy. It was Jevons who started using the term 'economics' to replace political economy (Earle et al., 2017). The discipline of economics underwent a paradigm shift during the late nineteenth century. With the methodological shift from studying the economy from a

[1]Sorry to use the term 'man', as is found usually in the economics literature. It is not gender-neutral but used in a generic sense, which we must avoid. Feminist economists, keeping in mind the over representation of man in the economics profession and man-centric theory, ask if individual other than man can ever be economic. In a patriarchal society, being rational is construed a trait of male person and being emotional a female characteristic.

social class perspective to understanding the economy from an individual as a unit of analysis (Bharadwaj, 1994), methodological individualism became pervasive.

Alternative Approaches

We need to acknowledge that there is no only way of organizing the economy. The economy can be organized in many ways. The nature of economies across the globe is not the same; characteristics of economies may vary from country to country. Even within a country the socio-economic problems may differ from region to region. One particular theory may not be sufficient to explain the economy. But mainstream economics claims itself to be universal and scientific, independent of ideology, history, culture, and institutions (Zaman, 2019). This sets a major problem in mainstream economics. Economics is value-laden and political (Stilwell,2016), not free from ideology and ethics (Omkarnath, 2012), and certainly not ahistorical (Roncaglia, 2005). Economy constitutes 'a set of institutions' that influences the economic processes of production, exchange, distribution, and accumulation (Omkarnath, 2012). To understand these institutions properly and their impacts on the economy we need plurality in economics. Pluralism in the discipline will help students to realize that there are multiple ways of thinking about the economy (Earle et al., 2017).

Hence, along with neoclassical traditions students of economics, during the foundation years of higher education, should be introduced to theories from different perspectives. Schools of thought like classical political economy, Marxian economics, Keynesian economics, institutional economics, etc. should be given due importance and space in the curriculum. The first step towards making the curriculum pluralistic is to reintroduce the teaching of history of economics and the history of economic thoughts as core papers in universities and colleges. This would help students to get to know the progress and the discourse of economics as a discipline. Simultaneously, it would make the students familiar with the existence of different perspectives in economics. Sinha and Thomas (2019: 1) argue that "over the last four decades or so, the teaching of the history of economics has been slowly purged from the curricula of economics at both the graduate and the undergraduate levels". This trend of removing history from economics teaching is neither good for the discipline and nor for the students.

Studying the history of economic thoughts is very much important (Roncaglia, 2005; Blaug, 1985; Hodgson, 2001).

Case of Economics Curriculum in Odisha

Undergraduate programmes are the primary apparatus of higher education or any professional learning. In Indian undergraduate programmes, students are supposed to choose a subject as honours, where they have the scope for learning the subject closely. The syllabus of the programme provides a bird's eye view of the papers and concepts which are expected to be learned in the undergraduate programme. The syllabus is ought to be structured according to the current demand of the students aiming at the scope for acquiring higher education, getting a job, and, importantly, to have an understanding of a just, sustainable, and egalitarian society. This section tries to understand some of the key concerns of the undergraduate economics syllabus (*State Model Syllabus for Under Graduate Courses in Economics*, state model syllabus, hereafter) in Odisha.

Structural Constraints

Recently, the autonomy of having own curriculum for colleges and universities has been withdrawal in India through the implementation of the University Grants Commission's (UGC) Choice Based Credit System (CBCS). The implementation of the state model syllabus for all the state universities in Odisha has further undermined their autonomy to develop and pursue their own syllabus, which they had earlier according to the need and requirement of the particular university. The teaching of any organized thought requires a prerequisite to have an understanding of the intellectual terrain of the students (Chakraborty, 1986). The present state model syllabus desires to catch up with the syllabus of elite institutes of economics in India. This obsession for catching up requires a particular level of quality of education and socio-economic opportunities before joining the undergraduate programme. The dearth of teaching faculty in the state multiplies the problem. Libraries of most of the colleges including those government and non-government aided do not have textbooks prescribed in the syllabus. The state government providing the scope for faculty development programme is a good sign for the quality improvement of the teaching fraternity. The syllabus formation committee should be an inclusive

one. Of course, the presence of external experts has a greater value addition and along with that teachers from colleges must be included to have a better understanding of the ground reality (De and Thomas, 2018).

