Aston Business School
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Centre for Business Prosperity

International Servitization of Manufacturing: Learning to Export, By Serving (At Home)

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How to make the UK a more effective trader?

S1.1 White Paper 1: UK Trade in the new Globalised World
S1.2 Research Project: On the Determination of Sectoral UK Exports
S1.3 Research Project: Defying Gravity? Policy Uncertainty and Trade Diversion
S1.4 Research Project: De-internationalisation Strategies and Post-re-entry Performance
S1.5 Research Project: Non-tariff Measures (NTMs), Firm Performance and Brexit
S1.6 Insight paper: COVID-19 Pandemic and Global Value Chains
S1.7 Insight paper: UK Professional and Business Services (PBS) Sectors and their International Traders
S1.8 Research Project: Service Restrictiveness, Sourcing and Delivering International Services and Productivity
S1.9 Research Project: Integration in Global Value Chains and Adoption of Robots
S1.10 Research Project: Learning to export (at home) – the International Servitization of the UK Producers
S1.11 Ongoing project: Intermittent Exporters in the UK: Stylised Facts and regional view
S1.12 UK Parliament Inquiry: the UK-US trade negotiations
S1.13 Report: UK Trade and Prosperity 2020 – Looking Beyond BREXIT and COVID
S1.14 UK House of Lords EU Committee Inquiry: The future UK-EU relations on trade in services
S1.15 Research paper: UK Trade and COVID
S1.16 Research Paper: Feeding the Celtic Tiger – Brexit, Ireland and Services Trade
S1.17 Research Paper: Export spillovers in the UK regions
S1.18 Research Project: Is Green trade more resilient to global shocks?

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The Context

1. De-industrialisation in the industrialised world.

De-industrialization has started multiple decades ago and was accelerated by the 2008-2009 crisis in most high income countries….Factory-free economy (Fontagné and Harrison, 2017)

The UK is second-largest service exporter in the world.

2. Services have never been so tradable

Globalisation and ICT use

Service liberalisation started in the 1980s (Hoekman and Shepherd, 2017).

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The Context

3. The blurred boundary between manufacturing and services

Manufacturing firms not only rely on intermediate services sourced domestically and abroad (Nordås, 2010), but also actively engage in delivering services alongside their products in a process known as servitization (Baines and Lightfoot, 2013) or 'product-service systems' (Neely, 2008).

4. Servitization of manufacturing firms

Large and fast growing literature spanning several fields (Raddats et al., 2019).

*E*conomic, financial and strategic benefits, helping survival.

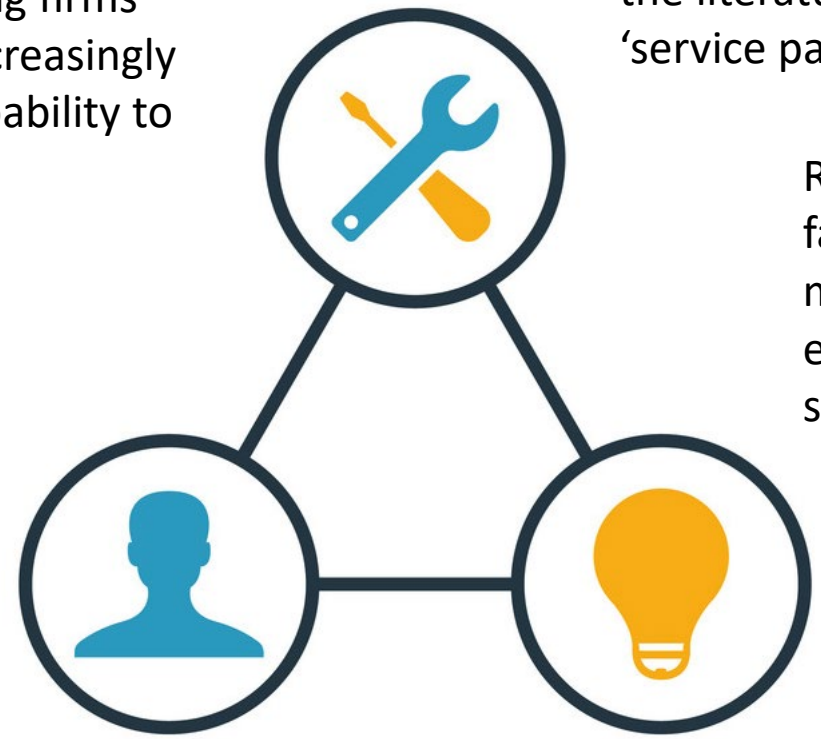
The benefits of economics of scope of offering products and services.

