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Does Servicification of Manufacturing Increase the GVC Activities of Firms? Case of India

Ketan Reddy,[1] Subash Sasidharan,[1] Shandre Thangavelu[2]

[1]Indian Institute of Technology Madras

[2]Jeffrey Cheah Institute for Southeast Asia, Sunway University and Institute of International Trade, The University of Adelaide

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# Outline

What are Global Value Chains ?

- Antràs, P. (2020) - "A global value chain or GVC consists of a series of stages involved in producing a product or service that is sold to consumers, with each stage adding value, and with at least two stages being produced in different countries. A firm participates in a GVC if it produces at least one stage in a GVC."

Australian Passport

Source :Department of Foreign Affairs and Trade - Australia

The Smile Curve
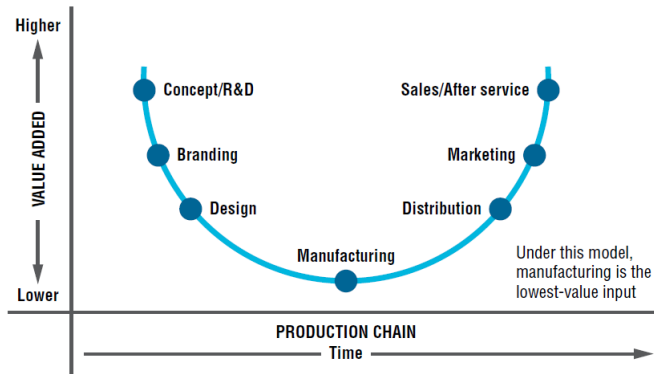
Source : Samuel et al.(2012)

The Role of services

- Use of Services as inputs in production process - "Servicification"
- Input aspect - Packaging, marketing, research and development in the production
- Output aspect - Incorporation and bundling of services with sales ; After-sales services
- Bundling service solution allows for product differentiation
- Enablers - service-linkages between manufacturing activities (Logistics - ensures smooth functioning of GVCs)
- Services are at the centre of GVC sustenance

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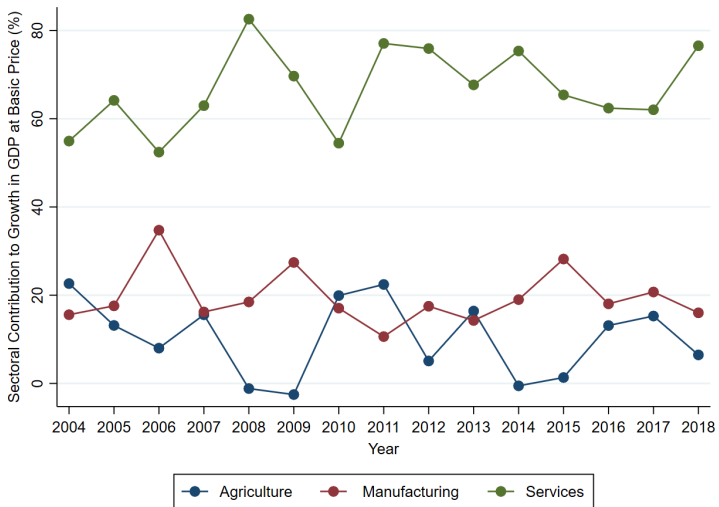Motivation
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Evidence from Literature

- WDR (2020) - Services contributed 43% in production worldwide in 2009
- Lodefalk (2010) - Services accounted for 35% of manufacturing exports for OECD countries and 40% for European countries
- Miroudot and Cadestin (2017) - services contributed 37% in manufacturing exports of 62 economies
- Thangavelu, Wang, and Oum (2018) - services trade accounted for around 68% of total trade in value-added terms for East Asian countries
- Kelle (2013)- Germany : manufacturing firms exporting nearly 25% of services export.
- Crozet and Milet (2017) - 76% of the French manufacturing firms tends to sell services.