Curricular Concerns

The foundational courses of the state model syllabus start with microeconomics, macroeconomics, mathematical economics, and statistics akin to other universities in India. The content of the papers mostly incorporates neoclassical or marginalist ideas. The whole assemblage of the neoclassical idea is based on the logic of representative economic agents. In a socio-culturally diverse country like India, the assumption of a representative agent seems impractical because there is inequality in opportunity and privilege across caste, gender, and religious groups. Individuals are not homogeneous in India.

We believe that the syllabus should be pluralistic incorporating different schools of thought. The presence of a pluralistic school of thought in the curriculum makes students aware of different debates and questions and no single theory can fully explain any socio-economic phenomenon. The neoclassical approach is a historical. It ignores the historical processes and the social transformation which the society has undergone in the past. Knowledge in economics does not progress in a linear manner (De and Thomas, 2018). In this context, no 'model' fully supersedes the other models. Thus, classical economics is not a primitive version of present-day neoclassical economics (Chakraborty, 2018). It is not that liberalization and privatization are the only successful economic processes; students need to understand the success story of cooperatives and the need for government intervention (Shah, 2016).

Quantitative components are an integral part of economics. But the use of excessive mathematics and an obsession with proficiency in English at the undergraduate level make it exclusionary. We know that getting an education in the English medium is a matter of privilege in India (Biswas, 2022). We are not trying to argue whether we should read quantitative courses in economics or not; of course, we have to know of that. Our main concern is what aspects and issues we are supposed to study in economics.

The moment we accept the mathematical hegemony and treat economics as a 'science', we are knowingly or unknowingly supporting the claim of people like Alfred N Whiteland who proposed that science that hesitates to forget its founder is lost (Chakraborty, 1986). For a holistic knowledge of economics knowing its evolution and history is important.

The majority of the prescribed textbooks in our syllabus are written by foreign authors with the examples from US or UK. Students find it difficult to understand and relate it with their daily life circumstances. There is an urgent need for the academician to write an economics text book by citing examples and macroeconomic events from India. One of the best examples in this regard is the book *Macroeconomics: An Introduction* by Alex Thomas (2021) where the author considers the structural heterogeneity of the Indian economy in great detail.

During our undergraduate programme, we were thinking that concepts like caste and gender was the subject matter of disciplines like sociology and political science and it had nothing to do with economics. Now also if anyone searches for the words such as caste, gender, and tribe in our state model syllabus we will find nothing, neither in core papers nor in the elective ones. Does this silence on the above topics is problematic? When a Dalit student comes from an interior rural area to study in an urban-based college for the undergraduate programme, she/he faces many difficulties to find a rented house, even if rooms are vacant and her/his willingness to pay the rent just because of the caste identity associated with her/his surname. When a teacher of economics teaches the concept of representative economic agents and tries to convince the students that there are no restrictions in buying and selling in the market, the students who face social discrimination feel difficult to understand and relate it with the real-life experience. Caste is the biggest social reality of India and without having an analysis on it, it is difficult to have an understanding of social relations, exchange, and production in the county. College campuses and even classrooms are not free from caste discrimination. Dalit and Adivasi students get admission in colleges through affirmative action. Affirmative action (reservation) does not solve the problem of caste discrimination within the college campus. Upper caste students generally perceive reserved category students as meritless and creating inefficiency in the system. The prevalence

of such a peculiar mentality among the students in a classroom perpetuates age-old discrimination and social inequality. Reserved category students face caste-based hostility both within and without the campus (Biswas, 2022). Reservation does not create inefficiency rather it is a mechanism to have a more just and egalitarian society (Deshpande, 2011). Study of caste and other social problems like class, gender and race in economic theories will make the students more sensitive and conscious about society.

Conclusion

It is not the case that the state model syllabus does not provide space for papers like history of economic thought, regional economics, etc. but the problem with the present syllabus is that those courses are elective courses rather than core ones. For instance, the history of economic thought is an optional paper from the last semester. The inclusion of papers like research methodology and a provision of dissertation paper in the end semester is a welcome step. The initiative to improve academic writing skill of the students through a dissertation will be helpful for the students to articulate economic phenomena.

The economics curriculum in the state of Odisha should be modified to make it more pluralistic and representative: plurality in terms of theoretical approaches. The content in economics should be devised in such a way that it would attract students from marginalized sections of society to make the discipline more inclusive. Diversity in economics would enrich the discipline.

