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Regional export advantage of rising power SMEs

Analytics and determinants in the Indian context

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Abstract

Purpose – The purpose of this study is to examine the subnational regional dimension of exports by small and medium-sized enterprises (SMEs) in India, one of the prominent emerging economies or "rising powers".

Design/methodology/approach – To understand the forces driving the variation in subnational region's share in international business of rising power SMEs, an analytical conceptual framework on regional export advantage (REA) was formulated based on the review of relevant theoretical and empirical literature. The model was estimated for Indian states using the most appropriate and recently developed econometric technique of fractional logit model.

Findings – The paper provides evidence that the emergence of exports by rising Indian power SMEs is geographically limited to a few select regions/states. Southern Indian states alone accounted for half of exports from SMEs in the organized manufacturing sector during 2000-2008, followed by Western India. The REA analysis has brought to the fore that regional stock of technological knowledge, availability of skill, port facilities, urban areas and foreign direct investment stocks are crucial factors determining states' share in SME exports across technological subcategories. However, the size and sophistication of local demand continue to influence states' efforts at enhancing exports by SMEs, at least those belonging to the medium- and high-technology categories.

Research limitations/implications – The proposed empirical framework could be extended to include institutional and political economy factors. Its application to subnational regional shares in total exports by all firms taking into account fixed effects for regions may be another feasible line of future research.

Practical implications – Empirical findings recognize that appropriate strategies by subnational policymakers are important for a region to achieve a higher contribution in national SME exports. Subnational policy measures aimed at upgradation of regional technological assets and skill base through the promotion of technology clusters and R&D of local firms, facilitation and creation of better industry-university linkages and investments in education and training institution may help the states to gain higher export advantage.

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Originality/value – This paper provides new analytics and insights into the role of subnational spaces in the internationalization of rising power SMEs from India and serves to contribute to the extant international business research that is predominantly occupied with "nation" as the unit of location.

Keywords India, Exports, Rising power SMEs, Advantage

Paper type Research paper

1. Introduction

In the literature on internationalization, the analysis on the role of space has largely been confined to the country as the unit of location. The locational preference of firms in the origin and direction of their cross-border activities is conceptualized, analyzed and considered at the level of a country (Beugelsdijk and Mudambi, 2013; McCann and Mudambi, 2005). Spatial heterogeneity often gets characterized by inter-country differences in the level of economic development, infrastructure, size and growth of market, availability of tangible and intangible assets, institutional and cultural environment.

Recently, international business research, however, has started emphasizing subnational spatial heterogeneity that might play a significant role in the internationalization activities of firms (Beugelsdijk and Mudambi, 2013). Subnational regional distance reflecting variation in locational advantages in market characteristics, resources, institutions and agglomerations are found to have significant explanatory influence on foreign affiliates' performance in host location (Chan *et al.*, 2010), location of foreign direct investment (FDI) (Nunnenkamp and Stracke, 2008; Li and Park, 2006; Deichmann *et al.*, 2003) and origin of exports (Pradhan and Das, 2013; Matthee and Naude, 2008).

This growing recognition of the role of subnational spaces in firms' international activities is yet to be incorporated into the literature on international business of firms from the so-called "rising powers" (Sinkovics *et al.*, 2014a, 2014b). Empirical studies exploring outward investments of rising power firms are mostly focused on investment characteristics and firm strategies at the level of home country or their locational preference among host countries (Pradhan, 2011, 2008; Sauvant *et al.*, 2010b, 2010a; Gammeltoft *et al.*, 2010; Ramamurti and Singh, 2009; UNCTAD, 2007, 2006). The role of subnational regions in the growth of rising power firms has received little attention. Similarly, analysis on exporting by rising power firms continued to be focused on national-, sectoral- and firm-level analyses with inadequate recognition of the influence of subnational regional factors (Pradhan and Das, 2013).

A few recent studies on rising powers like China (Wu, 2007; Perkins, 1997), India (Pradhan and Das, 2012) and South Africa (Matthee and Naude, 2008) have all indicated that the export activities of rising power firms are considerably regionally concentrated within the home economy. Interregional disparities in the origin of national exports are, thus, a remarkable feature of recent export performance of emerging economies. This is a reflection of the rise of the subnational competitive systems increasingly determined by the spatially agglomerated production and innovation within a given national boundary (Mytelka and Farinelli, 2000; Das, 2008). National export growth can, thus, be seen in terms of subnational regional competitive advantages in exporting. This may raise the question as to why international business of rising power firms is unevenly organized over subnational spaces.

The subnational regional variation in rising power firms' exports is substantial and could be a result of a number of region-specific factors that are important for firms'

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location and regional technological activities. Marshall (1890) suggested that specialized industries may get spatially concentrated in localities abundant with skilled labor and supporting and ancillary trades. Where globally competitive industries have evolved being concentrated in spaces across the world (Porter, 1990), spatial groupings of interlinked businesses have largely driven the competitive advantages of national economies (Porter, 1998). The geographical proximity of increasing number of firms and organizations in a given subnational region allows for interactive learning and innovation through the exchange of tacit and explicit knowledge (Asheim and Isaksen, 1997, 2002; Cooke, 2001). Localities, cities and regions have, eventually, increasingly become the chosen level for studies on technological developments and competitiveness of firms and nations (Isaksen, 2001).

Although typically valid for the modern subsectors, the so-called new economic geography provides an intense view on how local external economies of scale and falling transport costs may induce similar firms to agglomerate (Krugman, 1991a, 1991b; Fujita and Krugman, 2004). The industrial districts and "innovative milieu" approaches place economic success of nations at the subnational levels of geographically defined productive systems that foster local innovation by easing information flows, facilitating network linkages and boosting social relations (Lawson, 1997). The creative synergies and social networks among Silicon Valley's engineers, managers and entrepreneurs and their drive for cooperative technological developments, for example, resulted in the global success of the Valley (Castells and Hall, 1994). It may be surmised that a nation's competitive and innovative advantages in specific segments of global markets are increasingly being related to the rise of a few selected local regions within the national boundary.

Against this backdrop, the present study concentrates on subnational regional disparities in the emergence of exporting by firms from a rising power, India. The particular focus is on Indian small and medium-sized enterprise (SME) exports. SMEs play a prominent role in the industrial and growth dynamics of most countries including emerging economies contributing to the generation of large scale employment and improving regional income. However, resource constraints in capital, information, management expertise, technology and other intangible assets that are hallmarks of SME business tend to discourage SMEs' greater involvement in export markets and outward investments (Pradhan and Sahu, 2008; UNCTAD, 2007; Hollenstein, 2005; Karagozoglu and Lindell, 1998; Acs *et al.*, 1997).