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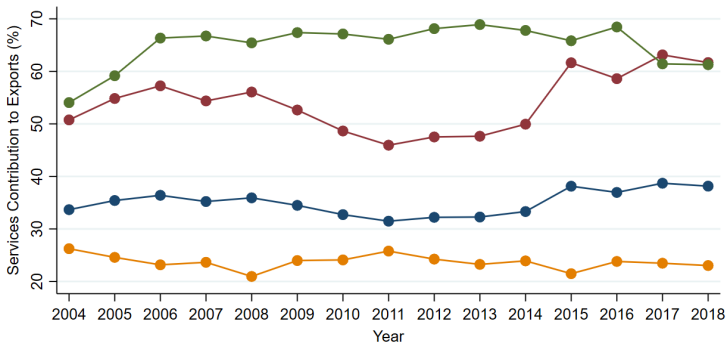Motivation
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How our study is different ?

- Objective - Does greater servicification of Indian manufacturing shape their GVC participation
- Disentangle the channels through which servicification impacts GVC activities of Indian firms.
- Correct for Endogeneity which originates from the bi-directionality between servicification and GVC
- Why India ?
  - One of the fastest growing economies but weak GVC linkages
  - Policy push for greater GVC integration
    - GVCs can contribute 25% of the $5 trillion target in value-added terms by 2025
    - Provide employment to 40 million workers by 2025 and 80 million by 2030

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Source : Authors' compilation based on RBI's Database on Indian Economy

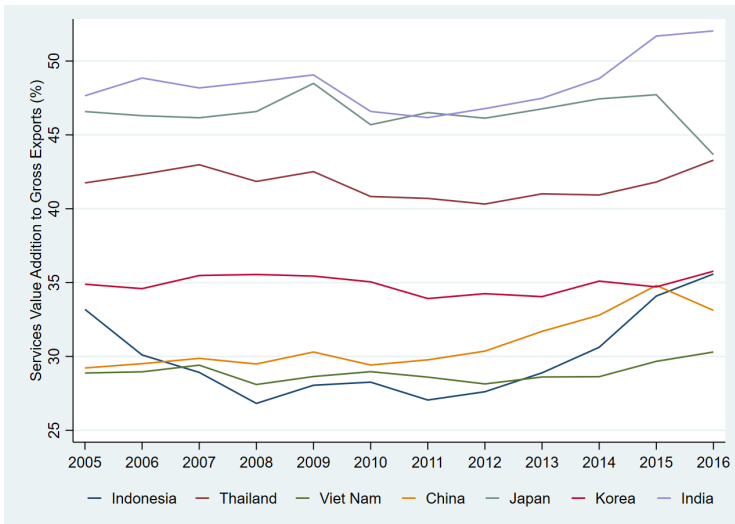Introduction
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Source : Authors' compilation based on RBI's Database on Indian Economy

Source : Authors' compilation based on TiVA Database
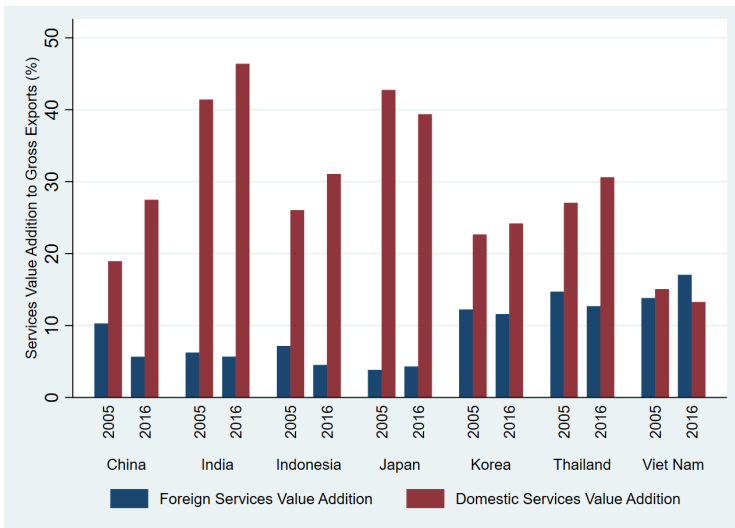
Source : Authors' compilation based on TiVA Database

Data

- Firm-level information - CMIE PROWESS database
- The PROWESS database provides firm-level information compiled from the firm's annual reports.
    - Manufacturing Firms at two-digit NIC classification
    - Study period of 2001-2018
- Data filtering process
    - Exclude all the firms which report non-positive or missing values for gross fixed assets, sales, and firms with less than three years of continuous observations
    - We have an unbalanced panel of 4806 firms

Variables

Global Value Chains

- GVC is defined as a process where value addition in the final product is sourced from at least two countries.