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Covid-19 Pandemic and Economic Development: Emerging Public Policy Lessons for Indian Punjab

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Harsandeep Kaur

The book is an attempt to gauge and understand the impact of the coronavirus pandemic on the economic and social structure of the Punjab state. The pandemic has been largely disruptive in terms of economic activity as well as loss of human lives. Almost all the sectors have been adversely affected as domestic demand and exports sharply plummeted with some notable exceptions where high growth was observed. Punjab has emerged as one of the worst affected states in terms of infection and the fatality rate. The decision to impose a 24x7 lockdown led to the loss of livelihood of workers which resulted in the largest migrant crisis since Indian independence. The poorer sections were the worst affected as they failed to access bare minimum necessities of life as their daily earnings were gone.

Even before the pandemic the fragile state had been reeling under a fragile economy marked by agrarian distress, environmental degradation, and unemployment. The pandemic has further deepened the already stressed healthcare system and exposed poor governance. Punjab has been lagging in terms of per capita income and investment deficiencies. The nearly dysfunctional fiscal policy of the state coupled with stressed relations with the central government has failed to provide the roadmap for recovery and growth. In this context, the book with twenty-two chapters suggests policy

Harsandeep Kaur, Assistant Professor, School of Commerce and Management, Khalsa College, Punjabi University, Patiala, Punjab.
Email: harsandeep09@gmail.com

measures to rejuvenate all sectors of the state economy. These chapters are arranged under six sections, namely, agricultural sustainability, industrial sector, services sector, labour and gender issues, migration and diaspora and governance issues.

The first section on the multi-dimensional crisis of agriculture in Punjab highlights depleting natural resources, stagnant yields and falling farm incomes. As a result, both the income and environment in Punjab are undergoing a severe sustainability challenge which has been aptly discussed by Sukhwinder Singh who has suggested policy measures like timely, cost-effective and easy availability of farm machinery. During the pandemic the shortage of labour had led to medium and large farmers opting for increased use of machinery. In another chapter Kamal Vatta and others have studied these effects of lockdown on agricultural trends in detail and suggested that the state government's role in reviving the farm sector during the post-pandemic phase should be to encourage crop diversification to make agriculture environmentally inclusive. Sukhpal Singh has suggested an agricultural market reform map for Punjab to accelerate post-Covid-19 recovery pointing out that the state government can play a crucial role in the promotion of the food processing industry which would provide marketing opportunities to farmers. Strengthening of supply chains and local institutions like village panchayats and farmers' cooperatives are needed not only to revive agriculture but also to boost the rural economy. Examining the dairy industry of Punjab Naresh Singla has advocated a sustainable plan for agriculture that is inclusive of agriculture-related activities such as dairy farming, livestock rearing, etc.

The manufacturing sector of Punjab faces numerous challenges related to infrastructure, energy, regulatory and institutional hurdles. An already fragile state of enterprises in urban Punjab got worsened further due to the Covid-19 pandemic as discussed in the chapter by Varinder Jain. It has been suggested that the state should become an active facilitator and invest in infrastructure to boost industrial activities. State also must enact policy measures to protect the interests of industrial labour. Swati Mehta has investigated local and global value chains and discussed resultant losses from the lockdown. She has suggested continuous learning and knowledge generation as the way forward for the co-evolution of different participants, organisations and institutions for making the industry resilient and competitive.

Mass migration of labourers to their native places during the Covid-19 lockdown was a humanitarian crisis. The human cost of the pandemic has been huge and the worst affected section of the society has been the daily wagers, migrant workers, farm labourers, especially women workforce as explored by Ashapurna Baruah and Indervir Singh. The challenges posed to the most marginalized segment of workers, the Scheduled Castes, have been highlighted by Deepak Kumar. On livelihood issues of farm labourers in Punjab Sukhpal Singh has argued that the capitalist mode of Punjab agriculture has led to a drastic decrease of job opportunities for agricultural workers who have been migrating to urban areas exerting pressure at the destination. All the authors have argued that the prevailing state policy regarding labour has been ineffective and insufficient to support them in times of adversity. They have advised the state to come up with an ingenious policy for better placement and support of labour. Rural industrialisation can be the answer to the rural labour crisis as the local industry will ease the burden on urban areas and women and marginalised workers will get a chance to work and lead a dignified life.

