

DOCTOR OF PHILOSOPHY IN MANAGEMENT

SERVICIFICATION OF MANUFACTURING INDUSTRIES

By

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INDIAN INSTITUTE OF MANAGEMENT
BANGALORE

2022

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**By
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A Dissertation submitted in Partial Fulfillment of the Requirements for the
degree of Doctor of Philosophy at

INDIAN INSTITUTE OF MANAGEMENT BANGALORE

2022

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*To my beloved Gigi (Dr. Bandana Talukdar) who always
wanted me to pursue research*

ACKNOWLEDGEMENTS

This thesis has been brought to existence due to the staunch and unwavering support of my advisor, Prof. Rupa Chanda. I will always be grateful to her for her advice, support, and love. She constantly finds time for me despite her busy schedule. Ma'am has always been incredibly patient with me through my highs and lows. She allowed me to put my physical and mental well-being ahead of finishing my thesis during the second half of 2021, and I cannot thank her enough for that. I also express my gratitude to Prof. Tirthatanmoy Das and Prof. Vidhya Soundararajan for their insightful criticism and suggestions about my thesis work. They helped me through my tough times while working on my thesis, and I can't thank them enough.

My parents (Dr. Barnali Chaklader and Gautam Chaklader) are the proudest owners of this thesis today. Their continuous belief in me propelled the work towards completion. I sincerely thank them for supporting me throughout the thirty years of my life, especially the last five years and seven months. My brother, Jayanta Chaklader, needs to be thanked especially for moving to Bangalore right in my second year of PhD and sponsoring weekly dinners and movies for his elder sister during the stipend period. I also thank my husband (Ritesh Pandey) for gliding into my life post-comprehensive exams and supporting me in ways that continue to surprise me to date. He celebrates my wins better than me. He helps me let go of my failures better than I ever can. Also, a big thanks to my friend and mother-in-law, Anupama Pandey, who is extremely proud of my achievements today. Additionally, this thesis has survived three waves of COVID. Throughout the lockdown, my first adopted pet Vella-Raman stuck with me right from finalizing the question, working on the data, and writing the thesis word by word.

I have also been blessed with certain people who have only motivated me to do better. One of them is my senior, Dr. Nandini Seth. Till today I haven't been able to figure out what she sees in me, but her immense faith in me makes me think that anything is achievable. I also want to thank my other senior, Dr. Rahul Singh, for unconditionally supporting me and giving me constructive and insightful recommendations throughout my thesis. Additionally, I would highlight the entry of my junior in IIMB, Ms. Shivali Sharma, who pushed me towards opportunities where I had already disqualified myself. Her push has been instrumental in enabling me to reach steady-state levels of confidence.

ACKNOWLEDGEMENTS

Last but not least, I must I also thank my batchmate, soon-to-be Dr. Satarupa Mitra, who has been a fellow traveller in my IIMB journey. It was a treat to have someone with a similar life trajectory as I had, right from taking classes in B, clearing the comprehensives, getting married, our first international conference, our first placement and finally graduating.

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ACRONYMS

| | |
|----------------|--|
| TFP | Total Factor Productivity |
| EU | European Union |
| GVC | Global Value Chain |
| OECD | Organization for Economic Co-operation and Development |
| R&D | Research and Development |
| VA | Value-Added |
| TiVA | Trade in Value-Added database |
| ICT | Information and communications technologies |
| GEE | Generalized Estimating Equation |
| MLE | Maximum Likelihood Estimation |
| PCA | Principal Component Analysis |

Thesis Abstract

Manufacturing firms in India and worldwide have been increasingly focusing on service activities over the past two decades. It is evidenced through their continuous purchases of services (outsourced domestically or imported), production of services (in-house service activities), and sale of services with goods. This phenomenon of increased use of services by manufacturing firms is termed as “servicification” in the Economics literature (Lodefalk 2014; Elms, Kay and Low, 2013). Services are embedded across different stages of manufacturing value chains and are vital intermediate inputs. For instance, the initial stages of a value chain rely heavily on R&D and design services to develop a prototype. Support services such as logistics and transportation, inventory management services, communication, and other supply chain management services become indispensable for sourcing raw materials and delivering manufactured goods. After final assembly, services such as packaging, marketing, branding, and distribution facilitate domestic and international sales of products. Services are also increasingly being used to differentiate products. Traditional core product offerings are being restructured and bundled with services such as after-sales maintenance services, apps for electronic devices and warranties (Raddats and Easingwood, 2010; Nordås and Kim, 2013; Kelle, 2013).

