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Subnational Export Performance and Determinants: Evidence from Two Indian States

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Abstract: Traditionally, the export performance of the economies were analysed taking individual countries as the locational unit, which were not able to explain the subnational, regional or spatial disparities within the geographically vast countries like India, because huge amount of heterogeneity exist among different states in terms of economic development, infrastructure, skill, knowledge and subnational policies. The analysis of the two selected states, namely Uttar Pradesh and Tamil Nadu indicates that their differential performance in manufacturing exports can be related to their contrasting heterogeneity in terms of above spatial factors. Findings also suggest that firms' exporting in these two states are shaped by a number of firm level parameters such as firm age, firm size, R&D intensity, foreign and business group affiliation, etc.

Key words: Subnational Exports; spatial factors; India

JEL Classification: F10; R10; O53.

1. Introduction

The literature on international trade tends to largely focus on countries as the units of location. Mainstream trade theories explain the cause of the patterns of trade flows between countries to differential composition of their factor endowments (Heckscher, 1919; Ohlin, 1924), bilateral trade volumes to the gravity variables like economic size and trade costs (Tinbergen, 1962; Anderson, 1979) and intra-industry trade flows to the working of economies of scale and product differentiation (Krugman, 1979, 1980). For national economies, firms' decision to enter the foreign market is being explained by sunk costs and productivity as determining factors (e.g., Roberts and Tybout, 1997; Bernard et al., 2003; Melitz, 2003). Thus, country's exports or their inter-firm and inter-sectoral differences are conceptualized and analyzed taking country as a homogeneous locational unit.

However, recent studies on internationalization activities of national firms reveal that such activities are subject to subnational spatial heterogeneity (Pradhan and Das, 2015; Beugelsdijk and Mudambi, 2013). The subnational origin of national exports in emerging economies like India (Pradhan and Das, 2012, 2013), China (Wu, 2007; Perkins, 1997) and South Africa (Matthee, and Naude, 2008) is found to be heavily spatially concentrated indicating that productive enterprises in some regions are more outward oriented than those from others. This subnational regional variation in firms' exports could be a result of proactive subnational policies adopted by some region than others (Pradhan, Zohair and Alagawadi, 2013) and a host of other spatial factors that are important for firms' location and regional technological activities (Pradhan and Das, 2015). The rise of cluster and agglomeration based subnational productive systems serving global markets (Mytelka and Farinelli, 2000; Das, 2008; Porter, 1990, 1998) may further possess important implications for studies on international trade hitherto focused on nation as the unit of location.

The spatial proximity of increasing number of interlinked businesses and organizations tends to shape the interactive ways in which learning, innovation and knowledge exchanges take place, thus, making subnational localities, cities and regions as the spatial units for studying technological developments and competitiveness of firms and nations (Asheim and Isaksen, 1997, 2002; Cooke 2001; Isaksen, 2001). The new economic geography (Krugman, 1991a, b;

Fujita and Krugman, 2004), industrial districts and innovative milieu approaches (Lawson, 1997) have all emphasized the role of agglomeration and subnational levels of geographically defined productive systems that drives a nation's competitive and innovative advantages in specific segments of global markets. Therefore, national export growth may be seen in terms of emergence of subnational regional competitive advantages for exporting (Pradhan and Das, 2015).

In the above backdrop, this study focuses on subnational export performance of two selected states of India. As an emerging economy, India reflects enormous magnitude of subnational spatial heterogeneity in the level of economic development, availability of infrastructure, endowments of skills and intangible assets, size and growth of market, urbanization, institutional and cultural environment. In particular, the chosen Indian states, Tamil Nadu and Uttar Pradesh are examples of contrasting subnational Indian regions in terms of such heterogeneity. The per capita income of Tamil Nadu is three times that of Uttar Pradesh, which indicates the development disparities between these states. The study is motivated to examine export performance of these selected states and to explore the role of regional factors including subnational policies in the export activities of local firms.

To start with, the study examines the export performance of both the selected states in Section 2. The differential export success between Tamil Nadu and Uttar Pradesh was described in terms of their differences in locational factors for export advantages in Section 3. Section 4 summarizes recent subnational policies framed by both these selected states for encouraging their local firms' international expansion. Section 5 discusses the issue of export determinants at the level of firms and presents results from econometric analysis of sample firms. The final section carries concluding remarks.

2. Subnational Exports from Tamil Nadu and Uttar Pradesh

Trends of subnational exports from Tamil Nadu and Uttar Pradesh are summarized in Table-1. The focus is on manufacturing exports from these states and their individual contribution to the national manufacturing exports during 1991–2008. Manufacturing exports from both these states have been steadily growing since 1991 but the scale of exporting differs between them. Tamil Nadu's manufacturing exports amounted to \$7.6 billion in the period 1991–99 nearly doubled the volume of exports undertaken by Uttar Pradesh. During 2000–08 manufacturing exports from Tamil Nadu was \$24.8 billion which is 1.9 times of \$12.8 billion of exports from Uttar Pradesh.

Tamil Nadu has achieved faster growth of manufacturing exports than Uttar Pradesh during 1991–99 and succeeded in improving its contribution to the national manufacturing exports continuously. The share of Tamil Nadu in national manufacturing exports, which was marginally higher than Uttar Pradesh in the year 1991, became double in 1999. This impressive performance of Tamil Nadu over Uttar Pradesh in the 1990s is due to superior export intensity of its manufacturing firms. The ratio of export intensity of Tamil Nadu to that of Uttar Pradesh has generally increased from 5:4 in 1991 to 12:8 in 2008.

Manufacturing exports from Uttar Pradesh grew at the rate of 18 per cent during 2000–08 slightly better than 16 per cent of export growth for Tamil Nadu. In fact, exports from Tamil Nadu declined in absolute value from \$5.1 billion in 2007 to \$4.3 billion in 2008, probably as the result of slowdown in the global economy and shrinkage of overseas demand. Nevertheless, the share of Tamil Nadu in national manufacturing exports continued to be double than that of Uttar Pradesh even during this period. The export intensity of manufacturing firms in Uttar

Pradesh improved to around 8 per cent in 2007–08, whereas the same for the firms in Tamil Nadu improved rapidly and rose to more than 13 per cent in 2007. From 1997 onwards the export intensity of Tamil Nadu firms is in double digits except in the year 2000, when it was marginally below 10 per cent.

Table-1: Trends in Manufacturing Exports of Uttar Pradesh and Tamil Nadu, 1991–2008

Year	Manufacturing Exports (\$ millions)		As a per cent of national manufacturing exports		Manufacturing Export Intensity (%)	
	Uttar Pradesh	Tamil Nadu	Uttar Pradesh	Tamil Nadu	Uttar Pradesh	Tamil Nadu
1991	270.5	363.3	2.1	2.8	4.1	5.0
1992	328.1	438.5	2.5	3.3	5.2	5.8
1993	325.4	485.0	2.3	3.5	5.2	6.5
1994	426.6	671.2	2.6	4.0	6.1	8.3
1995	525.1	945.7	2.6	4.6	6.0	9.5
1996	601.8	1080.0	2.5	4.5	6.1	9.6
1997	679.7	1182.3	2.8	4.8	6.0	10.1
1998	627.6	1184.6	2.4	4.5	6.3	11.0
1999	618.9	1235.9	2.4	4.8	5.8	11.0
2000	680.6	1271.1	2.3	4.3	5.4	9.2
2001	765.9	1545.9	2.2	4.5	5.7	10.5
2002	807.2	1588.6	2.4	4.8	6.3	11.2
2003	905.7	1989.6	2.3	4.9	6.0	11.6
2004	1247.9	2306.1	2.6	4.8	7.0	11.7
2005	1543.6	3050.7	2.5	5.0	7.1	12.5
2006	1764.5	3603.9	2.4	5.0	7.5	12.4
2007	2537.8	5126.2	3.0	6.0	8.3	13.6
2008	2575.6	4276.6	2.5	4.2	7.9	11.9
Average Annual Growth (%)						
1991–99	11.6	17.3	2.2	7.3	4.9	10.7
2000–08	17.9	16.1	1.1	-0.5	3.8	1.3

Note: Financial year average exchange rate has been used to convert rupee figures into US\$; Export intensity is manufacturing exports from the given state as a per cent of sales of sample firms based in the concerned state.