UNCTAD (2007) reported that SMEs from India tend to undertake invariably small volume of overseas investments as compared to their large-sized counterparts, as they have insufficient resources to meet the costs of information collection (e.g. foreign markets, government regulations and consumer preference) and are less able to withstand the uncertainty and risk associated with such internationalization activities. Hence, accentuating competition in domestic markets of open emerging economies like India tends to underscore the importance of international business like exports or outward FDI for harnessing the SME sector which is vital for employment generation, decentralized industrialization and promotion of local entrepreneurship[1].

When the extant literature on exporting by rising power SMEs is yet to recognize the subnational spatial dimension of export performance, the contribution of the present study is important. Firm-specific factors and industry characteristics continue to receive focus as main factors influencing SME exports. Technology (R&D, technology importing and training investment), firm size (over a relevant range), skills of the workforce and labor productivity are observed to be key drivers of exporting by Taiwan's SMEs (Yang *et al.*, 2004). In South Africa, enterprise export probability is positively related to size class, age, competition within South Africa, access to borrowed finance, corporate tax, business linkages and access to information (Gumede, 2004). Argentinian SMEs are likely to export if they possess large size, source inputs from abroad, invest in product improvement and possess higher labor productivity (Ottaviano and Martincus, 2011). Ngoc *et al.* (2008) reported that technological activities (product innovation, process innovation and product modification) and size are two important determinants of exporting by the Vietnamese SMEs. Exporting Indian SMEs in the pharmaceutical sector have been found to be determined by firm size, R&D, imports of capital goods and fiscal incentives (Pradhan and Sahu, 2008). As a number of the these enterprise-level factors like technology are often linked to local institutions and resources like regional technological knowledge base, skills, agglomeration, analysis of subnational region's role in SME exports is warranted.

In the present study, subnational regions' share in rising power SME manufacturing exports from India is interpreted as an indicator of regional competitive advantage in Indian SME exports. The aim of this study is to seek answer to the following: why do a few subnational spaces claim disproportionate share in the rising power SME exports from India? What drives disparities in regional export advantages (REAs) of rising power SMEs within a given country? Findings from the Indian experience on the regional advantage in SME manufacturing exports may be useful to the policymakers of many other emerging economies that boast a strong SME sector. Starting with developing an analytical framework on REA based on relevant theoretical literature in Section 2, Section 3 offers a quantitative picture on the share of Indian states in SME exports from the organized manufacturing sector. Section 4 discusses econometric issues and estimations of empirical model on REA. Results are summarized and discussed to draw relevant inferences in Section 5. The final section sums up the study.

2. Developing an analytical framework on subnational REA

A notable volume of research during the past three decades tends to emphasize that the competitive advantage of exporting firms cannot be understood without examining the characteristics of the locations in which the firms are based. The recognition of space in competitive advantage brings into sharp focus the role of regional scale in resource endowments of labor, capital and knowledge, spatial competitive and cooperative interactions, geographic agglomeration and clustering, localized knowledge externalities, specific and general purpose infrastructure, local institutions and policies (Porter, 2003; Lengyel, 2004; Asheim and Gertler, 2005; Martin *et al.*, 2006; Camagni, 2008; Das, 2008). Drawing upon this genre of literature, the present study proposes the following framework as summarized in Figure 1 for the analysis of export share of subnational spaces.

In the above-mentioned framework, subnational regions are treated as territorially defined productive systems with a cumulative process of endogenous resource creation, accumulation, diffusion and transfer so as to determine regional export shares. This view about regions is essentially derived from the vast literature on industrial districts (Markusen, 1996; Sforzi, 2002; Beccatini *et al.*, 2003), innovative milieu (Camagni, 1995; Maillat, 1998) and learning region (Rutten and Boekema, 2007). A region is summarized

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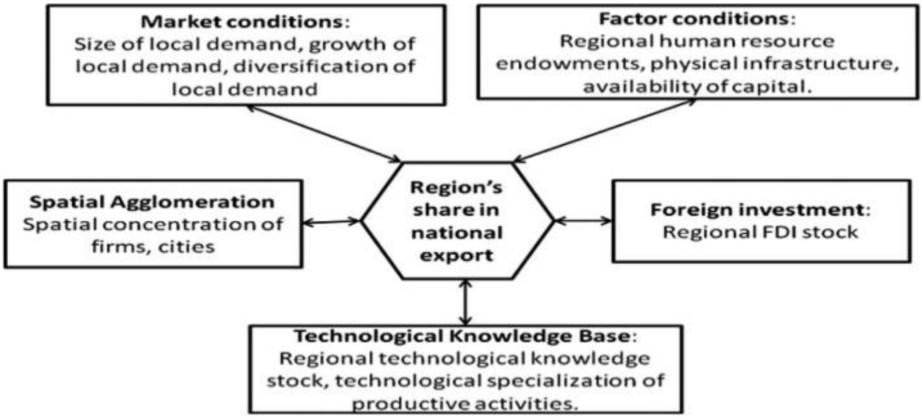

Source: Author's conceptualization

Figure 1.
Regional export competitiveness

by its stock of knowledge and information, institutions, interactive interactions and skilled labor force; the higher are the levels of such resources, more likely it is for firms embedded in this region to gain competitive advantages for greater export activities.

The competitive advantage of a region's export sector is importantly influenced by its stock of technological knowledge. A higher knowledge stock would increase technological opportunities and yield intra-temporal knowledge spillovers for greater R&D performance of local firms, which may, in turn, lead to higher export share by the region. The flow of new knowledge being directly related to the existing stock of knowledge and the number of scientists and engineers engaged in R&D is also supported by the R&D-based models of economic growth (Romer, 1990; Jones, 1995; Abdih and Joutz, 2006). In the theory of "technology gap" on international trade, countries engaged in innovation 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). To a certain extent, this may also be true at the subnational level when a few technologically advanced regions within a country may dominate the national export baskets.

A region's export performance may also be shaped by the technological structure of its industrial base (Pradhan and Das, 2013). Certain regions appear to be leaders in targeting and promoting technology-intensive manufacturing activities. Such regions are likely to have greater involvement in global markets as technology-intensive products are the fastest growing category in the world trade (Lall, 2000), and also a greater specialization in technology-driven industrial sectors generate extensive knowledge spillovers in the host regions.