The next section of the book brings together the literature and data on some serious issues faced during the Covid-19 pandemic including the healthcare system and education. The entire services sector suffered huge losses and the tourism and hospitality industry was severely affected. What shocked the entire state was the total disintegration of healthcare services, especially in rural areas. Even though the public health infrastructure and capabilities were not unknown before the pandemic, the devastating domino effect that the pandemic has caused led to some serious introspection by experts. Varinder Sharma has provided a detailed comparative framework of the situation of healthcare services in Punjab. The future course correction in terms of investment, rural healthcare development, availability of adequate health workers, experts and equipment is a necessity and cannot be ignored. Kamlesh Narwana and Angrej Singh Gill examine the crumbling education sector of Punjab. They have argued that the social inequalities as a result of the neoliberal reforms have led to an increased burden of private education. They have made a case for the state to devise policy measures to regulate these schools with inclusive policy strategies and guiding principles and at the same time make some serious investment in government educational institutes. Manjit

Sharma and Pushpak Sharma have endorsed that the state must abandon neoliberal policies and intensify public investment with demand-driven aims for the reconstruction of the service sector.

The light at the end of the tunnel may still be far but what came out as a positive dimension during lockdown was the selfless service of the community. The next section of the volume contains contributions by Baldev Singh Shergill, Lakhwinder Singh and Shinder Thandi who have investigated the role of the state and the role played by the non-state actors, viz., socio-religious institutions, social organizations, individuals and society at large. Even though inadequate, the efforts of social and voluntary organisations in providing food, shelter, drinking water, health and education facilities were appreciable. The ugly truth of lack of government preparedness for the pandemic and disaster mismanagement was revealed. Indian diaspora used the opportunity offered by the lockdown to perform community service and help those in need. This led to positive perceptions about the Sikhs especially where the community has faced problems of mistaken identity.

The three sectors of the economy and the state's overall financial health have been deteriorating during the past decades. Sucha Singh Gill has examined the self-destructive governance model of Punjab which has encouraged successive state governments to withdraw from their responsibilities. In the process, the space has been taken up by private players. He points out that the capacity and capability of the state further have been undermined due to the gaps in the governance structure, revenue losses due to lockdown and other illegal economic activities. Adding fuel to the fire is the diminishing mutuality between the centre and states, which, in the case of Punjab has been compounded; the revenue of the state from its resources has not been growing. This is discussed by Pritam Singh. The volume suggests sector-specific as well as overall development policy suggestions. The first and foremost step that the state can take is to reform its fiscal policy and increase revenue generation, which can be utilised for investing in public health, education, industry, and agricultural reforms.

The message in the book is loud and clear: the weakest link is the dysfunctional fiscal policy of the state which has weakened public policy measures. This has not only distorted the economy and polity but has

destroyed public morale and shredded the social fabric. The crumbling of the health and education systems during the pandemic should have set alarm bells ringing in the government corridors. Sukhpal Singh, Lakhwinder Singh and Kamal Vatta in the concluding chapter have brought together various policy perspectives and suggestions on major sectors of the state economy. As suggested by the scholars in the book, the way forward is to design an inclusive agriculture policy that promotes agro-industry, rural job creation and diversified crop production patterns. There is also a need to invest in robust infrastructure and supply chains that will become the backbone of the industry. Concerning public health, education, and social security, the state has a huge task before it to win back the lost trust and provide standard facilities to all sections of the society.

The book echoes the fact that there is a crisis of poor governance and revenue generation in Punjab. The governance structure in the state is now dominated by three parties, namely, Indian National Congress, Shrimoni Akali Dal and Aam Adami Party and similar agenda and promises are pronounced by all the three. This book is indispensable for political parties and government agencies to understand the current situation of the Punjab economy and actively consider solutions laid forward by distinguished intellectuals.

1232km: The Long Journey Home

by Vinod Kapri,
HarperCollins Publishers India,
2021,pp.195. Paperback

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OEA

Annavajhula J. C. Bose

The machines ground to a halt in the cities
Only their hands and feet moved
Their lives they had planted back in the villages
Here, they have only brought their bodies and plugged them in!
They pulled out the plugs
'Come, let's go home' – and they set off
They will go to die there – where there is life.

The famous Gulzar of the Hindi film industry had penned a hauntingly moving tribute on the above lines—in Hindi and Urdu—to the migrant labourers—our lifelines indeed—and the horror they went through during the first lockdown in India amid the coronavirus outbreak. Both *Scroll.in* and *The Wire* have boldly and vividly documented how India has failed the lockdown-migrant workers in both the 2020 and 2021 crises—i.e. the first and second corona waves.