Source: (i) National exports of manufactured goods is from RBI Database on Indian Economy Online database (2010); (ii) SPIESR-GIDR locational dataset of Prowess manufacturing firms (2010)

2.1 Sectoral Composition

A comparison of the sectoral profile of manufacturing exports from Tamil Nadu and Uttar Pradesh reveals a number of interesting features. During 1991–99 Uttar Pradesh showed a more balanced technological spectrum of manufacturing exports with technological groups like high-technology, medium-technology and low-technology products each contributing more than 30 per cent export shares for the state (Table-2). In marked contrast, low-technology products accounted for much higher share at 53.6 per cent in Tamil Nadu’s manufacturing exports, followed by high-technology and medium-technology products respectively with 35 per cent and 12 per cent shares in the same period. While high technology products more or less contributed same 35 per cent share in manufacturing exports from both these states, differences begin to appear in the share of low technology products.

Both Tamil Nadu and Uttar Pradesh have seen increasing role of high-technology products in their manufacturing exports in the period 2000–08. This increasing share of high-technology products is because of a decline in the shares of medium-technology and low-technology manufactures in the case of Uttar Pradesh while the same for Tamil Nadu is due to shrinking share of low-technology products alone.

Table-2 Sectoral Composition of Manufacturing Exports of Uttar Pradesh and Tamil Nadu, 1991–99 and 2000–08

Sector	Uttar Pradesh				Tamil Nadu			
	Exports (\$ millions)		Annual Average Growth (%)		Exports (\$ millions)		Annual Average Growth (%)	
	1991–99	2000–08	1992–99	2000–08	1991–99	2000–08	1992–99	2000–08
High-technology	1520.2 (34.5)	5835.5 (45.5)	13.3	21.0	2638.4 (34.8)	10372.4 (41.9)	15.3	15.9
Chemicals & chemical products	216.1 (4.9)	572.7 (4.5)	17.8	17.8	901.9 (11.9)	1910.7 (7.7)	11.5	9.8
Drugs & pharmaceuticals	56.2 (1.3)	55.2 (0.4)	34.6	25.8	359.8 (4.7)	1714.2 (6.9)	51.2	16.3
Electrical & optical equipment	262.6 (6.0)	2653.2 (20.7)	18.3	33.8	257.9 (3.4)	932.8 (3.8)	25.8	11.4
Machinery & equipment	111.4 (2.5)	410.0 (3.2)	21.5	50.1	523.5 (6.9)	1232.4 (5.0)	6.3	13.3
Transport equipment	873.9 (19.8)	2144.4 (16.7)	14.6	20.8	595.3 (7.8)	4582.2 (18.5)	20.3	26.9
Low-technology	1400.0 (31.8)	3654.9 (28.5)	18.9	11.3	4065.4 (53.6)	7679.9 (31.0)	20.2	6.4
Diversified	95.3 (2.2)	169.0 (1.3)	47.1	571.3	135.7 (1.8)	24.7 (0.1)	27.6	-7.7
Food products, beverages & tobacco	476.6 (10.8)	1395.8 (10.9)	7.5	19.4	610.1 (8.0)	1966.5 (7.9)	14.8	25.6
Leather & leather products	193.7 (4.4)	800.0 (6.2)	188.0	14.8	467.2 (6.2)	745.2 (3.0)	74.7	-2.3
Other manufacturing	97.5 (2.2)	291.5 (2.3)	31.1	19.0	116.9 (1.5)	227.9 (0.9)	103.4	14.0
Publishing & printing	1.4 (0.0)	12.7 (0.1)	-0.1	25.6	14.9 (0.2)	79.7 (0.3)	17.4	34.2
Pulp & paper products	0.2 (0.0)	4.2 (0.0)		154.2	53.6 (0.7)	322.2 (1.3)	95.3	30.6
Textiles & textile products	525.7 (11.9)	981.4 (7.7)	37.2	3.6	2663.9 (35.1)	4263.9 (17.2)	21.9	4.5
Wood & wood products	9.5 (0.2)	0.3 (0.0)	112.6	273.7	3.0 (0.0)	50.0 (0.2)	157.1	47.3
Medium-technology	1483.4 (33.7)	3338.5 (26.0)	4.6	23.8	882.8 (11.6)	6706.4 (27.1)	10.5	39.8
Basic metal & metal products	156.4 (3.6)	1602.3 (12.5)	39.4	35.0	370.3 (4.9)	5304.5 (21.4)	17.0	53.7
Coke & petroleum products	777.7 (17.7)	1098.5 (8.6)	-2.2	39.2	38.0 (0.5)	248.7 (1.0)	2.0	53.2
Other non-metallic mineral products	112.9 (2.6)	121.3 (0.9)	31.2	2.4	119.3 (1.6)	302.9 (1.2)	39.3	14.1
Rubbers & Plastics	436.4 (9.9)	516.4 (4.0)	24.2	9.6	355.2 (4.7)	850.4 (3.4)	12.1	15.7
Grand Total	4403.5 (100)	12828.9 (100)	11.2	17.9	7586.6 (100)	24758.6 (100)	16.7	16.1

Note: Percentage share in parenthesis.

Source: SPIESR-GIDR locational dataset of Prowess manufacturing firms (2010)

The major categories of manufacturing exports from Uttar Pradesh included transport equipment (19.8 per cent), followed by coke and petroleum products (17.7 per cent), textiles (11.9 per cent), food products including beverages and tobacco (10.8 per cent) and rubbers and plastics (9.9 per cent) in the 1990s. In the same period, Tamil Nadu's major exporting sectors cover textiles (35.1 per cent) and chemicals (11.9 per cent). During 2000–08 the profile of major exporting sectors changed for Uttar Pradesh with the emergence of electrical and optical equipment (20.7 per cent) and metal and metal products (12.5 per cent) as important exporters in addition to the continued significance of transport equipment (16.7 per cent) and food products (10.9 per cent). Similarly, new industries such as basic metal and metal products (21.4 per cent) and transport equipment (18.5 per cent) entered into the list of top exporting sectors for Tamil Nadu in addition to existing sectors like textile (17.2 per cent).

Some sectors in Uttar Pradesh displayed encouraging performance. As a percentage of manufacturing exports from Uttar Pradesh, the share of electrical and optical equipment increased significantly from 6 per cent in the 1990s to about 21 per cent during 2000–08 and that of metal and metal products from about 4 per cent to 13 per cent. Between these periods, transport equipment displayed a significant increase in export share of Tamil Nadu from 7.8 per cent to 18.5 per cent, and that of basic metal and metal products from 4.9 per cent to 21.4 per cent. The export share of textiles in both the state has suffered a setback during 2000–08 as compared to the 1990s.

2.2 Manufacturing exports by ownership categories

The patterns of manufacturing exports by different ownership categories of firms, namely domestic standalone firms, domestic business groups, foreign firms and public sector firms are presented in Table-3. Domestic business groups played an important role in the manufacturing exports of both Uttar Pradesh and Tamil Nadu contributing as high as 47–48 per cent shares during the 1990s. While their export share stayed above 40 per cent for Uttar Pradesh in the period 2000–08, the same was about 36 per cent for Tamil Nadu. This suggests that Uttar Pradesh and Tamil Nadu both relied more on domestic business groups for their performances in manufacturing products.

Between 1991–99 and 2000–08, manufacturing export share of foreign affiliates increased from 15 per cent to 25 per cent for Uttar Pradesh while the increase was from 18 per cent to 35 per cent for Tamil Nadu. Clearly, foreign affiliates are playing an increasing role in manufacturing exports of these states in the recent periods. Notably the export share of foreign affiliates now exceeded that of domestic standalone firms for both Uttar Pradesh and Tamil Nadu since 2000–08.

The position of domestic standalone firms in manufacturing exports has improved considerably from 18 per cent in 1991–99 to 22 per cent in 2000–08 for Uttar Pradesh but their share for Tamil Nadu slipped from 30 per cent to 27 per cent between these periods.