With skill and technology intensity becoming critical factors in world manufacturing exports (Lall, 2000), regions with rich endowment of low-cost skilled and technical human power can be expected to be export leaders in a country. It is argued that exporting firms rely on the use of skilled workers to differentiate their products to beat the intense competition in international markets (Munch and Skaksen, 2008). A growing body of firm-level literature supports that exporting firms pay higher average wages than non-exporting firms, as the former uses more educated labor than the latter

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category of firms (Bernard and Jensen, 1995; Schank *et al.*, 2007). Thus, regions with poor human capital base are likely to be export laggards as their firms get deprived of access to required endowment of skills.

The regional disparities in exports could be related to the inter-regional differences in the availability and quality of different physical infrastructure like reliable supply of power, transportation system (roadways, railways and airways), ports and telecommunication networks (telephone, internet, etc.) that critically determine the cost of production, transportation and evolution of supply capacity among regions (Redding and Venables, 2004; Fugazza, 2004). A number of empirical studies has verified the trade-facilitating role of these physical infrastructure (WTO, 2004; Fugazza, 2004; Francois and Manchin, 2007).

The export share of regions may very well be related to the development of their financial institutions that ensures firms' access to industrial and trade finance and products for insurance. Inadequate access to finance has been the single most important constraint on firm growth and internationalization in emerging economies (Morris *et al.*, 2001; Mbekeani, 2007; Pradhan and Sahu, 2008). As regions vary greatly in terms of adequate availability of finance to firms, inter-regional differences in building financial institutions and supply of credit could be another important factor explaining regional differences in the export share.

Spatial agglomeration of firms may be another factor relevant to the analysis of a region's share in national exports. Regions experiencing greater number and extent of spatial concentration of productive units could leverage the localized knowledge flows and spillovers, labor market pooling, input sharing and demand proximity to gain an edge in exporting (Muro and Katz, 2010). Physical proximity, locally embedded exchanges and knowledge spillovers are critical elements of the evolution of product-specific clusters (Porter, 1998; Das, 2005) and drive adaptation, learning, innovation and competitiveness of firms located in these clusters (Malmberg and Maskell, 2002). Strong spatial agglomerations in a region also benefit firms from being placed closer to consumers, productive resources and access to transport and a supportive infrastructure. Further, the existence of a pool of exporters in a region may positively influence the exporting decision of non-exporting firms in proximity (Koenig, 2009).

Urban centers/cities have become an important source of global competitiveness, as they are found to be more innovative and productive (Simmie *et al.*, 2002; Acs *et al.*, 2002; Lim, 2003; Bettencourt *et al.*, 2007; Rothwell *et al.*, 2013). They offer a number of agglomeration-related advantages to firms, namely, proximity to demand, variety and access to urban assets that allow conducive environment for innovation (Athey *et al.*, 2007). States with larger urban locations, thus, may enjoy certain advantage in undertaking exporting activities.

Disparities in regional share in national exports may also be determined by the regional distribution of FDI. The role played by FDI in the export growth from a number of developing host countries has been significant and becoming considerable in recent time (UNCTAD, 2002). The presence of foreign firms not just brings knowledge and tangible assets to expand the supply capacities of host economies/regions, but it also provides access to two-thirds of world export markets associated with the activities of multinational enterprises (MNEs) (UNCTAD, 1999). MNE affiliates directly contribute to the regional exports and may boost exports by domestic firms through the creation of

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forward and backward linkages in the host region, knowledge-spillovers and pro-competitive effects (Markusen and Venables, 1999). Therefore, regions hosting relatively large amount of FDI inflows can be more export-contributing than another region less attractive to foreign firms. The regional origin of Chinese exports is concentrated in the coastal and central regions which are exactly the provinces that host disproportionate share in FDI inflows into China (Sun, 2001). However, if FDI is predominantly market-seeking in character, then its competitive effect may adversely affect export activities of domestic firms (Pradhan and Das, 2013).

The characteristics of the regional market may contribute to the REA significantly. Large market of a region may be viewed as profitable for exporting by host firms as larger markets facilitate concentration of production with increasing returns and saving on transport costs (Krugman, 1991a; Fujita *et al.*, 1999). Regions having large sized and growing markets benefit from the critical minimum demand for better products and processes, presence of specialized suppliers, labor pool, and lower transaction costs (Caniels and Romijn, 2005). In the present study, the regional gross state domestic product (GSDP) (*SDP*) is used as a proxy to the absolute size of the regional market and regional per capita SDP (*PSDP*) has been used to represent the importance of the sophistication of regional demand for more product varieties.

The above discussion on the determinants of REA can be summarized in the following econometric relationship for Indian subnational regions/states:

$$\begin{aligned} REX_{kt} = {} & \beta_0 + \beta_1 SDP_{kt} + \beta_2 SDPG_{kt} + \beta_3 PSDP_{kt} + \beta_4 STKS_{kt} + \beta_5 SKL_{kt} \\ & + \beta_6 SPWR_{kt} + \beta_7 STRP_{kt} + \beta_8 SPRT_{k} + \beta_9 STI_{kt} + \beta_{10} SFN_{kt} \\ & + \beta_{11} SFDI_{kt} + \beta_{12} SPL_{kt} + \beta_{13} SCON_{kt} + \beta_{14} TWN_{kt} + \varepsilon_{it} \end{aligned} \quad (1)$$

where explanatory variables are as measured in Table I, and ε_{it} is the random error term. In this model, the subnational units of our analysis are states in India.

The validity of the REA framework proposed above can be empirically applied to all categories of rising power firms irrespective of their sizes and business group affiliation, as subnational spatial heterogeneity might be driving Indian firms' strategy with respect to international business, like exports and outward FDI. This REA framework recognizes that it is not the whole of the economy of India that is "rising", but most of the dynamic energy propelling it forward is residing in a select number of dynamic regions and clusters. Ramamurti (2010) proposed that large emerging economies like India may be viewed as collections of highly underdeveloped (e.g. Bihar, Odisha or Chhattisgarh) and highly developed parts (e.g. Maharashtra, Gujarat or Tamil Nadu) and the latter hosting industries or firms that are quite sophisticated, in terms of technology, operations and management to be capable of spawning global firms. Thus, SMEs based in highly developed subnational regions in India are likely to be major exporters.