The book taken up for review here—with a perfectly powerful foreword by N. Ram and prologue by the author—is arguably the most valuable and innovative addition to the literature on pandemic-lockdown-migrants, which is a new add-on to the already existing labour-research-based literature in general on the migrant workers as the most exploited and ill-treated people in legal as also illegal firms in the country. The author, Vinod Kapri, is famous and exemplary for his sensitive and empathetic contributions in the fields of filmmaking and journalism.

Annavajhula J.C. Bose, Professor, Department of Economics, Shri Ram College of Commerce, Delhi. Email: ajc.bose@srcc.du.ac.in

This is anon-fiction novel I could not put down without rapidly reading from A to Z at one go. It is a real-life tale of seven young and intrepid migrant workers courageously bicycling their way, over seven days and seven nights, from Ghaziabad to Saharsa district in Bihar in the face of all manner of difficulties, deprivations, and dangers to life and health. The book originated as an add-on to a full-length documentary produced for Disney+Hotstar on the basis of marvellous ethnographic work of the author and his illustrious colleague as witnesses as also participant-observers without which we could not have obtained the total truth of the migrant-crisis so as to smash the wagonloads of propaganda of the central and state governments on how well they were able to handle the socio-economic crisis brought on by the pandemic-lockdown.

The author's self-realization out of these contributions ought to be the understanding to be internalized by the apathetic middle and upper classes and castes in this country. He conveys this, thus (p.180): "Whenever I look back, I can say with conviction that those were some of the most precious moments of my life. When we were returning from Saharsa to Noida, I kept thinking about the seven-day journey that had brought about a sea change in my life and attitudes. Not only these seven labourers, but all the labourers in the world were no more nameless, faceless humans for me. Those seven days offered me the chance to know their names. Those seven days taught me that they were simple, hardworking and honest people, who desperately wanted to be considered as equal in the eyes of others. A human being with a heart that beats, despite facing challenges that we can't even begin to imagine; a heart that gets bogged down by the daily grind, but picks itself up, smiles and laughs, and gets on with the business of life."

The book is a window to understanding the Indian system and Indians in the face of a widespread calamity in terms of (a) the utter failure of the central and state governments to provide even an elementary safety net; (b) the atrocities of the police in conjunction with the all-pervasive slumbering and callous system; (c) the failure of the mainstream news media to capture and project the gravity and enormity of the crisis; (d) the meaninglessness to the 40 million internal migrants in India, of the core values of the Indian republic as set out in the Preamble to the Constitution of India—justice, liberty, equality and fraternity; (e) what the lives of millions of labourers might be like, with hunger, poverty and unemployment as the

biggest and persistent pandemic in India; (f) how Godly help comes nevertheless sometimes from good samaritans from unexpected quarters; (g) the collapse of human values with even the poor trying to rob and ill-treat the fellow poor, which is a virus more sinister than Corona; and (h) the Bihari labourers mistreated by their own administration when at last they patriotically and emotionally make it to Bihar as their motherland!

The book, needless to say, is a must reference for anyone seeking to research and understand Indian socio-economic realities with a view to remove the deadly combination of mass deprivation, policy insensitivity and social indifference that has accumulated over decades of unequal and distorted development.

I salute Vinod Kapri and his associates for dedicating this book to the seven migrant workers that they studied, and for shaking the conscience of its readers.

There is one factual error in the book, though. The country with the largest number of labourers (labour force) in the world is China, not India as Kapri says. According to worldatlas.com, China has 806,300,000 labourers and India, 501,800,000.

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Book Chapter

Benito, G., & Gripsrud, G. (1995).The internationalization process approach to the location of foreign direct investment: An empirical analysis.In R. B. McNaughton, &M. B. Green (Eds.), The Location of Foreign Direct Investment: Geographic and Business Approaches (pp. 43-58). Aldershot: Avebury Press.

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Levien, M. (2018). Dispossession without development: Land grabs in neoliberal India. New York: Oxford University Press.

Website

Rao, M. G. (2017).Central transfers to states in India: Rewarding performance while ensuring equity. Report prepared for the NITI Aayog. Retrieved from https://niti.gov.in/writereaddata/files/document_ publication/Final%20Report_25Sept_2017.pdf(Date of last access Month Date Year)

Beck, T. (2015). Microfinance: A critical literature survey. (World Bank Independent Evaluation Group Working Paper No. 4). Retrieved from https://openknowledge.worldbank.org/handle/10986/23546 (Date of last access Month Date Year)

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