While public sector enterprises played notable role in the manufacturing export performance of Uttar Pradesh contributing 20 per cent in 1991–99 and 12 per cent in 2000–08, their role is quite modest for Tamil Nadu with export shares in the range of 2–3 per cent only.

Table-3: Firm Affiliation and Manufacturing Exports of Uttar Pradesh and Tamil Nadu, 1991–99 and 2000–08

Affiliation	Uttar Pradesh				Tamil Nadu			
	Exports (\$ millions)		Annual Average Growth (%)		Exports (\$ millions)		Annual Average Growth (%)	
	1991–99	2000–08	1991–99	2000–08	1991–99	2000–08	1991–99	2000–08
Domestic standalone	793.5 (18.0)	2858.4 (22.3)	27.0	18.3	2303.7 (30.4)	6658.5 (26.9)	34.2	9.3
Domestic business groups	2073.1 (47.1)	5180.2 (40.4)	13.8	15.5	3658.3 (48.2)	8799.5 (35.5)	14.9	12.7
Foreign Affiliates	642.3 (14.6)	3235.4 (25.2)	17.5	21.8	1397.3 (18.4)	8694.4 (35.1)	4.5	35.7
Public sector	894.6 (20.3)	1554.9 (12.1)	-1.3	31.6	227.3 (3.0)	606.2 (2.4)	16.2	20.8
All Firms	4403.5 (100)	12828.9 (100)	11.2	17.9	7586.6 (100)	24758.6 (100)	16.7	16.1

Note and Source: Same as Table-2.

2.3 Manufacturing exports by size of firms

Uttar Pradesh and Tamil Nadu are observed to be both excessively dependent on large firms in manufacturing exports. Large firms contributed 90 per cent or more of these states' total exports since 1991 (Table-4). This shows that small and medium sized firms have played rather minor roles in the manufacturing exporting from the organized sector in Uttar Pradesh and Tamil Nadu. In fact, whatever minor export shares that small and medium enterprises (SMEs) possess further decreased between 1991–99 and 2000–08. The inability of Uttar Pradesh and Tamil Nadu in exploiting export potential of SMEs reflects the fact that subnational policies are yet to be successful in motivating greater export participation and contribution by SMEs.

Table-4 Firm Size and Manufacturing Exports of Uttar Pradesh and Tamil Nadu, 1991–99 and 2000–08

Firm Size	Uttar Pradesh				Tamil Nadu			
	Exports (\$ millions)		Annual Average Growth (%)		Exports (\$ millions)		Annual Average Growth (%)	
	1991–99	2000–08	1991–99	2000–08	1991–99	2000–08	1992–99	2000–08
Small	232.7 (5.3)	190.7 (1.5)	29.8	-12.8	374.5 (4.9)	740.2 (3.0)	48.1	21.3
Medium	122.2 (2.8)	77.2 (0.6)	86.2	23.6	389.7 (5.1)	791.9 (3.2)	15.9	2.3
Large	4048.6 (91.9)	12561.0 (97.9)	10.6	18.7	6822.4 (89.9)	23226.6 (93.8)	16.3	17.0
All Firms	4403.5 (100)	12828.9 (100)	11.2	17.9	7586.6 (100)	24758.6 (100)	16.7	16.1

Note: Manufacturing firms with an accumulated value of up to Rs. 5 crore of plant and machinery is taken as small firms, those with value above Rs. 5 crore but up to Rs. 10 crore are called medium firms and that with value of plant and machinery of above Rs. 10 crore is labelled as large firms; Percentage share in parenthesis.

Source: Same as Table-2.

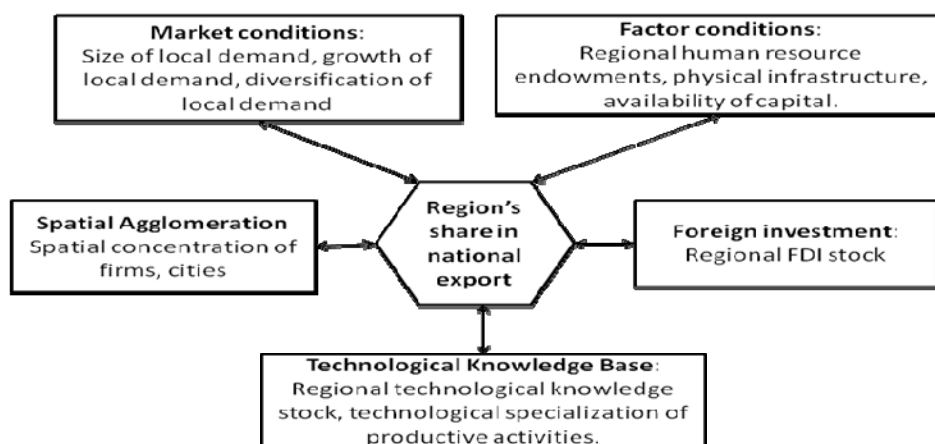
Overall the above findings suggest that Tamil Nadu possesses higher scale of manufacturing exports and intensity to export as compared to Uttar Pradesh. Both these states, however, reflects largely similar technological structure of manufacturing exports where high-technology products being followed by low-technology products and then by medium-technology products in term of export contribution. Also domestic business groups dominated their exports while the role of foreign firms in manufacturing exports has been increasing for each of them. The difference lies

in the fact public sector enterprises more export contributing for Uttar Pradesh than Tamil Nadu. By and large, manufacturing exports from both these states is heavily led by large size enterprises.

3. Locational Export Advantage of Tamil Nadu and Uttar Pradesh

Whether or not a subnational space could maintain or increase its export competitiveness relative to other spaces lies in the interrelationships between local institutions, firms and spatial factors including local policies. Pradhan and Das (2015) proposed a simple framework of regional export competitiveness to explain inter-regional export contribution in a given economy. Drawing upon on the extensive literature on industrial districts (Markusen, 1996; Sforzi, 2002; Becattini et al., 2003), innovative milieu (Camagni, 1995; Maillat, 1998), and learning region (Rutten and Boekema, 2007), they treated subnational regions as territorially defined productive systems with a cumulative process of endogenous resource creation, accumulation, diffusion and transfer so as to determine regional export shares. Pradhan and Das (2015) identified and included spatial factors, based on relevant theoretical and empirical literature, that are likely to support export developments of subnational regions through strengthening of local firms' innovation and competitiveness (Figure-1).

Figure-1: Sources of Regional Export Competitiveness



Source: Pradhan and Das (2015)

3.1 Size and nature of local demand

A key locational requirement for the local firms to be successful in exporting is the presence of large sized and growing of market in proximity. The large size of local demand facilitates concentration of production with increasing returns and saving on transport costs (Krugman, 1991a; Fujita, Krugman and Venables, 1999) while endowing local firms the benefits of the critical minimum demand for better products and processes, presence of specialised suppliers, labour pool, and lower transaction costs (Caniels and Romijn, 2005).

A comparison of the gross state domestic product (*SDP*), which is taken as a proxy to the absolute size of the regional market, suggests that Uttar Pradesh has advantageous access to the sizeable local markets as compared to Tamil Nadu (Table-5). However, relatively higher growth of local market in Tamil Nadu in recent years has resulted in almost closure of this exporting

edge of Uttar Pradesh over Tamil Nadu. The analysis of regional per capita SDP (*PSDP*) capturing the importance of the sophistication of regional demand for more product varieties shows that Tamil Nadu has distinct export advantages over Uttar Pradesh on this aspect of the local demand. The PSDP of Tamil Nadu was 1.3 times that of Uttar Pradesh during 1982–89 and it has grown consistently to become 2.2 times in the period 2000–09. While the economic size of local markets converges between Tamil Nadu and Uttar Pradesh, the former is well placed in terms of a more diversified local demand that may facilitate exporting by local firms.