3. Inter-regional differences in Indian SME manufacturing exports

It is clear from the above discussion that subnational spaces may have distinct export advantage of rising power firms if they possess abundant competitive resources, infrastructure, institutions and human power within their boundary. Hence, export activities of rising power firms including SMEs are likely to differ substantially between subnational regions, given the extent of regional disparities in such determinants of export advantage. What is the profile of REA in India with respect to SME exports? This

Variables	Symbols	Measurements
Dependent variable		
Regional export share	REX_{kt}	Goods and services exports of *k*th Indian state as a ratio of total exports from India in the year *t*
Independent variables		
Demand conditions		
State domestic product (SDP) (net)	SDP_{kt}	Natural log of GSDP (constant 1999.00 Indian Rs.) of *k*th Indian state in year *t*
Growth of SDP	$SDPG_{kt}$	Annual percentage change in SDP (constant 1999.00 Indian Rs.) of *k*th Indian state in year *t*
Per capita SDP	$PSDP_{kt}$	Natural log of per capita SDP (constant 1999.00 Indian Rs.) of *k*th Indian state in year *t*
Factor conditions		
State skills availability	SKL_{kt}	Natural log of higher education enrolments in *k*th Indian state for *t*th year
State power availability	$SPWR_{kt}$	Power generated (kWh) per 100,000 population of *k*th Indian state for *t*th year
State land transport infrastructure	$STRP_{kt}$	Total road and railway line length (km) per 100 km^2 area of *kth Indian state for t*th year
State port infrastructure	$SPRT_k$	Dummy variable taking value 1 if *k*th Indian state possesses port facilities, 0 otherwise
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 by scheduled commercial banks (Rs. crore) per 100,000 population of *k*th Indian state for *t*th year
Regional technology		
State technological knowledge stock	$STKS_{kt}$	Natural log of the number of cumulative patent applications from *k*th Indian state since 1989-1990 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*
FDI location		
State's inward FDI	$SFDI_{kt}$	Cumulative FDI inflows since 1982-1983 into *k*th Indian state as a per cent of its GSDP in year *t*
Spatial agglomeration		
Spatial concentration of firms	$SCON_{kt}$	Number of manufacturing factories per 1,000 sq km of area of *k*th Indian state in year *t*
Towns	TWN_{kt}	Natural log of number of towns possessed by *k*th Indian state in year *t*

Notes: High-technology manufacturing sectors include chemicals, pharmaceuticals, electrical and optical equipment, machinery and equipment and transport equipment; 1 crore = 10 million

Table I. Description and measurement of variables

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can be assessed by analyzing subnational regional or state-wise data on SME exports, which is presently not available for India. This study draws upon a unique locational dataset that provides regional exports data of Indian manufacturing firms from the organized sector only. It should be noted that the average of state-level shares of SMEs in the organized sector manufacturing exports discussed below is not comparable to 40 per cent share of SMEs in national exports reported in the official source. While the latter source covers all commodities exports comprising minerals, agricultural and other primary products as well as exports of manufactured goods from organized and unorganized sectors, the state-wise share of SMEs in the present study is only for the organized sector manufacturing exports.

Table II summarizes results from a region-wise analysis of the manufacturing exports by Indian SMEs operating in the organized sector. Among different regions, West India accounted for the bulk of total exports by SMEs in 1991-1999 with 49 per cent (Table II). South India comes second with 32 per cent share in SME exports. The combined share of top two regions reached 81 per cent. Maharashtra (32 per cent), Tamil Nadu (13 per cent), Gujarat (11 per cent) and Karnataka (10 per cent) emerged as major states in contributing to SME exports during the same period.

Regional disparities in SME exports further increased during the period 2000-2008. The share of south India rose to almost half of the total SME exports from India, and it overtook West India as the most dynamic region for SME exporting. West India, however, saw its export share decline to 32 per cent during 2000-2008. Among major exporting states, Karnataka emerged as the home to more than 38 per cent of SME exports of manufactures from India during this period. Maharashtra with 24 per cent and Delhi with 12 per cent are other major states contributing to SME exports. The share of Gujarat in SME exports fell to 6 per cent during 2000-2008. This suggests that Gujarat, while boasting a strong SME sector, depends more on large firms for its export growth.

The share of SMEs in the state-level manufacturing exports demonstrates that Indian states' exports are mostly due to large firms. SMEs represent less than 10 per cent share in state-level exports for as many as 17 states and accounted for 10-19 per cent for another subgroup of eight states during 1991-1999. Delhi is the only subnational entity where SMEs had strong export contribution, accounting for above 67 per cent. Compared with the 1990s level, the share of SMEs in state-level exports declined for 19 states at different rates during 2000-2008. Deviating from this negative trend, SMEs share in manufacturing exports rose for Karnataka by 86 per cent to reach 29 per cent during 2000-2008, and similar sharp rise can be noticed for Pondicherry, Uttarakhand and West Bengal.

Judging from these trends, it can be said that manufacturing exports by Indian SMEs are pronouncedly concentrated among a few Indian subnational regions/states. Policymakers from states focusing on the SME sector to harness their exports could take note of the declining share of SMEs in national manufacturing exports so as to devise discrete strategies. In the following section, the relevant issue of the determinants of REA has been explored.

4. Estimation issues, methods and data sources

The REA function expressed in equation (1) takes the dependent variable (*REX*) as a fractional response variable, which is theoretically bounded between 0 per cent for