- GVC firms as those involved in exporting and importing simultaneously (Antràs 2020 ; Del Prete, Giovannetti, and Marvasi 2017 ; Harvie, Narjoko, and Oum 2010 ; Urata and Baek 2020 ; World Bank 2020 ; Rigo 2020 ; Dovis, & Zaki 2020 ; Ehab & Zaki 2020)

- GVC is a binary variable =1 if firm exports and imports $\geq$ 10% of sales

Servicification

- Firms' expenditure on services inputs relative to its total inputs (Nordwal, 2016)
- Four components - Normalized to total expenditure
  - Firm's expenditure on R&D (upstream segment)
  - Outsourced professional jobs (upstream segment)
  - Selling and distribution expenditure (downstream segment)
  - Communication expenditure (linkage factor)

Summary Statistics

				GVC Firms		Non-GVC Firms		
Variable	Obs	$\overline{X}$	Std. Dev.	Obs	$\overline{X}$	Obs	$\overline{X}$	T-Test
GVC	50098	0.147	0.354					
Servicification	50098	0.047	0.047	7374	0.056	42724	0.046	0.010***
Log TFP-LP	50098	4.038	1.093	7374	4.18	42724	4.013	0.167***
Log Size	50098	7.035	1.677	7374	7.757	42724	6.911	0.846***
Log Age	50098	3.217	0.571	7374	3.233	42724	3.215	0.018***
Leverage	50098	0.387	0.292	7374	0.352	42724	0.393	-0.040***
Foreign	50098	0.055	0.229	7374	0.084	42724	0.05	0.033***

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Methodology

- Probit Model

$$Pr\left(GVC_{it}\right) = \Phi\left(\beta_1 Servicification_{i,t-1} + \mathbf{Z} + \gamma_t + \delta_j + \epsilon_{it}\right)$$

- GVC participation is our binary dependent variable

- Our major variable of interest is the coefficient of the Servicification variable

- $\mathbf{Z}$ is the vector of control variables

TABLE 1 – Probit Model : Impact of servicification on GVC participation of the firm

VARIABLES	(1) GVC	(2) GVC	(3) GVC	(4) GVC
L.Servicification	0.283***	0.269***	0.212***	0.229***
	(0.036)	(0.037)	(0.039)	(0.042)
L.LogTFP		0.0035	-0.003	0.010***
		(0.002)	(0.002)	(0.003)
L.LogSize		0.017***	0.030***	0.028***
		(0.001)	(0.001)	(0.002)
L.LogAge		-0.046***	-0.010**	-0.004
		(0.004)	(0.004)	(0.005)
L.Leverage		-0.031***	-0.043***	-0.038***
		(0.006)	(0.006)	(0.007)
Foreign		0.014**	0.006	0.005
		(0.006)	(0.006)	(0.007)
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes
Observations	44,569	44,569	44,569	44,569

TABLE 2 – Probit model : Channels of servicification

VARIABLES	(1) GVC	(2) GVC	(3) GVC	(4) GVC
L.S&D	0.218***			
	(0.052)			
L.Outsourced		0.433*		
		(0.229)		
L.Communication			1.967**	
			(0.917)	
L.R&D				0.265*
				(0.157)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	43,656	43,207	32,175	12,815