The benefits of economics of scale of offering products and services globally.

In a nut shell

Today manufacturing firms' competitiveness increasingly depends on the capability to servitize.

Servitization is a highly complex and challenging, and to carry out internationalised servitization is more so.



Important gaps remain in the literature.
'service paradox'

Research question: What factors drive manufacturing firms to engage in cross-border servitization?

Our approach

What we find

Are firms selected into exporting services?

- *Large literature on firm level determinants of exports, services have remained under-researched as most of these studies are focused on trade in goods.*

- *Resources (*Barney, 1991) *and capabilities (*Eloranta & Turunen, 2015) literature.

- *Differences between goods and services: a higher fixed cost associated with exporting services (Ariu, 2012*).

- *Evidence suggests firm specific advantages may not matter for export intensity.*

H1a: Productive firms self-select into participating in international servitization.

H2: Firms with specific advantages in scale, technological competence and human capital are more likely to engage in international servitization.

Learning to exporting services, by serving at home

- *Domestic servitization has been found to improve firm productivity, profitability, survival, innovation and competitive advantage (Bascavusoglu-Moreau & Tether, 2010; Dachs et al., 2014).*

- Organization learning literature

- Network actor theory (Jaakkola and Hakanen (2013)

- Relationships between manufacturers and upstream suppliers play an increasingly vital role for future research (e.g., Story et al., 2017 ; Vendrell-Herrero, Bustinza, Parry, & Georgantzis, 2017).

H3: Domestic servitized firms are more likely to engage in international servitization.

Learning to exporting services: intensive, extensive margins and diversification strategy

- Service traders are more sluggish in increasing their extensive margins of trade (Ariu, 2012).
- Organisational resources such as firm size and technological capabilities are found to drive market diversification.

H4: Domestic servitized firms are more likely to show wider extensive and intensive margins.
H5: Firms with strong firm-specific advantages are more likely to adopt market specialisation strategy in international servitization.

Data

International trade in services data (ITIS), the Annual Business Survey (ABS) and the IBDR Business Structural Database (BSD) compiled by the ONS.

The ITIS survey collects data on international transactions in services by private sector companies resident in the United Kingdom, and is the main input into the trade in services account in the United Kingdom balance of payments (ONS 2007b; Breinlich and Criscuolo 2011). Good coverage and oversampling for potential service traders.

The linked sample of ITIS and ABS consists of an average of 45,000 firms per year, containing both service traders and non-service traders.

This analysis draws on the sample of the manufacturing sector over 2011-2018, with average of 7,000 manufacturing firms per year.

Stylised facts

Breakdown of Categories of Service and Goods Traders for Manufacturing Sector, 2011-2018

Service Trade Categories	Non-exporters of Goods	Exporters of Goods	Total
Service exporter and domestic provider	1,255 (3%)	5,306 (11%)	6,561 (14%)
Service Exporter only	580 (1.3%)	1,901 (3.7%)	2,481 (5%)
Domestic Service provider only	13,282 (29%)	12,030 (26%)	25,312 (55%)
Non-Service Provider	5,928 (13%)	5,872 (13%)	11,800 (26%)
Total	21,045 (46%)	25,109 (54%)	46,154 (100%)

Stylised facts

1: **19%** of manufacturing firms export services over 2011-2018, lower than 22% reported by Breinlich & Criscuolo (2011) for 2000-2005.

2: *Although **69%** of the manufacturing firms are domestically servitised, only 14% also export services.*

3: **4%** of these firms export only services and no goods.

4: Only **26%** of the firms do not offer services either domestically or internationally.

5: Domestic servitization is more prevalent than international servitization with **55%** of the firms providing services domestically with no service export, while **5%** export services without selling services domestically.