Table-5 Demand Characteristics in Tamil Nadu and Uttar Pradesh

Period	Tamil Nadu			Uttar Pradesh		
	GSDP (Rs. Crore)	GSDP Growth Rate (%)	Per Capita GSDP (Rs.)	GSDP (Rs. Crore)	GSDP Growth Rate (%)	Per Capita GSDP (Rs.)
						<i>Annual Average</i>
1982–89	46817	5.4	9096	86056	5.2	7104
1990–99	88648	7.7	15213	132554	3.9	9132
2000–09	178437	6.8	27614	220705	5.9	12283
2011	336171	39.4	49951	337826	14.6	16976

Note: All series are in 1999–2000 constant prices; 1 crore = 10 million.

Source: Authors’ estimation based on various *Statements on State Domestic Product* released by the Central Statistical Organization (CSO).

3.2 Local technological activities and high-technology sectoral specialization

Technologically advanced subnational regions within a country are likely to dominate the national export baskets (Pradhan and Das, 2013). Such regions are likely to possess higher export shares as higher technological activities imply greater technological opportunities and intra-temporal knowledge spillovers for local firms. This is similar to the postulation of the theory of ‘technology gap’ on international trade where innovative countries are leaders in international markets as there is a time lag in technology transfer/diffusion from innovating countries to non-innovating countries (Posner, 1961; Soete, 1981; Dosi and Soete, 1988). Thus, subnational regions engaged in innovation like to have greater endowments of intangible assets than technologically laggard regions in a country to emerge as the major sources of national export performance.

Moreover, high-technology specialization of the manufacturing base of a region may determine its national export share (Pradhan and Das, 2013). Apart from extensive knowledge spillovers, states targeting and promoting technology-intensive manufacturing activities reap benefits of the fact that technology intensive products are the fastest growing category in the world trade (Lall, 2000).

The indicators of the extent of local technological activities, namely the number of patent applications filled and patent intensity show that Tamil Nadu is significantly ahead of Uttar Pradesh (Table-6). The number of patent applications originating from Tamil Nadu is about thrice the same originating from Uttar Pradesh. For each Rs. 10 billion of constant GSDP, Tamil Nadu is generating more than 3 patents as compared to 1 patent from Uttar Pradesh in 2010. Moreover, Uttar Pradesh has been sliding in her specialization of manufacturing on high-technology products while Tamil Nadu is further expanding its technological specialization. The share of high-technology products decreased from 44 per cent during 1991–99 to 35 per cent in the period 2000–09 for Uttar Pradesh whereas the share for Tamil Nadu increased from 38 per

cent to 40 per cent. In 2010, it stands at 46 per cent for Tamil Nadu but 37 per cent for Uttar Pradesh. Obviously, Tamil Nadu has greater technological competitive edge as well as technological specialization of manufacturing for undertaking international business than Uttar Pradesh.

Table-6 Regional Technological Activities and Technological Specialization of Manufacturing in Tamil Nadu and Uttar Pradesh

Period	Tamil Nadu				Uttar Pradesh			
	Ordinary Patent Applications		Share of High-Technology Sectors in Manufacturing Value-added		Ordinary Patent Applications		Share of High-Technology Sectors in Manufacturing Value-added	
	Number	Intensity	Share (%)	Annual Average Growth Rate (%)	Number	Intensity	Share (%)	Annual Average Growth Rate (%)
1991–99	1193	1.45	38.0	-2.1	381	0.31	43.7	1.5
2000–09	3492	2.03	40.1	0.4	1215	0.57	35.3	-3.2
2010	818	3.39	45.6	26.9	322	1.09	37.3	27.0

Note: Patent intensity is the number of patent applications per Rs. 10 billion of constant GSDP; The number of patents applications by Uttar Pradesh for the earlier period of 1991–2001 was determined based on its observed share in the combined patent applications of Uttar Pradesh and Uttarakhand (i.e. newly divided states) during 2002–05; High-technology manufacturing sectors are taken to include chemicals, pharmaceuticals, electrical & optical equipment, machinery & equipment and transport equipment.

Source: Authors' estimation based on (i) various *Annual Reports* of the Controller General of Patents, Designs & Trade Marks, (ii) various statements on State Domestic Product and reports of *Annual Survey of Industries (ASI)*, CSO.

3.3 Local Knowledge Institutions and Availability of Skills

Among the locational factors influencing export performance of regions, existence of greater number of knowledge institutions and availability of skills may play a prominent role as skill and technology intensity have become critical factors in world manufacturing exports (Lall, 2000). Rich endowment of low-cost skilled and technical human-power enables adoption of product differentiation by local exporters crucial for succeeding in international markets (Munch and Skaksen, 2008) while the presence of knowledge institutions like universities, institutes of technologies, R&D laboratories, etc., permits interactive regional innovation system so vital for regional competitiveness (Pradhan, 2011; Rasiah and Chandran, 2009; Joseph and Abraham, 2009; Kazakova and Atoyian, 2006; Asheim and Isaksen, 2002). In addition to the supply of skills, such knowledge institutions facilitates regional knowledge creation by supporting academic research and knowledge sharing through organizing meetings, conferences, workshops, publication and partnering industry for innovation.

As far as absolute number of knowledge institutions and higher education enrolments are concerned, Uttar Pradesh appears to possess higher numbers of both these indicators than Tamil Nadu (Table-7). These absolute differences in numbers, however, may not be an accurate reflection of locational advantages for exporting of Uttar Pradesh over Tamil Nadu as it disguises significant size differences of the subnational regions being compared. The adjustment of the size of the regional economy in terms of geographical area or population exhibits that there is hardly any significant differences in the availability of higher educational institutions between Tamil Nadu and Uttar Pradesh. In 2009, the number of higher educational institutions

available per 1000 square kilometer area of the state, at 9.4 for Tamil Nadu is comparable to that of Uttar Pradesh at 10.

However, Tamil Nadu has some advantage over Uttar Pradesh when one consider availability of human resources, namely number of higher educational enrolments per 100000 population. This enrolments for Tamil Nadu was 372 as compared to 315 of Uttar Pradesh in 1995, which increased to 1597 for the former while 1155 for the latter. This is indicative of the fact that Tamil Nadu is to able to provide a greater supply of skilled manpower to local firms than what Uttar Pradesh does.

Table-7 Knowledge Institutions and Higher Education Enrolments in Tamil Nadu and Uttar Pradesh

Year	Tamil Nadu				Uttar Pradesh			
	Knowledge Institutions		Higher Education Enrolment		Knowledge Institutions		Higher Education Enrolment	
	No.	No. Per 1000 sq. km. area	No.	No. Per lakh population	No.	No. Per 1000 sq. km. area	No.	No. Per lakh population
1995	332	2.6	216949	372	543	2.3	450086	315
2000	984	7.6	613758	996	1628	6.8	1005936	625
2005	1245	9.6	809366	1257	2165	9.0	1507991	847
2009	1223	9.4	1060543	1597	2421	10.0	2218243	1155

Note: Knowledge/ higher education institutions comprise of universities, deemed universities, institutions of national importance, research institutes, colleges for professional education (e.g. engineering, technology, architectural and medical colleges) and colleges for general education.

Source: Authors' estimation based on (i) various issues of the *Selected Educational Statistics*, Department of Higher Education under the Ministry of Human Resource Development (MHRD), Government of India, (ii) various annual reports of the MHRD, (iii) *Compendium of Selected Indicators of Indian Economy* (Volume I) of the CSO (2009).

3.3 Availability of infrastructure

The availability of physical infrastructure like power, transportation networks, telecommunication systems, etc., in a region, which lowers the cost of production and transportation while facilitates supply capacity (Redding and Venables, 2004; Fugazza, 2004), can improves its locational advantages for exporting substantially. There is abundance of evidence on the export promoting role of physical infrastructure in the relevant empirical literature (WTO, 2004; Francois and Manchin, 2007). Moreover, regions export performance may also be related to the financial infrastructure especially the access of local firms' adequate industrial and trade finance and products for insurance. Inadequate supply of credit has been a major constraining factor for firms' growth and survival in emerging economies (Pradhan and Das, 2015; Mbekeani, 2007).