Region/State	SME manufacturing exports (US$ million) 1991-1999	2000-2008	As per cent of total manufacturing exports 1991-1999	2000-2008
Central India	96.9 (1.7)	88.4 (0.4)	2.4	0.8
Chhattisgarh	1.0 (0.0)	6.8 (0.0)	0.2	0.3
Madhya Pradesh	95.9 (1.7)	81.6 (0.3)	2.7	0.9
East India	210.7 (3.6)	529.9 (2.2)	2.2	2.3
Bihar	2.6 (0.0)	1.7 (0.0)	0.2	0.1
Jharkhand	28.4 (0.5)	0.4 (0.0)	2.1	0.0
Odisha	49.0 (0.8)	14.8 (0.1)	2.1	0.2
West Bengal	130.7 (2.3)	512.9 (2.2)	2.8	4.9
North India	741.0 (12.8)	3627.9 (15.3)	6.0	8.8
Chandigarh	1.4 (0.0)	2.7 (0.0)	14.7	1.0
Delhi	142.1 (2.5)	2827.3 (12.0)	67.1	66.8
Haryana	117.4 (2.0)	195.9 (0.8)	3.8	2.3
Himachal Pradesh	27.9 (0.5)	3.9 (0.0)	3.4	0.1
Jammu & Kashmir	0.1 (0.0)	1.3 (0.0)	0.1	0.1
Punjab	59.0 (1.0)	95.7 (0.4)	2.4	1.4
Uttar Pradesh	354.9 (6.1)	267.9 (1.1)	8.1	2.1
Uttarakhand	38.2 (0.7)	233.2 (1.0)	3.2	6.8
Northeast India	63.4 (1.1)	31.9 (0.1)	4.4	1.8
Assam	63.4 (1.1)	31.9 (0.1)	4.4	1.9
South India	1858.1 (32.1)	11794.6 (49.9)	10.6	14.8
Andhra Pradesh	198.5 (3.4)	870.0 (3.7)	4.7	4.8
Karnataka	593.0 (10.2)	9064.8 (38.3)	15.6	29.0
Kerala	299.5 (5.2)	317.5 (1.3)	17.2	5.7
Pondicherry	2.9 (0.1)	10.1 (0.0)	2.5	6.1
Tamil Nadu	764.2 (13.2)	1532.0 (6.5)	10.1	6.2
West India	2823.1 (48.7)	7586.4 (32.1)	9.7	4.6
Dadra & Nagar Haveli	103.8 (1.8)	19.6 (0.1)	18.5	0.5
Daman & Diu	24.1 (0.4)	99.8 (0.4)	11.6	4.7
Goa	37.3 (0.6)	49.5 (0.2)	14.7	5.6
Gujarat	621.4 (10.7)	1346.9 (5.7)	5.9	1.7
Maharashtra	1868.5 (32.3)	5755.9 (24.3)	12.0	7.8
Rajasthan	168.0 (2.9)	314.6 (1.3)	8.4	4.4
Grand Total	5793.2 (100)	23659.0 (100)	7.8	7.3

Note: Percentage shares to total exports by SMEs are in parentheses
Source: SPIESR-GIDR locational dataset of Prowess manufacturing firms (2010)

Table II. SME manufacturing exports by states in India

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states contributing a negligible amount to national SME exports and 100 per cent (or 1 in the case of ratio) for a state that alone is the source of SME exports. The main intention here is to identify the subset of factors from a $1 \times K$ vector of explanatory variables $x = (x_1, x_2, \ldots, x_k)$ that may meaningfully describe the indicator of REA REX, $0 \leq REX \leq 100$. A linear conditional mean specification for REX, $E(REX|x) = x\beta$ where β is a $K \times 1$ vector of coefficients is not appropriate, as REX is bounded at its lower and upper bounds. The effect of any explanatory variable is likely to be non-linear and inconstant in its entire range, contrary to the assumptions behind a linear specification (Papke and

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Wooldridge, 1996; Ramalho *et al.*, 2011). Further, predicted values from such a linear specification do not necessarily lie in the unit interval.

Modeling the log-odds ratio as a linear function has been a popular approach to deal with the fractional variable *REX*: $E(\log[REX/(1 - REX)|x) = x\beta$ which is basically a linearization of the logistic formulation: $E(REX\ |x) = e^{x\beta}/(1 - e^{x\beta})$. However, the log-odds transformation of *REX* requires the responses to be strictly between zero and one. *Ad hoc* adjustments must be made for arriving at the log-odds ratio for *REX* observations that are at the boundary values of zero and one (Ramalho *et al.*, 2011). When facing a large proportion of the data located at the extremes, *ad hoc* adjustments are the least plausible (Papke and Wooldridge, 1996). Moreover, additional assumptions are necessary to recover $E(REX|x)$ from the estimated model.

Tobit model has been advanced to handle the possibility of a non-negative response variable having multiple observations at the upper and/or lower limits. In this approach, a latent variable $REX^* = E(REX^*|x) + \varepsilon$ is introduced whose conditional expectation is described as a linear function: $E(REX^*|x) = x\beta$. The observed *REX* values are assumed to become REX^* if $REX^* > 0$ and to attain a zero value if $REX^* \leq 0$. *REX* is interpreted as a censored variable because its true values are observable for a restricted range of observations, whereas values of independent variables *x* are known for all observations. According to Tobin (1958), consistent estimates for such a limited dependent variable can be obtained by the use of the maximum likelihood (ML) estimation. However, any deviation from the assumptions of normality and homoscedasticity leave the obtained ML estimates as inconsistent. It is also argued that a censored specification, like Tobit on proportions data that contain 0, 1 and intermediate values, is not an appropriate strategy, especially when the observed data are not truly censored in its character but are a natural outcome of individual choices (Ramalho *et al.*, 2011; Baum, 2008). For proportions data, values outside the [0, 1] interval are not feasible, as they are naturally bounded.

In the backdrop of the limitations of aforementioned methods, a number of alternative approaches have recently been suggested for the models involving bounded dependent variables with observations at the boundaries. These methods are as follows:

- fractional logit model (FLM) proposed by Papke and Wooldridge (1996);
- two-part fractional model (TFM) by Ramalho and Silva (2009); and
- fractional panel probit model (FPPM) by Papke and Wooldridge (2008).

TFM basically is a reformulation of Papke and Wooldridge's (1996) FLM into a discrete component formulated as a standard binary choice model and, conditional on this decision, a continuous component expressed as a fractional regression equation.

4.1 Fractional logit model

Papke and Wooldridge (1996) proposed the quasi-maximum likelihood (QML) estimator to describe the data generation process for a fractional-dependent variable like *REX* on the closed interval [0, 1]. The conditional expectation of *REX* is defined as $E(REX\ |x) = G(x\beta)$, where G(.) is a known non-linear function and is well-defined even if *REX* assumes 0 or 1 with positive probability. Any cumulative distribution function may be specified for G(.) including Bernoulli for binary data. Taking the Bernoulli log-likelihood function, $LL_i(\beta) = REX_i \log[G(x_i\beta)]+(1-REX_i) \log[1-G(x_i\beta)]$, which is a density in the linear exponential family, the QML estimator $\hat{\beta}$ is derived by maximizing the $\Sigma_{i=1}^{N} LL_i(\hat{\beta})$ with respect to $\hat{\beta}$.