TABLE 3 – Probit estimation : Size classification

	Small & Medium Firms		Large Firms	
VARIABLES	(1) GVC	(2) GVC	(3) GVC	(4) GVC
L.Servicification	0.293***	0.306***	0.219***	0.191***
	(0.046)	(0.051)	(0.058)	(0.066)
L.LogTFP	0.010***	0.022***	0.006*	0.022***
	(0.002)	(0.003)	(0.003)	(0.004)
L.LogAge	-0.010***	0.0003	-0.044***	0.003
	(0.004)	(0.005)	(0.006)	(0.008)
L.Leverage	-0.023***	-0.021***	-0.033***	-0.039***
	(0.007)	(0.007)	(0.010)	(0.011)
Foreign	0.028***	0.024**	0.0009	-0.006
	(0.009)	(0.009)	(0.009)	(0.010)
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes
Observations	21,619	21,619	22,950	22,950

Technology Classification

- Heterogeneous technology across industries
- The servicification phenomenon is relatively more prominent for technology-intensive industries [1]
- Positive and significant impact of servicification on GVC participation for both high-tech and low-tech industries.
- The magnitude of the servicification coefficient is larger for low-tech industries [2]
- R&D is the significant factor driving the servicification on GVC participation of high-tech firms.
- Selling and distribution expenses and communication services drives GVC participation of firms from low-tech industries [3]

Robustness

Endogeneity

- Reverse causality - Extensive integration into GVC could drive greater servicification (Thangavelu et al., 2018)

- Instrumental Variable Approach - Average industry level of service expenditure as a suitable IV [4]
  - Firms from similar industries experience similar service needs, and may have comparable service expenditure.
  - However, a decision to participate in GVCs is firm-specific and is not conditional upon the servicification of other firms in the industry.

Alternate GVC measure

- GVC firm, if it exports and imports 10% of its sales simultaneously for at least three years continuously (GVC-A) [5]

Conclusion

- We examine the role of servicification on GVC participation of Indian manufacturing firms
- Unbalanced panel of 4608 firms from 2001-2018 ; Probit model
- Manufacturing firms using service inputs in production are more likely to participate in GVCs
- Disentangle the channels of servicification
- Servicification promotes GVC participation of SMEs
- Results of the study are robust to alternate specifications and measures of GVCs
- Limitation :
    - Unable to capture GVC participation with more refined measure
    - Identifying the origin of services, i.e., distinguishing between domestic and foreign services

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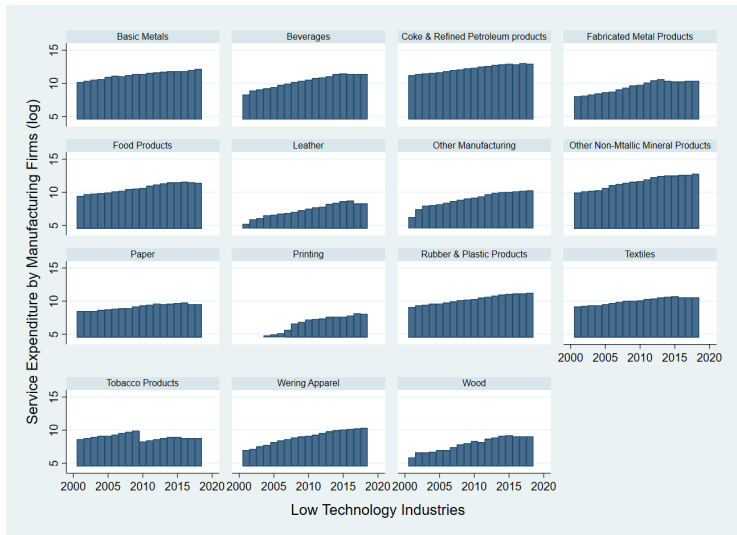
Source : Authors' compilation based on CMIE-PROWESS Database
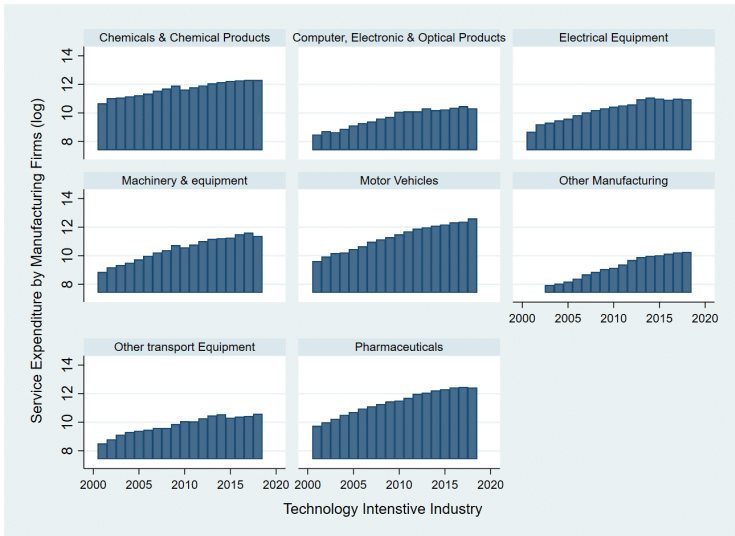
Source : Authors' compilation based on CMIE-PROWESS Database