The disparity in the availability of infrastructure between Tamil Nadu and Uttar Pradesh is quite striking (Table-8). During 1995–99, the telecommunication density, road length, credit advanced by commercial banks, and power generation in Tamil Nadu were respectively 3.3 times, 1.4 times, 5 times and 3.2 times those in Uttar Pradesh. While the inter-state difference got vanished for road length in recent years, it continued for all other variables. In 2010, per 100000 population basis Tamil Nadu generated 52.2 kilowatt hour of power and supplied commercial credits of Rs. 483.4 crore as compared to 12.2 kilowatt hour of power and Rs. 68.9 crore credit advance in Uttar Pradesh. Uttar Pradesh has greater spatial intensity of railway networks over Tamil Nadu but it is largely marginal. Moreover, being a coastal state Tamil Nadu has access to

port facilities whereas Uttar Pradesh does not. As Tamil Nadu enjoys better infrastructure than Uttar Pradesh, it could be an important factor giving exporting edge over Uttar Pradesh.

Table-8 Infrastructure Availability in Tamil Nadu and Uttar Pradesh

Period	Tele-density	Road length in km per 100 sq. km. of area	Railway route in km per 100 sq. km. of area	Credit advanced in Rs. Crore per lakh population	Power generated in kWh per lakh population
<i>Annual Average</i>					
Tamil Nadu					
1995–99	2.3	120.9	3.1	53.8	37.5
2000–09	16.5	133.5	3.2	202.0	52.2
2010	74.3	146.1	3.1	483.4	52.2
Uttar Pradesh					
1995–99	0.7	88.4	3.6	10.6	11.6
2000–09	7.3	108.8	3.6	34.4	12.4
2010	38.5	156.2	3.6	68.9	12.2

Note: Tele-density denotes number of telephones per 100 population; 1 crore = 10 million.

Source: Author's estimation based on (i) *Compendium of Selected Indicators of Indian Economy* (Volume I) of the CSO (2009), (ii) various issues of *Basic Road Statistics of India*, Ministry of Road Transport and Highways, Government of India, (iii) *Annual Report on the Working of State Electricity Boards & Electricity Departments*, Planning Commission (Power and Energy Division), (iv) various General Reviews, Central Electricity Authority, Ministry of Power, Government of India, (v) various volumes of *Money and Banking*, Centre for Monitoring Indian Economy, (vi) various years of *Railway Year Book*, Railway Board, Ministry of Railways, Government of India.

4. Subnational Policies in Tamil Nadu and Uttar Pradesh for Export Promotion

In addition to the role of subnational spatial factors discussed in the previous section, regional policies may play a pertinent and direct role in encouraging local firms' export activities. In fact, increasing number of state governments in India have started appreciating the importance of exporting in the economic development of the state and seeing merit in their firms' expansion into business operation overseas (Pradhan, Zohair and Alagawadi, 2013; Pradhan and Das, 2012). These subnational governments have just begun to frame and pursue deliberate policies that actively support exporting by local firms. While both Uttar Pradesh and Tamil Nadu has formulated promotional policies but the former so far has not been relatively successful in pushing local firms into more exporting. Export promoting policies of these selected Indian states are reviewed below.

4.1 Policy initiatives of Uttar Pradesh

As a part of the *Infrastructure and Industrial Investment Policy 2012*, the state government of Uttar Pradesh has announced several measures to promote exports from the state. The measures to promote exports from the state includes input tax refund, no checking of custom sealed export consignment by other department, strengthening of the office of Export Commissioner etc¹. For promoting investment and industrialisation, many SEZs, Export Promotion Industrial Parks, Information Technology Parks, Apparel Parks, Agro Parks, Leather Technology Parks, Integrated Industrial Development Centres, Growth Centres, and Industrial Clusters have been developed in different parts of the state. The state government offers various fiscal incentives, subsidies, marketing support and has established various institutions to facilitate exports. It introduced its Special Economic Zone Policy in 2007 which focuses on providing good infrastructural facilities, creating employment opportunities, boosting exports and inviting

¹ Government of Uttar Pradesh (2012), *Infrastructure and Industrial Investment Policy*, Lucknow.

domestic and foreign investments, so as to foster the economic development of state and the country. The SEZs set up by the state government are Multi Product Noida-SEZ at Noida and Product Specific SEZ at Moradabad. In addition, few SEZs were also developed in private sector². Uttar Pradesh State Industrial Development Corporation has developed Export Promotion Industrial Parks (EPIP) at Gautam Budh Nagar and Agra, where high standard infrastructure facilities have been provided. For the growth of exports from the state, the state government sees opportunities in software exports, because the state ranks fourth in the country in the export of software, processed food and handicrafts such as carpet and metal works³. The state government announced UP IT Policy in 2004.

Some agencies are exclusively created by the state government and dedicated to promote exports from the state. Their role in export promotion is briefly reviewed below.

Department of Small Scale Industries and Export Promotion

This department of the state government is created to play the key role in the economic development of the state. It, not only monitors the growth of industry by creating necessary infrastructure for sustained industrialisation, but also formulates policies, programmes, projects and schemes for growth of export in the state. The basic responsibilities of the department include creation of industrial atmosphere in the state so that produce of the state meet the global standards. It is intended for bridging the information gap, increasing industry awareness, developing industrial data base in all major fields and providing marketing support. It also provides support for quality testing, trade fairs, training and organising urban meets. The department continuously reviews policies, programmes and delivery systems in consultation with stakeholders⁴.

Export Promotion Bureau

The government of Uttar Pradesh established Export Promotion Bureau in 1999 with the objective of promoting exports from the state by taking variety of steps and creating suitable environment for the exporters. It liaisons between exporters on one hand, and export promotion councils, export associations, and various state and central government agencies on the other hand. In marketing related information, it provides trade information about export products, markets, demand, competitor countries, potentials sources to seek buyers, and fairs etc. The Bureau creates awareness among exporters about export procedure, and various facilities and assistance offered by different agencies. It also ensures follow-up of export policy matters and miscellaneous problems of exporters. Exporters registered with Bureau get export assistance offered by the state government such as design inputs, market development assistance, participation in overseas fairs/exhibitions, buyer seller meet, project study on exports etc⁵.

U.P. Trade Promotion Authority

This authority plays an important role in export promotion of the state based products by organising buyer-seller meets and participating in trade fairs in India and abroad. It provides opportunity to showcase new products and cutting edge solutions to high priority customers. It is also responsible for leading trade delegations for export promotion and facilitating the abroad

² PHD Chamber of Commerce and Industry (2011), *Uttar Pradesh- The State Profile*, New Delhi.

³ Indian Brand Equity Foundation (undated), *Indian States Economy and Business- Uttar Pradesh*, Gurgaon.

⁴ www.ssi.up.nic.in

⁵ www.upbupindia.com

travels of exporters. It conducts market surveys and explores market potential in foreign countries and procures trade enquiries and export orders⁶.

U.P. Export Corporation

This corporation was established in 1966 as a government company under Companies Act, 1956 for directly affecting export of handicraft, handloom and other products of the state having export potential. It has established its chain of emporia under the name 'Gangotri' in major cities of the country. It assists the artisans by developing infrastructure for production and marketing of various hand-made products of the state. It organises design workshops 'Craft Bazaars' and thematic exhibitions for the development of crafts and craft-persons⁷.

Other Agencies

In addition to the above, several other initiatives were taken by the state government to promote industrial and entrepreneurial atmosphere. The Department of Industrial Development was established to create environment stimulating industrial growth by formulating and implementing industrial and infrastructure development policies and disseminating information on investment opportunities in the state. The Uttar Pradesh State Industrial Corporation was established in 1961 to develop industrial areas equipped with required infrastructure, acquires land for large projects and development of integrated Industrial Township. Uttar Pradesh Financial Corporation offers loans to small and medium entrepreneurs to promote industrial activity in the state.