With the correct specification of $E(REX|x) = G(x\beta)$, the obtained estimator is consistent and asymptotically normal regardless of the true distribution of REX_i conditional on x_i and nature of REX_i (i.e. continuous or discrete, or possess both continuous and discrete characteristics). Oberhofer and Pfaffermayr (2012) replicated the fractional logit results of the seminal paper of Papke and Wooldridge (1996) based on the standard routines provided in the statistical software, STATA, and observed that their proposed RESET specification test is useful for detecting neglected non-linearities in the small samples. In the export literature, Wagner (2001) has used the QML method based on the logistic specification, which is the FLM, to examine relationship between the firm size and exports for a sample of German manufacturing establishments.

In 2008, Papke and Wooldridge extended their methodological treatment of the fractional response variable to the context of panel data (Papke and Wooldridge, 2008). Under the assumption of exogeneity of a set of explanatory variables x_{it} and a probit response function, the conditional mean of the fractional response variable, REX_{it} ($0 \leq REX_{it} \leq 1$), has been expressed as $E(REX_{it}|x_{it}, c_i) = \Phi(x_{it}\beta + c_i)$, where $\Phi(.)$ is the standard normal cumulative distribution function and c_i is the unobserved heterogeneity. Once a conditional normality for the distribution of c_i given x_{it} similar to Chamberlain (1980) is assumed, $c_i|X_i \sim N[\alpha + \acute{\eta}\,\bar{x}, \acute{o}]$ with X_i denoting the $T_i \times K$ matrix of data on x_{it} for the T_i periods, estimates for the parameters β_j, and the average partial effects of the covariates across the distribution of c can be identified. This FPPM can be estimated by the pooled quasi-MLE through the generalized linear method (GLM) or a generalized estimating equation (GEE)[2].

Given that ours is a panel dataset, ideally, the suitable method of estimation would be FPPM. However, the inclusion of individual explanatory variables, x_{it}, their region-specific time averages $\bar{x}_i$ and year dummies as required in the FPPM resulted in widespread and severe multicollineairty. The estimated variance inflating factor (VIF) for SDP_{kt} stands as high as 3,488, followed by 666 for $PSDP_{kt}$, 121 for $STKS_{kt}$, 97 for $SCON_{kt}$ and 52 for SKL_{kt}. In view of this limitation of our sample, we decided to opt for FML with control for year dummies and use GLM command of the statistical package, STATA, with the option for bootstrap standard errors.

4.2 Data source

For the empirical analysis of the REA function A, the dependent variable, namely, states' share in SME exports has been derived from the SPIESR-GIDR Locational Dataset on Indian Manufacturing Firms (SG-LoDIMF). This is a multi-dimensional dataset compiled for the Indian Council of Social Science Research-sponsored research project entitled, *Exploring Regional Patterns of Internationalization of Indian Firms: Learnings for Policy*, and which classifies 8,486 Indian manufacturing firms, obtained from the Prowess database of the Centre for Monitoring Indian Economy (2009), by states and union territories based on the plant location, product profile (producer of single or multi-products) and size of production (capacity/actual). The sample manufacturing firms covered in the SG-LoDIMF database are estimated to have accounted for about 58 per cent of national manufacturing exports during 1991-2008 (Pradhan and Das, 2012). For estimating state-wise SME exports, manufacturing firms with an accumulated value of plant and machinery up to Rs. 100 million are taken as SMEs, and those with value above Rs. 100

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million are designated as large firms[3]. This identification of SMEs has been done based on available firm-specific latest year data on cumulative investment in plant and machinery and specified investment ceilings suggested by the Micro, Small and Medium Enterprise Development Act (2006).

The annual data on states' real GSDP, growth of real GSDP and real per capita GSDP were derived from nominal and real series obtained from various *Statements on State Domestic Product* released by the Central Statistical Organization (CSO). Patent applications according to the state of origin were collected from various *Annual Reports of the Controller General of Patents, Designs & Trade Marks*. Net value added for total manufacturing and high-technology industries used in the calculation of state-level technological specialization of manufacturing sector came from various reports of *Annual Survey of Industries* (*ASI*), CSO. High-technology manufacturing segment is defined to include chemicals, pharmaceuticals, electrical and optical equipment, machinery and equipment and transport equipment. The number of manufacturing factories per state is also collected from the *ASI*.

State-wise FDI stock was estimated by accumulating FDI inflows data since 1982-1983. The FDI inflows data from 1982-1983 to 2003-2004 are on approval terms, and from 2004 to 2005 onward inflows are on actual basis. FDI data up to 2003-2004 came from foreign collaborations dataset maintained by the Institute for Studies in Industrial Development and from 2004 to 2005 information obtained from *SIA Newsletter* (Annual Issue) various years have been used. It needs to be noted that the data related to the subperiod since 2004-2005 is FDI actual inflows data classified as per Reserve Bank of India regions.

State-level higher education enrolments were collected 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. Teledensity data for Indian states came from the *Compendium of Selected Indicators of Indian Economy* (Volume I) of the CSO (2009). Total road length information was compiled from various issues of *Basic Road Statistics of India*, Ministry of Road Transport and Highways, Government of India. Statistics on gross power generation by states is taken from the *Annual Report on the 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 *Money and Banking* brought out by the Centre for Monitoring Indian Economy. Number of towns per state was collected from *Census of India* 1991 and 2001.

5. Empirical results and inferences

The existence of a high degree of linear correlation among explanatory variables may be expected for a model that maps the range of the REA to the domain of 14 explanatory variables identified theoretically and additional 13 year-specific dummies included for controlling year-wise variations. The VIF for SDP_{kt}, SKL_{kt} and $STKS_{kt}$ stands at 35.35, 31.07 and 19.57, respectively. This stresses the need to minimize adverse effects of the multicollinearity on standard errors of estimates. To address this problem, we ran three auxiliary regressions, fitting each of these variables on selected regional factors with which each had a strong correlation (i.e. variables having at least 0.5 magnitude of correlation coefficient), and residuals from these regressions are used in the place of original variables[4].

Moreover, there could be a bias in the estimation from possible simultaneity between regional growth, FDI inflows and flows of exports. As $SFDI_{kt}$ in the present study is expressed as a stock or a cumulative of past FDI flows and REX_{kt} is states' share in national organized sector SME exports in the current year, the scope for such bias is marginal at best. Similarly, the possibility of REX_{kt} influencing states' overall growth realized together by all the sectors like agriculture, services and manufacturing (organized and unorganized segments) may have a marginal consequence.