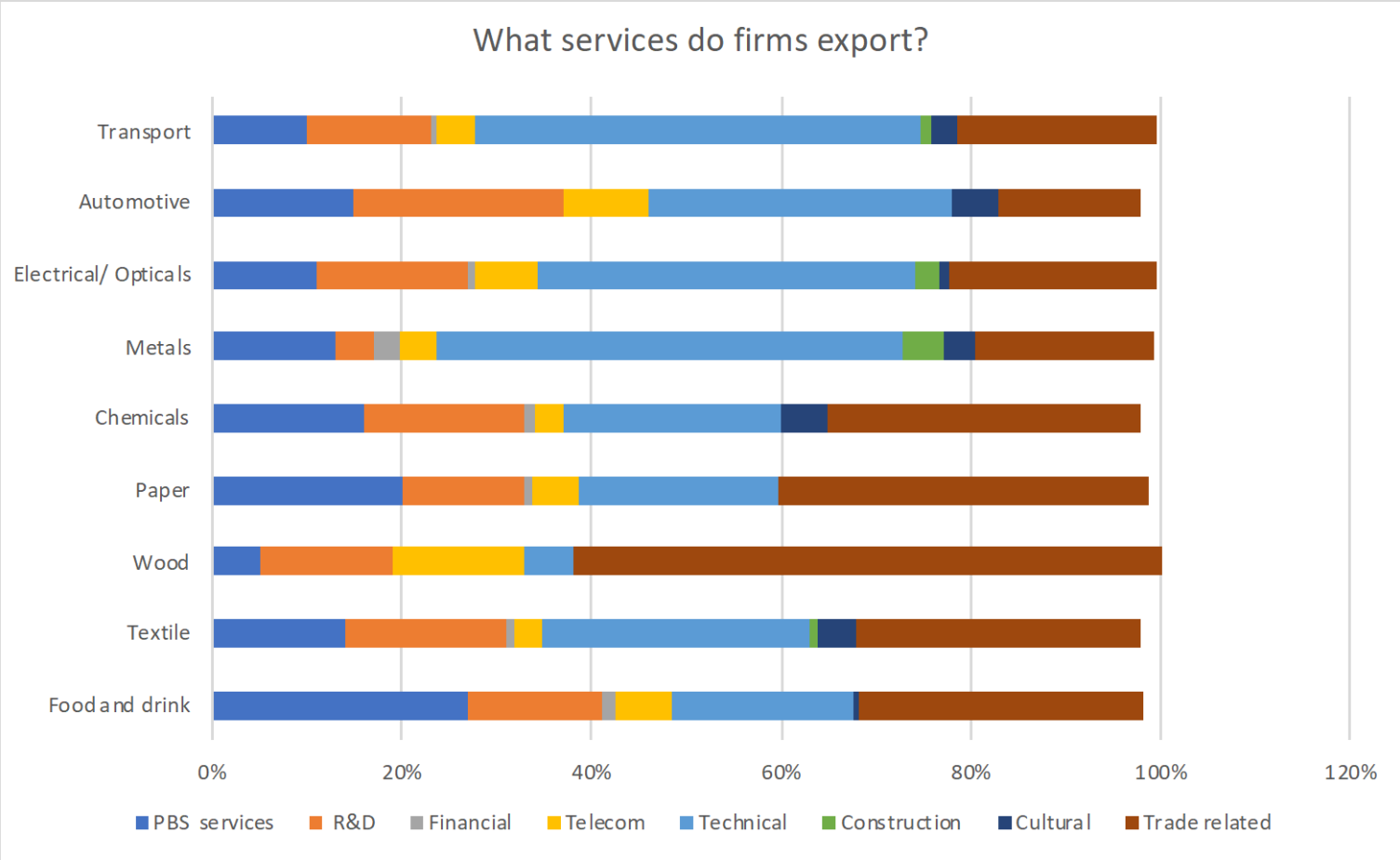
Stylised facts

6: Internationally servitised firms that also export goods contribute significantly to the economy in terms of value added, turnover and employment, compared to the other categories of manufacturing firms.

7: Manufacturing firms that are domestically and internationally servitised, and also export goods account for the majority of service exports.

8: Manufacturing industries and UK regions are heterogeneous with regards to their level of international servitization (i.e. sectoral and spatial unevenness).

9: On average, internationally servitised Manufacturing firms are more productive, bigger in terms of employment and turnover, older, more innovative/invest in more intangible assets and have a higher level of domestic servitization compared to non-internaltionally servitised manufacturing firms.