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TABLE 4 – Probit Estimates : Technology Classification

	High-Tech		Low-Tech	
VARIABLES	(1) GVC	(2) GVC	(3) GVC	(4) GVC
L.Servicification	0.221***	0.173***	0.315***	0.293***
	(0.063)	(0.066)	(0.045)	(0.056)
L.LogTFP	0.021***	0.018***	0.009***	0.002
	(0.004)	(0.005)	(0.003)	(0.004)
L.LogSize	0.015***	0.023***	0.012***	0.032***
	(0.002)	(0.003)	(0.002)	(0.002)
L.LogAge	-0.040***	-0.007	-0.043***	-0.001
	(0.007)	(0.008)	(0.004)	(0.006)
L.Leverage	-0.005	-0.020*	-0.030***	-0.045***
	(0.011)	(0.012)	(0.006)	(0.007)
Foreign	0.015	0.013	0.011	0.001
	(0.010)	(0.011)	(0.008)	(0.009)
Year FE	No	Yes	No	Yes
Industry FE	No	Yes	No	Yes
Observations	19,529	19,529	25,007	25,007

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TABLE 5 – Probit estimates : channels of servicification

	HIGH-TECH				LOW-TECH			
VARIABLES	(1) GVC	(2) GVC	(3) GVC	(4) GVC	(5) GVC	(6) GVC	(7) GVC	(8) GVC
L.S&D	0.065				0.316***			
	(0.088)				(0.062)			
L.Outsourced		0.209				0.513		
		(0.331)				(0.350)		
L.Communication			2.373				3.890***	
			(1.450)				(1.274)	
L.R&D				0.358**				-0.621
				(0.178)				(0.582)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,179	19,196	14,210	8,041	24,444	23,978	17,949	4,758

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TABLE 6 – IV-Probit model : impact of servicification on GVC participation of the firm

VARIABLES	(1) GVC	(2) GVC	(3) GVC
L.Servicification	1.458***	1.289***	1.113***
	(0.258)	(0.280)	(0.292)
First Stage			
Instrument	0.962***	0.86***	0.846***
	(0.044)	(0.043)	(0.044)
F-Stat	482.44	148.36	45.66
Wald Test	13.18***	13.38***	9.44***
Controls	Yes	Yes	Yes
Yes			
Year Dummy	No	No	Yes
Observations	44,564	44,564	44,564

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TABLE 7 – Probit estimates : robustness – GVC*

VARIABLES	(1) GVC-A	(2) GVC-A	(3) GVC-A	(4) GVC-A
L.Servicification	0.182***	0.177***	0.133***	0.119***
	(0.030)	(0.028)	(0.028)	(0.026)
L.LogTFP		0.010***	0.001	0.006***
		(0.002)	(0.001)	(0.002)
L.LogSize		0.006***	0.014***	0.012***
		(0.001)	(0.001)	(0.001)
L.LogAge		-0.030***	-0.003	0.001
		(0.003)	(0.003)	(0.003)
L.Leverage		-0.014***	-0.022***	-0.017***
		(0.005)	(0.004)	(0.004)
Foreign		0.007	0.003	0.002
		(0.004)	(0.004)	(0.004)
Year FE	No	No	Yes	Yes
Industry FE	No	No	No	Yes
Observations	44,569	44,569	44,569	44,569