The results obtained from the FLM estimation of the share of Indian states in SME manufacturing exports over the 1995-2008 period has been summarized in Table III. The reported standard errors are derived from the non-parametric approach of bootstrapping based on 1,000 random samples. The estimation has been conducted for states' share in total SME exports as well as its three technological subcategories, namely, SME high-technology exports, SME medium-technology exports and SME low-technology exports[5]. All the estimated models showed up with chi-square values statistically different from zero. This indicates that the specified model is meaningfully explaining regional advantages in SME exports. R-squared values of the fitted models ranges from 72 to 90 per cent.

Independent variables	Coefficients (Absolute bootstrap *z*-statistic) SME total exports	SME high-technology exports	SME medium-technology exports	SME low-technology exports
SDP_{kt}	1.917360 (1.27)	1.698263 (1.67)*	3.521905 (1.68)*	1.957023 (1.06)
$SDPG_{kt}$	−0.028004 (1.38)	−0.007170 (0.41)	−0.029794 (1.08)	−0.033586 (1.35)
$PSDP_{kt}$	0.725987 (1.62)	1.399149 (3.39)***	2.363293 (2.37)**	0.589659 (0.94)
$STKS_{kt}$	1.725361 (4.86)***	1.361796 (4.38)***	1.823129 (2.94)***	1.791415 (4.26)***
SKL_{kt}	2.471861 (6.17)***	1.955434 (6.31)***	1.509985 (2.12)**	2.473448 (4.67)***
$SPWR_{kt}$	0.004875 (0.88)	0.021371 (4.55)***	0.012020 (1.24)	0.002341 (0.34)
$STRP_{kt}$	0.000324 (0.29)	0.000072 (0.08)	0.000649 (0.18)	0.000409 (0.30)
$SPRT_{kt}$	1.201296 (6.15)***	0.548992 (3.47)***	0.973514 (3.15)***	1.418972 (5.66)***
STI_{kt}	0.065202 (1.96)**	−0.035655 (2.00)**	−0.142840 (2.96)***	0.087506 (2.17)**
SFN_{kt}	0.001140 (0.64)	0.002058 (2.28)**	0.000792 (0.24)	0.000882 (0.39)
$SFDI_{kt}$	0.071066 (5.63)***	0.035041 (4.54)***	0.046003 (1.79)*	0.077159 (4.97)***
$SCON_{kt}$	−0.002549 (2.76)***	−0.000045 (0.06)	−0.002304 (0.46)	−0.003108 (2.51)**
TWN_{kt}	1.515322 (9.46)***	1.418652 (10.64)***	1.776015 (6.22)***	1.589178 (7.56)***
SPL_{kt}	0.018045 (2.65)***	0.034930 (5.38)***	0.016397 (1.57)	0.011949 (1.28)
Constant	−18.128373 (3.92)***	−25.208389 (6.01)***	−35.824955 (3.53)***	−16.998448 (2.65)***
χ^2 (27)!	827.39	824.73	318.72	458.56
Constant	0.0000	0.0000	0.0000	0.0000
R^2	0.77383645	0.89517876	0.71904518	0.71525953
Observations	327	327	327	327

Notes: Dependent variable: state's SME export share (ratio); absolute value of bootstrap *z*-statistics in parentheses; $*p < 0.1$; $**p < 0.05$; $***p < 0.01$; !-test values are obtained from the independent tests conducted to check whether the coefficient of all explanatory variables are simultaneously zero using the testparm command in the STATA; number of states in the unbalanced panel data is 26; year dummies were included in the estimation

Table III. Determinants of regional advantages in SME exports from Indian manufacturing

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5.1 Regional advantages in SME exports

The regional market-related variables, SDP_{kt}, $SDPG_{kt}$ and $PSDP_{kt}$, all turn up with statistically insignificant coefficients for the regional share in SME total exports. Therefore, specificities of local markets generally play a minor role in explaining how different states contribute to SME exports from India. Estimations for technological subcategories of SME exports, however, highlight that impact of market characteristics may rather be important for states' export share only in technology-intensive industry segments. SDP_{kt} has a modestly significant positive effect for the regional share in both high- and medium-technology SME exports, whereas its coefficient is statistically not different from zero for low-technology SME exports. Similarly, the positive effect of $PSDP_{kt}$ is quite strong for the former two technological subcategories of SME exports alone. This empirical finding emphasizes that the size of the local market and per capita income are relevant sources of differences in cross-state contribution to SME exports from technology-intensive manufacturing. The growth of the local market appears to play a fringe role in driving the REA.

$STKS_{kt}$ comes up with a strongly positive coefficient for states' SME export share across estimations. The stock of technological knowledge accumulated by a state, thus, critically influences its share in SME total exports and technological subcategories of SME exports. States with higher technological knowledge are likely to outperform others in accounting for higher national export share, as they enjoy greater technological opportunities and a continuous flow of innovative products and services.

SKL_{kt} representing the availability of skilled labor has a positive coefficient throughout, which is statistically different from zero. Hence, states' lower share in national SME exports may be attributable to their lack of access to human capital. Differential access to skilled human power is a significant determinant of disparities in the SME export share of regions within India.

The availability of electricity symbolized in $SPWR_{kt}$ turns up with a predicted positive effect across estimations but could achieve statistical significance only in the case of SME high-technology exports. Access to power is known to be crucial for the promotion of business activities in a state, but its influence is less prominent in engineering a higher share of the state in national SME exports. For high-technology sectors, though, power supply may still be a factor for states in attaining higher shares in national SME exports.

Among the other infrastructure-related variables, $STRP_{kt}$ was accompanied with a positive sign but could not achieve the accepted level of statistical significance. Thus, land transportation networks, which are a common ingredient for high degree of industrialization of a state and basic performance of its SMEs, may not have distinctive influence to cause any inter-state variation in the regional share of national SME exports. $SPRT_k$ posted with a consistently positive and significant coefficient across estimations. The existence of port facilities in their administrative boundaries appeared to have benefitted host states in strengthening their shares in SME exports.

STI_{kt} picked up a significantly positive coefficient in the estimation for states' share in SME total exports. States with higher telecommunication density, on an average, are generally stronger contributors to the national SME exports. Estimations for technological subcategories reveal that telephone connections may have a specific and catalytic role in the REA of states in low-technology sectors. Industries where competition is more on cost than quality and business operation is with lower margin,

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SMEs may be overwhelmingly using low-cost telephone network for communication needs and networking, whereas high-end and sophisticated channels of communication like internet might be the preferred choice for SMEs in high- and medium-technology sectors.