What services do firms export?
Transport
Automotive
Electrical/ Opticals
Metals
Chemicals
Paper
Wood
Textile
Food and drink
0%
20%
40%
60%
80%
100%
120%
PBS services
R&D
Financial
Telecom
Technical
Construction
Cultural
Trade related

Variables

Conditional Test of Difference in Means Between Internationally servitised and non-internationally servitised manufacturing firms

Variables	Service Exporters (mean) (Obs = 9,041)	Service Non-Exporters (Mean). (Obs = 38,908)
TFP	3.5*	3
Age (years)	29*	25
Size: Employees	304*	112
Size: Turnover (Log)	9.4*	7.7
Wages (Log)	7.8*	6
Investment in Patents per employee (log)	0.02*	0.01
Investment in Purchased Software per employee (log)	0.2*	0.1
Industrial Domestic Services Provided (Log)	3*	1.6
Non-Industrial Domestic Services Provided (Log)	2.4*	1.4
Subsidy received (Log)	0.3*	0.1

* *Difference significant at 5% or better on a two tailed t-test.* Office of National Statistics. (2020). *Annual Business Survey, 2008-2017*: Secure Access. [data collected]. *12th Edition*. UK Data Service. SN:7451, ***http://doi.org/10.5255/UKDA-SN-7451-12***

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Methodology

We estimate a fixed effect logit model, tobit model, Poisson Model and a Robust Outlier Regression for the different dependent variables of export participation, extensive and intensive export margins, and diversification proxies.

$$Y_{it} = \alpha_{it} + \beta_1 Productivity_{it} + \beta_2 FSA + \beta_3 DS_{it} + \beta_4 X_{it} + \varepsilon_{it}$$

Where

Y_{it} measures the different aspects of international servitisation (participation, intensity and strategy)

Productivity is measured as TFP using LLP

FSA is a vector containing firm size, innovation and employees' skills.

DS is domestic servitisation measured as the log of the industrial and non-industrial services sold at home.

X_{it} is the vector of control variables which include ownership, service exporting experience, goods export status, subsidy received by the firm and the yearly exchange rate.

Fixed effect specification with lagged explanatory variables to deal with some of the endogeneity problem, and sample selection model when evaluating intensity of exporting.

Some preliminary findings:
Participation

VARIABLES	(1) Export_serv (FE logit margins)	(2) Export_serv (non-high tech margins)	(3) Export_serv (high tech margins)
Firm Characteristics			
Log TFP	0.0129***	0.0136***	0.00697
	(0.00339)	(0.00374)	(0.00810)
l_employee	0.0636***	0.0639***	0.0572***
	(0.00301)	(0.00330)	(0.00729)
l_average_wage	0.0322***	0.0332***	0.0315***
	(0.00439)	(0.00495)	(0.00978)
l_age	-0.0260***	-0.0249***	-0.0304***
	(0.00404)	(0.00443)	(0.00963)
Intangible Assets			
l_patent_employees	0.0494***	0.0505***	0.0521
	(0.0153)	(0.0160)	(0.0366)
l_avg_purchased_software	0.0277***	0.0284***	0.0297**
	(0.00581)	(0.00667)	(0.0121)
Purchased Services			
l_avg_computer_serv_purchased	0.0524	0.0581	0.103
	(0.0537)	(0.0658)	(0.0998)
l_avg_telecom_serv_purchased	0.0417	0.114*	-0.125
	(0.0568)	(0.0680)	(0.0986)
l_avg_industrial_serv_purchased	0.00583	0.00297	0.0102
	(0.0387)	(0.0449)	(0.0784)
Domestic Services Provided			
l_industrial_serv_prov	0.00600***	0.00447***	0.0118***
	(0.000935)	(0.00107)	(0.00202)
l_non_industrial_serv_prov	0.0102***	0.0104***	0.00956***
	(0.00101)	(0.00113)	(0.00228)
External Factors			
l_subsidy	0.0212***	0.0200***	0.0262***
	(0.00271)	(0.00293)	(0.00683)
exchange_rate	-0.0711	-0.0963	-0.166
	(0.118)	(0.128)	(0.293)
Dummies			
1.export_goods	0.104***	0.0997***	0.124***
	(0.00590)	(0.00639)	(0.0147)
1.ever_export_serv	0.0837***	0.0736***	0.142***
	(0.00818)	(0.00888)	(0.0208)
1.foreign_owned	0.118***	0.121***	0.106***
	(0.00815)	(0.00920)	(0.0173)
Constant	-5.310***	-5.210***	-1.979
	(0.867)	(0.965)	(3.246)
Observations	48,926	40,220	8,701
Number of entref	22,990	18,935	4,239

HT: Eurostat and OECD definition, which is based on the R&D and knowledge intensity of the industries.