4.2 Policy Initiatives of Tamil Nadu

The Industrial Policy-2007 of Tamil Nadu aimed at rejuvenating economic and industrial environment in the state through attracting investment and facilitating new manufacturing capacity and enabling global manufacturing competences and competitiveness of the wide variety local industries⁸. Apart from other objectives, it targeted at attaining the export of the state to the level of Rs. 140,000 crores. For supporting exports of the products originated from the state it also envisaged State Level Export Promotion Committee (SLEPC) functioning under Chairmanship of Chief Secretary with membership of FIEO, Export councils, leading export associations and officials. It also proposed an Industrial Cluster Export Promotion Committee for each major export cluster in the state to address various issues faced by exporters and help them in settling their problems. Setting up of a Special Economic Zone for industrial goods, a Comprehensive Trade Information Portal with network connectivity to all District Industries Centres, setting up of Agri Export Zones, increasing the number of Special Economic Zones and 100% Export Oriented Units in the state were among the issues emphasised in the policy document.

The agencies exclusively created by the state government to promote export from the state are described hereunder.

⁶ www.uptpa.org.in

⁷ www.upexport.in

⁸ Government of Tamil Nadu (2007), *The Industrial Policy 2007*, Chennai: Industries Department.

Tamil Nadu Industrial Guidance & Export Promotion Bureau

This bureau was constituted by the Government of Tamil Nadu in 1992, with the objective of promoting investment in the state. It facilitates single window clearance for the investment proposals through a common application for obtaining all infrastructure support like land, power and water etc. Some of the important investment proposals include Hyundai Motor India, Ford Motor India, HM Mitsubishi, Visteon, Saint Gobain, Xansa (India) and Hwashin etc. It also provides guidance to potential exporters and disseminates details of export enquiries for different products. It provides feedback to government on investment flows, and policy initiatives taken by the government⁹. A state level Export Promotion Committee is formed for considering and funding the proposals for development of export infrastructure in the state under the scheme of Assistance to States for Developing Export Infrastructure (ASIDE). Financial assistance to the tune of Rs. 20 crores was sanctioned during 2010–11 under this scheme.

Directorate of Industries and Commerce and Export Guidance Cell

The directorate is working for creating sustainable self-employment opportunities and guide small, tiny, cottage and handicraft industries. This directorate functions through the network of District Industries Centres (DICs). Under the directorate Export Guidance Cells have been formed in the DICs to promote exports by motivating entrepreneurs to become potential exporters, providing information on the existing export potential, assisting on the procedural matters to the exporters and various other matters for development of export activity in the district. In addition to it, a state level export promotion cell was formed to initiate measures for the development of exports in the state¹⁰.

Other Agencies

Tamilnadu Industrial Development Corporation (TIDCO) was incorporated in 1965 to identify and promote the establishment of large and medium scale industries within the State in association with the private sector¹¹. It played major role in establishing a number of IT Parks and Special Economic Zones in the state. Many such projects are developed in Public Private Partnership. Further, State Industries Promotion Corporation of Tamilnadu (SIPCOT) also develops Industrial Parks, Special Economic Zones and Industrial Complexes. Tamil Nadu Small Industries Development Corporation (TANSIDCO) plays catalytic role in promoting exports of small scale industries through several measures. Tamil Nadu Industrial Investment Corporation (TIIC) is engaged in fostering industrial development in the state by providing financial assistance.

5. Determinants of Exporting at Firm Level in Tamil Nadu and Uttar Pradesh

While the roles of regions and spatial factors have become increasingly important for overall national export performance, regional policy makers also are required to understand the microeconomic sources that drive export competitiveness of individual firms. They must recognize that firms are the basic unit to face the challenges of competition in overseas markets and to undertake exports. In fact, a successful export strategy by a subnational region should take into account the advantages offered by both location- and firm-specific factors.

⁹ www.tidco.com/guidance

¹⁰ www.indcom.tn.gov.in/export_guidance

¹¹ www.tidco.com

5.1 Theoretical Determinants of Firms Exporting

In international trade models with heterogeneous firms, the decision to enter the foreign market by a firm is conditional on its attainment of some critical level of productivity, which in turn enhances its ability to undertake sunk costs (Roberts and Tybout, 1997; Bernard et al., 2003; Melitz, 2003). Sunk costs of exporting are costs associated with collection of information on foreign demand and markets, adaptation of packaging and product to foreign consumer preferences and quality standards and establishment of marketing and distribution networks. Hence, firms with higher productivity are better placed to commit resources for starting export activities than other firms.

The theory of resource-based view may be used for explaining firms' decision to internationalize. Firms are summarized as different bundle of valuable resources that are unique and difficult to imitate or substitute (Wernerfelt, 1984; Barney, 2001; Newbert, 2007) and differences in the size of such resources would critically determine inter-firm variation in the capabilities for internationalization (Rodríguez and Rodríguez, 2005; Roxas and Chadee, 2011). The concept of resources embraces physical capital and intangible capital covering technological assets, human capital, organizational capital, and social capital.

As per above mentioned theories, a host of firm-specific factors becomes a source of export competitiveness of firms. Firm size (*SIZE*), which represents the resource base of the firm, has been found to be playing important role in export performance of enterprises (Roberts and Tybout, 1997; Bernard and Jensen, 1999; Bernard and Wagner, 2001; Kumar and Pradhan, 2007; Pradhan and Das, 2013). Very often a squared term of the firm size ($SIZE^2$) is also found to have significant effect indicating a non-linear impact that *SIZE* exert on firms' export activities (Wakelin, 1998; Roper and Love, 2002; Pradhan and Das, 2013).

The age of the firm (*AGE*) is another factor considered to be important in firms' export decision. *AGE* reflecting the effect of firm's accumulated learning and information over the past (Ericson and Pakes, 1995; Jovanovic, 1982) is expected to encourage more exports at the firm level. Firms' technological activities that cover in-house R&D and acquisition of foreign disembodied and embodied technologies may be predicted to provide significant export advantages (Wakelin, 1998; Singh, 2006; Anh et. al., 2007; Pradhan and Das, 2013). Further, firms undertaking large scale marketing and advertising activities may show more exporting as there are high marketing entry barriers in the export market (Pradhan, 2008).

Other firm-level characteristics that may influence firms' export capabilities are affiliation to domestic business groups (*BGA*) and foreign ownership participation (*AFF*). *BGA* gives affiliated firms access to business group's pool of resources and infrastructure and advantages of intra-group synergies covering sharing of information, inputs, skills, and technologies (Pradhan and Singh, 2011). Firms with ownership participation of multinational enterprises (MNEs) ensures that they have access to MNEs' capital, technology, information, distribution channels, marketing skills and the global market under their control (de La Torre, 1971). The more technology-intensive is the product in the world market, the more crucial will be the role of *AFF* for firms' export competitiveness (UNCTAD, 2002).

Apart from firm-specific factors, enterprise exporting may be more closely integrated with the inter-industry differences in technological opportunities and domestic market structure. Hence, a set of sectoral dummies are included to capture industry-specific heterogeneity that may influence firms export behaviour. Export promoting fiscal incentives like export credit, tax holiday on export income, duty drawbacks, export insurance programs, etc., have been observed

to have encouraged firms in resorting to higher export activities (Roy, 1993; Pradhan and Sahu, 2008; Pradhan and Das, 2013).

In view of above discussion, the empirical specification for exporting at the firm-level may be expressed as follows:

$$FEX_{it} = \beta_0 + \beta_1 AGE_{it} + \beta_2 SIZE_{it} + \beta_3 SIZE_{it}^2 + \beta_4 RDIN_{it} + \beta_5 ETP1_{it} + \beta_6 ETP2_{it} + \beta_7 ADV_{it} + \beta_8 AFF_i + \beta_9 BGA_i + \beta_{10} FSB_{it} + \sum_j \beta_j D_SEC_j + \varepsilon_{it} \quad (1.1)$$

Where explanatory variables are as measured in Table-9 and ε_{it} is the random error term.