SFN_{kt} experienced a positive coefficient, which is statistically different from zero for SME exports in the high-technology sector. Thus, credit advance by commercial banks is a relevant source for states' growing share in SME high-technology exports. $SFDI_{kt}$ was associated with a positive and significant effect across estimations. This suggests that states receiving growing FDI stock tend to have a greater share in SME exports. As foreign firms are possessing higher export intensity than their domestic counterparts in the total manufacturing sector (Kumar and Pradhan, 2007; Aggarwal, 2002) as well as the SME subsector (Pradhan and Das, 2013), larger volume of FDI means that the state is hosting increasing number of export-intensive firms. So export gains from the increasing number of foreign affiliates may be more than compensating any negative competitive effect that they may have on the market orientation of domestic enterprises. Moreover, some SMEs may become more active in export markets when increasingly foreign firms create local linkages and generate knowledge spillovers in the concerned state.

$SCON_{kt}$ was characterized by a significantly negative sign for states' share in SME total exports as well as SME low-technology exports. Although there are significant agglomeration advantages from the spatial concentration of diverse firms, it is possible that the geographical concentration of firms of the same and related subsectors (i.e. clustering) may be more important for export activities.

The share of states in SME exports appeared to be positively related to the number of towns in the states. TWN_{kt} possessed a positive and significant effect across all estimations. As argued earlier, cities with their physical and technological infrastructure, skilled labor pool and institutional inter-linkages are becoming smart to boost innovation and productivity throughout the economy.

SPL_{kt} measuring the technology-intensive structure of manufacturing production turns up with a positive sign throughout and significant for states' share in SME total exports as well as SME high-technology exports. Therefore, it can be inferred that Indian states specializing in high-technology industries are likely to account for greater share in national SME exports, especially in SME exports from high-technology sectors.

A number of year-specific dummies included in the estimation also came up significant. This suggests that there are significant year-wise differences in states' share of SME exports while taking 1995 as the base year.

6. Conclusions

International business research tends to stipulate the term "space" to the nation as a unit. This ignores the increasingly important role that subnational regions and clusters play in the internationalization of firms, especially from emerging economies. As there is limited evidence on rising power firms' exporting over subnational space, it becomes important to explore the role of subnational regional heterogeneity in international business.

The aim of this paper is to explore regional distribution of exports, mainly by SMEs from the rising power India. It makes three specific contributions as follows:

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(1) it estimates and presents state-wise distribution of organized sector manufacturing SME exports, which was hitherto unavailable;
(2) it uses fractional logit estimation while the export literature continues to be dominated by Tobit estimation; and
(3) it conceptualizes the REA and investigates its determinants to shed lights on the role of factors that enable subnational regions to account for larger shares in exports by Indian manufacturing SMEs.

The exports of rising power SMEs from the organized sector in India are found to exhibit significant regional concentration and widespread variation of export share between different regions/states. During 1991-1999, West India was the largest contributor to the national manufacturing SME exports with 49 per cent. The share of South India rose sharply to be half of the national SME exports during 2000-2008, leaving West India far behind. Among states, Karnataka and Maharashtra emerged as the dominant states in SME export contribution. A large number of Indian states, however, accounted for SME export shares less than 1 per cent.

The estimated REA model provides an understanding about different sources of spatial disparities in SME manufacturing exports. The share of states in Indian SME exports is driven by a number of factors that play out differently for different technological subgroups of industries. The regional stock of technological knowledge, availability of skill, port facilities, location in urban areas and FDI stocks are observed to help raise states' share in SME exports across technological subcategories. The size of local demand and its sophistication proxied by the per capita income are important factors for states to improve their share in high- and medium-technology exports by SMEs.

What are the implications of the above findings for regional policymakers from rising power economies like India? These indicate that subnational regions, depending on their stages of development, have to formulate appropriate strategies to achieve a higher contribution in national SME exports. Subnational policy measures aimed at upgradation of regional technological assets and skill base through the promotion of technology clusters and R&D of local firms, facilitation and creation of better industry-university linkages and investments in education and training institution may help the states to gain higher export advantage. Developing port facilities in the region or improving its access to ports hold significant potential for enhancing its share in national SME exports. Focusing on urban centers and supporting their overall economic infrastructure must be an integrated part of subnational policy that intends to achieve higher export share. Calibrated policies to improve a state's attractiveness to FDI may further stimulate state-level SME exports. In addition, it is particularly important that efforts of subnational regions in improving availability of electricity and credit and in building relatively technology-intensive sectors are crucial for them to achieve greater SME exports in high-technology segments of manufacturing.

Finally, future research should focus on extending the REA to include institutional and political economy factors. The empirical application of this framework to subnational regional shares in total exports by all firms taking into account fixed effects for regions may be another feasible line of future research.

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Notes

1. An estimated 44.8 million SMEs including microenterprises were engaged in services and manufacturing activities in the year 2011-2012 and created over 101 million jobs in India (Government of India, 2013). The percentage contribution of this sector in the national manufacturing output and total exports are 45 and 40 per cent, respectively (Government of India, 2010). These SMEs are known to be active across a broad range of sectors covering over 8000 products (data available at: http://dcmsme.gov.in/ssiindia/statistics/economic.htm#Employment).
2. STATA command for the pooled quasi-MLE is glm $y\ x_1, \ldots, x_k\ \bar{x}_1 \ldots \bar{x}_k$ d2, …, dT, fam(bin) link(probit) cluster(id) and for GEE is xtgee $y\ x_1, \ldots, x_k\ \bar{x}_1 \ldots \bar{x}_k$ d2, …, dT, fam(bin) link(probit) corr(exch), where d2, …, dT are time dummies.
3. Taking the exchange rate of Indian rupee *vis-à-vis* US dollar (US$1= Rs. 45.93) on June 16, 2006, the day when this Act got the assent of the President of India, the investment ceiling for SMEs is up to US$ 2.2 million.
4. Auxiliary regressions are: *SDP* on *STKS*, *SKL*, *TWN* and *SPWR*; *STKS* on *SKL* and *TWN*; and *SKL* on *TWN*.
5. This technological classification of exports is based on technological intensity of industries where high-technology sectors are assumed to include chemicals, pharmaceuticals, electrical and optical equipment, machinery and equipment and transport equipment. Sectors 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 industries. Medium-technology sectors consist of coke and refined petroleum products, rubber and plastic products, other non-metallic mineral products and basic metal and metal products.

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