Some preliminary findings:
Intensive margins

VARIABLES	(4) Export_intensity	(5) Export_intensity (non-high tech)	(6) Export_intensity (high tech)
Firm Characteristics			
Log TFP	0.00780*	0.00713*	0.00849
	(0.00412)	(0.00409)	(0.0128)
l_employee	0.00835**	0.00715*	0.00790
	(0.00404)	(0.00371)	(0.0131)
l_average_wage	0.0292***	0.0286***	0.0316**
	(0.00552)	(0.00516)	(0.0151)
l_age	-0.0189***	-0.0147***	-0.0334***
	(0.00364)	(0.00376)	(0.00491)
Intangible Assets			
l_patent_employees	0.0183	0.00839	0.0417***
	(0.0133)	(0.0150)	(0.0146)
l_avg_purchased_software	0.00393	0.00851	-0.00357
	(0.00511)	(0.00640)	(0.00695)
Purchased Services			
l_avg_computer_serv_purchased	0.173**	0.196**	0.172
	(0.0715)	(0.0800)	(0.120)
l_avg_telecom_serv_purchased	0.101	0.122	0.0603
	(0.0972)	(0.128)	(0.0698)
l_avg_industrial_serv_purchased	0.274***	0.221***	0.370**
	(0.0815)	(0.0665)	(0.167)
Domestic Services Provided			
l_industrial_serv_prov	0.00740***	0.00550***	0.0125***
	(0.00149)	(0.00159)	(0.00179)
l_non_industrial_serv_prov	0.00765***	0.00707***	0.00893***
	(0.000959)	(0.000899)	(0.00194)
External Factors			
l_subsidy	0.0124***	0.0140***	0.00520
	(0.00218)	(0.00163)	(0.00619)
exchange_rate	-1.019***	-0.931***	-1.166***
	(0.161)	(0.179)	(0.229)
Dummies			
1.export_goods			
1.ever_export_serv	0.254***	0.233***	0.293***
	(0.0146)	(0.00892)	(0.0394)
1.foreign_owned	0.0505***	0.0506***	0.0426***
	(0.00676)	(0.00765)	(0.00856)
Constant	0.274**	0.249*	0.0926
	(0.116)	(0.134)	(0.0944)
Observations	48,926	40,220	8,706
Number of entref			

Some preliminary findings:
Extensive margins

VARIABLES	(7) Exports of multiple products (FE logit margins)	(8) multi_dest_export (FE logit margins)	(9) No_prod_exp (poisson)	(10) No_dest_exp (poisson)
Firm Characteristics				
TFP	-0.00676	-0.00265	0.00310	0.0251
	(0.00769)	(0.00974)	(0.0169)	(0.0216)
l_employee	0.0130	-0.00688	0.0522***	0.0513***
	(0.00879)	(0.0102)	(0.00991)	(0.0191)
l_average_wage	0.0402***	0.0376	-0.0184	0.0339
	(0.0144)	(0.0323)	(0.0407)	(0.0383)
l_age	0.0341**	0.0358	0.0427*	0.110***
	(0.0146)	(0.0232)	(0.0234)	(0.0334)
Intangible Assets				
l_patent_employees	0.0251	0.0139	-0.00399	-0.0135
	(0.0256)	(0.0136)	(0.0215)	(0.0370)
l_avg_purchased_software	0.00745	0.00196	0.0201	0.0564**
	(0.00858)	(0.0176)	(0.0277)	(0.0270)
Purchased Services				
l_avg_computer_serv_purchased	-0.0131	0.283*	-0.0535	0.332
	(0.0789)	(0.146)	(0.191)	(0.228)
l_avg_telecom_serv_purchased	0.0733	-0.113	-0.0991	-0.128
	(0.209)	(0.251)	(0.299)	(0.235)
l_avg_industrial_serv_purchased	-0.0817	-0.0929	0.0115	-0.403**
	(0.0861)	(0.0839)	(0.149)	(0.175)
Domestic Services Provided				
l_industrial_serv_prov	0.00352**	0.00575*	0.00489	0.0215***
	(0.00176)	(0.00306)	(0.00466)	(0.00392)
l_non_industrial_serv_prov	0.00417**	0.00613**	0.0129***	0.0102*
	(0.00191)	(0.00300)	(0.00367)	(0.00556)
External Factors				
l_subsidy	0.00394	0.00411	0.0147**	0.00643
	(0.00421)	(0.00485)	(0.00639)	(0.00881)
exchange_rate	-0.815**	-1.092***	-0.358	-1.617*
	(0.330)	(0.352)	(0.409)	(0.867)
IMR			0.00455	-0.0709**
			(0.0260)	(0.0294)
Dummies				
1.ever_export_serv	0.0812***	0.118***	0.0450***	0.0946***
	(0.0175)	(0.0138)	(0.0155)	(0.0269)
1.foreign_owned	-0.000885	-0.0503**	0.0430**	-0.0855***
	(0.0151)	(0.0227)	(0.0200)	(0.0306)
Constant	-1.444	4.398	-0.345	0.637
	(3.763)	(3.980)	(0.359)	(0.706)
Observations	6,073	6,073	4,331	4,331
Number of entref	2,140	2,140		