Table-9 Description and Measurement of Variables

Variables	Symbols	Measurements
<i>Dependent Variable</i>		
Firm Export Intensity	FEX_{it}	Goods and services exports of it th manufacturing firm as a ratio of sales in the year t .
<i>Independent variables</i>		
Firm Age	AGE_{it}	Natural log of the age of it th firm in number of years from the year of its incorporation.
Firm Size	$SIZE_{it}$	Natural log of total sales (Rs. Million) of it th firm in t th year.
Firm Size Squared	$SIZE_{it}^2$	Squared of the natural log of total sales (Rs. Million) of it th firm in t th year.
R&D Intensity	$RDIN_{it}$	R&D expenditure (capital+current) as a percent of total sales of it th firm in t th year.
External Technology Purchase	$ETP1_{it}$	Expenses in royalties, technical and other professional fees paid abroad by it th firm as a percent of sales in the year t .
	$ETP2_{it}$	Expenses on imports of capital goods and equipment by it th firm as a percent of sales in t th year.
Product Differentiation	ADV_{it}	Advertising and marketing expenses of it th firm as a percent of sales in the year t .
Affiliation to Foreign Firm	AFF_i	Assume 1 if it th firm has affiliation to a foreign firm, 0 otherwise.
Business Group Affiliation	BGA_i	Assume 1 if it th firm has affiliation to a domestic business group, 0 otherwise.
Fiscal benefits	FSB_{it}	Total fiscal benefits related to export activities received by it th firm as a percent of sales in the year t .
Sectoral Dummies	D_SEC_j	Assume 1 for j th sector, 0 otherwise.

Note: 1 crore = 10 million.

5.2. Method of Estimation

The specification of firms' export function in equation 1.1 involves a fractional response variable bounded between 0 per cent for non-exporter and 100 per cent for wholly export oriented firms. Given the possibility of clustering of observations of the dependent variable, y , at its lower and upper bounds, the proposition of the Tobit model has strong theoretical appeal to the researchers. This model emerged as the widely used method of estimation for the analysis of dependent variables involving non-negative responses and having multiple observations at the upper and/or lower limits.

Tobin (1958) suggested that such dependent variables can be interpreted as censored variables because their true values are observable for a restricted range of observations while values of independent variables \mathbf{x} are known for all observations. Thus, a latent variable can be introduced in the form of $y^* = E(y^*|\mathbf{x}) + \varepsilon$ where its conditional expectation is described as a linear function: $E(y^*|\mathbf{x}) = \mathbf{x}\beta$. The observed y values are assumed to become the latent y^* values if $y^* > 0$ and to attain a zero value if $y^* \leq 0$. Consistent estimates of explanatory variables for function involving

such limited dependent variable can be obtained by the use of the maximum likelihood (ML) estimation. Nevertheless, the Tobit model requires stronger assumptions of normality and homoskedasticity and any deviation thereof render the ML estimates as inconsistent.

Recent theoretical developments in econometrics, however, indicated that the use of a censored regression technique like Tobit on proportions data that contains 0, 1 and intermediate values is not an appropriate strategy. The observed data on the proportion dependent variables like export intensity or R&D intensity is not truly censored in its character but are a natural outcome of individual choices (Ramalho, Ramalho and Murteira, 2011; Baum, 2008). For proportions data, values outside the [0, 1] interval are not feasible as they are naturally bounded.

Given that Tobit Model is formulated based on the assumption of censoring and its estimates are highly sensitivity to any deviation from normality and homoskedasticity assumptions, recently fractional logit model (FLM) has been proposed as more appropriate method for modeling bounded dependent variables with observations at the boundaries. Papke and Wooldridge (1996) formulated FLM, which was extended by Ramalho and Silva (2009) into two-part fractional model (TFM). Papke and Wooldridge (2008) extended it to the panel data through fractional panel probit model (FPPM). However, FPPM is applicable only for balanced panels and requires the inclusion of explanatory variables, \mathbf{x}_{it} , their individual-specific time averages \bar{x}_i and year dummies as additional independent variables that create widespread and severe multicollinearity for the sample data. Given that we have an unbalanced sample of firms, the pooled FLM has been chosen as the preferred method of estimation.

Fractional Logit Model (FLM)

A quasi-maximum likelihood (QML) estimator was formulated by Papke and Wooldridge (1996) to describe the data generation process for a fractional dependent variable y on the closed interval [0, 1]. The conditional expectation of y can be model as $E(y|\mathbf{x}) = G(\mathbf{x}\boldsymbol{\beta})$ where $G(\cdot)$ is a known nonlinear function and this is well defined even if y assumes 0 or 1 with positive probability. Researchers can specify any cumulative distribution function for $G(\cdot)$ including Bernoulli for binary data.

Taking the Bernoulli log-likelihood function, $LL_i(\boldsymbol{\beta}) = y_i \log[G(\mathbf{x}_i\boldsymbol{\beta})] + (1 - y_i) \log[1 - G(\mathbf{x}_i\boldsymbol{\beta})]$, which is a density in the linear exponential family (LEF), the QML estimator $\hat{\boldsymbol{\beta}}$ is derived by maximizing the $\sum_{i=1}^N LL_i(\hat{\boldsymbol{\beta}})$ with respect to $\hat{\boldsymbol{\beta}}$. With the correct specification of $E(y|\mathbf{x}) = G(\mathbf{x}\boldsymbol{\beta})$, the obtained estimator is consistent and asymptotically normal regardless of the true distribution of y_i conditional on \mathbf{x}_i and nature of y_i (i.e. continuous or discrete, or posses both continuous and discrete characteristics).

The fractional logit results of the seminal paper of Papke and Wooldridge (1996) were replicated by Oberhofer and Pfaffermayr (2012) based on the standard routines provided in the statistical software, Stata and they observed that their proposed RESET specification test is useful for detecting neglected non-linearities in the small samples. In the export literature, Sasidharan and Joseph (2011) and Wagner (2001) have all used the QML method based on the logistic specification for explaining firms' export performance while Pradhan and Das (2015) used the same for the national export shares of subnational regions.

5.3. Empirical Results and Analysis

For estimating the export equation 1.1, the study draws upon samples of single-state based manufacturing firms for Tamil Nadu and Uttar Pradesh from the SPIESR-GIDR Locational

Dataset on Indian Manufacturing Firms (SG-LoDIMF), built for the Indian Council of Social Sciences (ICSSR) sponsored research project entitled, *Exploring Regional Patterns of Internationalization of Indian Firms: Learnings for Policy*¹². All firm-specific financial and non-financial variables in this database were drawn from the Prowess Database of the Centre for Monitoring Indian Economy (CMIE) but identification of firm's host state has been accomplished based on plant location information collected from both the Prowess and intensive internet searches of company websites, annual reports, consultancy reports, etc. The size of the unbalanced sample of manufacturing firms available for estimation during 1995–2008 is 5435 observations pertaining to a total of 861 firms in Tamil Nadu while it is 2644 observations belonging to 394 enterprises in Uttar Pradesh.

The estimation of variance inflating factor for the matrix of explanatory variables suggested strong correlation between the firm size (*SIZE*) and its squared term (*SIZE*²). As a result, mean centred series has been used in the place of original *SIZE* (and *SIZE*²) to address strong correlation between firm size and its squared term. Additionally, one can expect the problem of endogeneity in the estimation as a number of firm-level independent variables are not strictly exogenous (Pradhan and Das, 2013). For example, firms' R&D may depend on the level of its export activities (e.g. Pradhan, 2011). Also the dependent variable, export intensity might have bi-way feedbacks with other factors like firm survival (age), size, purchase of foreign technologies and advertising expenses. Therefore, all the firm-specific variables in the study, except *AFF* and *BGA* dummies, are introduced in one year lagged form.

A summary of the empirical results obtained from the FLM with bootstrap standard errors based on 500 replications is provided in Table-10¹³. Chi-square values for the estimated models for both Tamil Nadu and Uttar Pradesh are very high and statistically significant indicating that included explanatory variables taken together are reasonably explaining firm's export performance.

The negative and significant coefficient of firm age for both Tamil Nadu and Uttar Pradesh may suggest that relatively younger firms are driving manufacturing exporting from these two states. The openness in the economic environment created by India since 1990s is probably facilitating emergence of new and young entrepreneurs that see markets as global while well established older Indian firms are relatively more focused on domestic markets.