Services also play an instrumental role in supporting exports for manufacturing businesses. Firms that are engaged in international trade incur ‘export market entry costs’ (Melitz 2003) which entail the use of various services. For instance, business units need to acquire information about foreign demand conditions, establish distribution and marketing channels, and educate themselves about the bureaucratic and administrative procedures in order to export. (Bernard and Jensen 2001; Das, Roberts,

Tybout 2007; Risteska et.al 2016). These expenses are sunk, up-front and influence participation in the export market. However, the entire process of overcoming trade and other barriers to trade, can be expensive. Exporting firms may incur high costs when using services, which could potentially outweigh the efficiency gains from using services. Further, service sector restrictions that inhibit the delivery of goods or services, bottlenecks in outsourcing, buying or producing services and the absence of a competitive service sector might compound these costs (Chanda, 2017).

This thesis extends the research of role of services for manufacturing exports and empirically analyses the role of services as inputs for manufacturing firms. The thesis studies servicification of manufacturing industries at three levels, i.e., at the cross-country level, at the firm-level across industries within a country, and across firms in a specific industry within a country.

Essay 1 estimates the association of increased use of services (or servicification) on a firm's ability to integrate with the foreign market and export a higher share of output (or export intensity). It analyses the impact of servicification on around 7000 Indian exporting firms across 23 manufacturing industries over the 2000 to 2019 period using a Fixed-Effects model and pooled quasi-MLE fractional probit model. It later relies on the GEE (Generalized Estimating Equation) method to enhance the efficiency of the fractional model. Results find an increase in the share of services input increases export intensity at a decreasing rate. Firms with lower service intensity experience a higher rise in export intensity than firms with higher service intensity. The results are robust after endogenizing service intensity and TFP in a Dynamic Panel GMM estimation. The essay also controls for selection bias and endogenizes service intensity using a Probit & FE-2SLS Model and continues to find results. Further, services are bisected into traditional and modern services and results find that the former has a more significant impact on manufacturing exports.

The second essay corroborates the findings from the firm-level study with a cross-country analysis by undertaking a detailed empirical analysis of the impact of servicification in 16 manufacturing industries

across 63 economies for the 2005 to 2015 period. Using OECD input-output data across countries, the share of total services purchased by manufacturing sectors to sectoral output produced is regressed on sectoral export intensity. The study finds that a rise in the share of services used is associated with rising export intensity at a decreasing rate. The result is statistically significant and robust to different estimation methods. The association is more substantial and significant for developed and EU countries, however, it is muted for developing countries. The study further contributes to the literature by analyzing the role of different types of services. It finds that traditional services play a crucial role in improving manufacturing export performance in developing countries. The effect of the association is muted for developed countries. Interestingly, modern services play a key role in enhancing developed countries' export intensity, and the effect is muted for developing countries

The third essay is based on a representative survey of 110 firms in India's automotive sector. It examines the nature and implications of servicification in the Indian automotive sector and the role of firm characteristics in shaping this impact. The questionnaire-based survey is complemented by in-depth discussions with key firms to better understand the survey responses and to obtain a qualitative understanding of the respondent firms. There are several takeaways from the study. First, firms find traditional services to be more important than modern services. Second, large firms value services more than MSMEs and tend to use services differently. For instance, large firms tend to offer in-house logistics services, whereas MSMEs fully outsource these services. Services like advertising and marketing are managed by MSMEs themselves, whereas large firms choose to use both sources of production. This highlights the inability of the MSMEs to outsource parts of a value chain to more productive counterparts to work better. Third, econometric analysis finds that services such as packaging, IT/ITeS and advertisement and marketing remain significant facilitators in determining the participation of a firm in exports.

Overall, across all three essays, a key finding is that manufacturing industries rely on a host of services, right from the initial stages of product conception to final delivery and sales. Exporters rely more on

services and spend more on average, compared to non-exporters. Traditional services and modern services have a significant and positive impact on the exports of manufacturing industries both in India and globally, though the effect of traditional services is higher than that of modern services in both cases. The findings suggest the importance of understanding the linkages that exist between manufacturing and services to enhance manufacturing competitiveness in India and globally.

Keywords: Firm, Export Intensity, Manufacturing, Services