Some preliminary findings:
International market strategy

VARIABLES	(11) Diversification: Product diversification within market	(12) Specialization: Market reach per product
Firm Characteristics		
TFP	-0.00901	0.0306
	(0.00663)	(0.0197)
l_employee	-0.0115*	0.0391*
	(0.00687)	(0.0204)
l_average_wage	-0.0303**	0.0970***
	(0.0120)	(0.0356)
l_age	-0.0363***	0.108***
	(0.0107)	(0.0318)
Intangible Assets		
l_patent_employees	-0.00756	0.00203
	(0.0256)	(0.0759)
l_avg_purchased_software	-0.0370***	0.0786**
	(0.0126)	(0.0374)
Purchased Services		
l_avg_computer_serv_purchased	-0.189**	0.823***
	(0.0865)	(0.257)
l_avg_telecom_serv_purchased	0.101	-0.156
	(0.143)	(0.424)
l_avg_industrial_serv_purchased	0.273***	-0.605***
	(0.0633)	(0.188)
Domestic Services Provided		
l_industrial_serv_prov	-0.00951***	0.0381***
	(0.00140)	(0.00416)
l_non_industrial_serv_prov	-0.00488***	0.00640
	(0.00143)	(0.00423)
External Factors		
l_subsidy	0.00217	-0.00479
	(0.00409)	(0.0121)
exchange_rate	0.808***	-2.352**
	(0.308)	(0.914)
IMR	0.0259*	-0.0695*
	(0.0134)	(0.0396)
Dummies		
1.ever_export_serv	-0.0435***	0.136***
	(0.0140)	(0.0414)
1.foreign_owned	0.0658***	-0.176***
	(0.0113)	(0.0334)
Constant	0.224	1.843***
	(0.220)	(0.653)
Observations	4,331	4,331

Preliminary findings

#1. Productivity and firm-specific advantages (FSAs) such as size, employee skills and technological resources predict export participation.

#2. Productivity affects entry into service exports, and has weak association with intensity of exports; and has no bearing with extensive margins, nor post-entry diversification strategy.

#3. FSAs share similar patterns: clearly drive the initial selection but not intensity. Firms with stronger FSAs are more likely to specialise than diversify.

#4. Domestic servitization is positively and consistently related to international servitization participation, intensity, extensive margins (esp. market reach), and specialisation strategy in exporting services. This is strong evidence of effect of learning by serving (at home).

Preliminary findings

#5. Patented innovation is key to high tech manufacturing firms services exports.

#6. Use of ICT is instrumental to delivering services, increasing market reach and specialisation.

#7. Connection to services networks does not lead to cross-border servitization, but it helps exporting more value and reaching more markets.

#8. Foreign firms and domestic firms have different strategies. While foreign firms are more likely to participate cross-border servitization, export more and diversify, domestic firms are more ready to specialise.

Next Step

- Robustness checks
- Understand better the channels of effects
- Implications on performance
- To differentiate the market destinations and assess the effect of the Brexit.
- To link trade barriers with firm international servitization strategy.

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