The impacts of firm size and its squared term are observed to be quite strong with positive and negative sign respectively. Thus, large size can help local firms to achieve higher export intensity in both the Indian states of Tamil Nadu and Uttar Pradesh. The positive effect of firm size, however, is only up to some critical level of firm size.

The coefficient of *ETPI*_{*it-1*} representing the purchase of disembodied foreign technologies turns out to be positive but it is statistically not different from zero for both the selected states. This may implies that the level of foreign technologies brought through international technical collaboration, technology contracts and licensing has been a minor consideration influencing the export behavior of firms in Tamil Nadu and Uttar Pradesh. Pradhan and Das (2013) suggested that technology contracts may come with export prohibition clauses leading to restriction on the export activities of the importing Indian firms.

¹² Single-state based firms are those whose all production units are located in a single state/union territory.

¹³ Estimation has been conducted with the help of the statistical package, STATA, where one can use GLM command with the option for bootstrap standard errors for obtaining QML estimates for FLM.

Table-10 Determinants of Manufacturing Firms' Exporting in Tamil Nadu and Uttar Pradesh*Dependent Variable: Export Intensity (in ratio)*

Independent variable	Coefficients (Absolute bootstrap Z-statistic)	
	Tamil Nadu	Uttar Pradesh
AGE_{it-1}	-0.229*** (-6.822)	-0.602*** (-7.385)
$SIZE_{it-1}$	0.139*** (7.846)	0.266*** (5.800)
$SIZE^2_{it-1}$	-0.00818 (-1.612)#	-0.0710*** (-3.323)
$ETP1_{it-1}$	0.0190 (0.397)	0.00458 (0.0692)
$ETP2_{it-1}$	0.00273 (1.422)	0.0155** (2.528)
$RDIN_{it-1}$	0.0486* (1.631)	0.130** (2.058)
ADV_{it-1}	-0.000559 (-0.0819)	-0.0237 (-1.582)
AFF_i	0.580*** (4.518)	0.506** (2.012)
BGA_i	0.218*** (3.467)	-0.679*** (-4.912)
FSB_{it-1}	0.276*** (9.799)	0.218*** (5.918)
Constant	-1.093*** (-4.178)	1.049** (2.398)
χ^2 -value!	830.03	1896.41
Prob > χ^2	0.0000	0.0000
Observations	5,435	2,644
No. of exporting firms@	559	206
No. of total firms@	861	394
Proportion of exporting firms@	64.92	52.28

Notes: Absolute value of bootstrap t-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%; #-significant at 10.7%; !-test values are obtained from the independent tests conducted to check if the coefficient of all explanatory variables are simultaneously zero using the testparm command in the STATA; @-Single counting of number of firms in the sample appearing at least once in the study period; a set of 15 sectoral dummies were also included in the estimation keeping other manufacturing as the base category.

The effect of the purchase of embodied technologies like capital goods and machinery imports is observed to be positive but is significant for Uttar Pradesh alone. Unlike manufacturing firms of Tamil Nadu, those in Uttar Pradesh increasing rely on foreign embodied technologies to improve their international competitiveness.

$RDIN_{it-1}$ has a positive sign and significant for firms' exporting in both Tamil Nadu and Uttar Pradesh. Therefore, firms' R&D signifying created assets is an important factor determining export success. The influence of affiliation to MNEs on firm level exporting is found to be strongly positive. Clearly, export intensity of foreign affiliates is much larger than that of domestic owned enterprises.

The role of domestic business group in exports is found to be quite contrasting between Tamil Nadu and Uttar Pradesh. The significant sign of BGA_i is positive for Tamil Nadu but negative for Uttar Pradesh. Thus, affiliated Indian firms to domestic business groups have higher export

intensity than standalone firms (i.e. firms not affiliated to domestic business groups) in Tamil Nadu but they are outperform by standalone firms in Uttar Pradesh.

The explanatory factor FSB_{it-1} included to capture the role of fiscal incentives, exerted a positive and strong influence on export activities in both the states. Thus, fiscal incentives for exporting have emerged as a major driver of international business of firms in Tamil Nadu as well as Uttar Pradesh.

ADV_{it-1} representing advertising activities of firms comes up with a negative sign across estimations but could not attain the level of statistical significance. This shows that manufacturing firms from both Tamil Nadu and Uttar Pradesh are less likely to be deriving any independent advantage for exporting from the size of their advertising and marketing activities.

Out of 15 sectoral dummies included in the estimation, significant coefficients are found for 8 dummies for Tamil Nadu and 11 dummies for Uttar Pradesh¹⁴. This generally suggests that firms' export behaviour is significantly differs across sectors but the sectoral heterogeneity in exporting is relatively more widespread in Uttar Pradesh than Tamil Nadu.

6. Concluding Remarks

Export performance of individual home economy has, traditionally, been analyzed and investigated at the national level, often with a sectoral focus or firm level exploration. In most instances, international business literature and trade theories have taken individual country as the locational unit for analyzing the origin of national export flows. However, treating large and geographically vast countries like India as the spatial unit for the analysis is to ignore enormous regional disparities that characterize the growth of national exports. Clustering and agglomeration have become all the more important as the sources of competitiveness required by firms to succeed in export markets.

As a result, the present study has analyzed the export performance of two selected Indian states, with a strong interest to explore and understand importance of subnational spatial factors including policies in shaping exports. The 1990s and 2000s periods have seen double digit growth rate of manufacturing exports from Tamil Nadu and Uttar Pradesh, though the former is considerably ahead in terms of the scale of exports. States' manufacturing export intensities and share in national manufacturing exports further testify the wide disparities that characterize the export performance between Tamil Nadu and Uttar Pradesh.

The locational characteristics that may be shaping the differential export performance between these two states were analyzed. As compared to Uttar Pradesh, Tamil Nadu possessed locational advantages of large size of regional market with more diversified local demand, greater technological activities and technology-intensive structure of manufacturing, higher spatial density of the availability of knowledge institutions, higher educational enrolments adjusted for state population size and most of the infrastructure variables covering power generation, telecommunication density, spatial density of road length and credit advances by commercial banks, and access to port. Differences between Tamil Nadu and Uttar Pradesh on these locational factors are likely to be generating asymmetrical incentives for exporting on the part of local firms.

¹⁴ Result on sectoral dummies is not provided in the relevant Table to save space but it is available upon request.

With the liberalization of national level policies, targeted subnational policies aiming at regional growth and competitiveness can become parameters of national economic and export developments. Regional policy makers need to recognize that local firms' access to global markets is a means of maximizing the long-term regional growth while maintaining desired levels of local employment. Therefore, regional policies for promoting local technological activities, targeting high-technology sectors within manufacturing, establishing more knowledge institutions and encouraging their linkages with local industry, and improving critical infrastructural supports for production are critical elements in ensuring the efficiency and competitiveness of local firms. States with proactive subnational policies, hence, become efficient production sources than other states without such policies.

Increasingly Indian states like Tamil Nadu, Uttar Pradesh, Gujarat, Karnataka are found to have been designing policies and institutions for facilitating firms' exporting (Pradhan and Das, 2012; Pradhan, Zohair and Alagawadi, 2013). Regional governments' growing recognition of the positive effects of exports on regional growth is a welcome development for the globalizing economy of India currently focusing on 'make in India' programme and enhancement of global competitiveness. Subnational policy action to expand local innovation and skilled human resources and to ensure adequate knowledge and physical infrastructure is likely to be very important in evolving international competitiveness of the Indian economy.

At the firm level, manufacturing exporting from Uttar Pradesh and Tamil Nadu is significantly led by firms that are relatively young, large sized, R&D intensive, and foreign owned. While domestic business groups are more export oriented for Tamil Nadu, in Uttar Pradesh they are more focused on domestic markets than standalone enterprises. Fiscal incentives for export promotion is found to be serving their objectives and are significantly promoting firms' exports in both these states. Firms' export intensity in both the states varies significantly across different industries within manufacturing. The disappointing export performance of old and domestic owned firms in both these states calls for special policy focus on these categories of firms. Local governments may undertake special drives targeting these firms with information diffusion on export opportunities, export markets and existing state policy supports for exporting.

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