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## Are goods and services trade complementary? Evidence from a new micro dataset<sup>1</sup>

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<sup>1</sup> This contribution was prepared for the conference. The views expressed are those of the authors and do not necessarily reflect the views of the European Central Bank, the Bank of Spain, the BIS, the IFC or the other central banks and institutions represented at the event.

# Are goods and services trade complementary?

EVIDENCE FROM A NEW MICRO DATASET

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# Motivation

- Trade in goods and services have been usually considered separately (e.g. statistical collection, economic analysis, trade agreements)...
- ... but they are instead likely to be quite interconnected:
  - Output complementarities (bundling)
  - Input complementarities (e.g. services inputs used for exports of goods)
- We combine customs data on trade in goods and granular survey data on trade in services for a representative sample of Italian firms
- We investigate to what extent goods and services trade are complementary

## Related literature

- Trade in goods and services
  - Ariu et al. 2020, Aquilante and Vendrell-Herrero 2021, Berlingieri et al. 2021 **We report the first systematic evidence covering the last decade**
- Trade in services
  - Breinlich and Criscuolo 2011, Kelle 2013, Federico and Tosti 2017, Moro and Tosti 2019, Tito 2019, Benz et al. 2020 **We focus on the interconnection with trade in goods**
- 'Servicification' in the manufacturing sector
  - Crozet and Milet 2017, Blanchard et al. 2017, Breinlich et al. 2018 **We focus on the cross-border component of servicification**

# Data

- Trade in goods, by firm, partner country and 8-digit product
  - Universe of exporters/importers (except for sole proprietorships)
  - Source: Customs and Monopolies Agency
- Trade in commercial services, by firm, partner country and service category
  - Quarterly survey on a stratified sample of firms
  - Includes firms that do not export or import services
  - Source: Bank of Italy
- Balance sheet data
  - Universe of incorporated firms
  - Source: Cerved
- Ownership structure (Foreign ultimate owner, affiliates abroad)
  - Source: BvD Orbis

# Sample

- Our sample covers roughly 2,800-3,300 firms each year between 2013 and 2021
- Mainly medium-large firms in manufacturing and services sectors
- The sample accounts for 37-42% of aggregate exports and imports of goods and services (excl. travel, transport and minor items) according to official statistics

% Coverage wrt to universe			
	Goods	Services	Goods & Services
Exports	36.2	45.4	36.9
Imports	41.9	38.9	41.6

# Empirical analysis

- Which **firms** are more likely to export goods and services ('bi-exporting' or 'bundling')?
- For which **products**?
- To which **destinations**?
- Has bundling increased over **time**?
- Does trade in services **boost** exports of goods?

## Bi-exporting: Firms

	Number of firms	Exports G&S	Exports G	Exports S
Bi-exporters	32.3	66.8	64.6	85.8
Only goods exp.	33.4	31.8	35.4	0.0
Only services exp.	9.7	1.5	0.0	14.2
Non-exporters	24.6	0.0	0.0	0.0

- 32% of firms in our sample are 'bi-exporters' (i.e. export both goods *and* services in a given year), accounting for 67% of exports
- For manufacturing firms, provision of services is ancillary to exports of goods (average share of services on total exports: 13% )
- Compared to 'only goods exporters', bi-exporters:
  - Are larger and more productive
  - Have a more skilled labor force
  - Have less tangible capital per worker, more intangibles
  - Are more likely to be foreign-owned

## Bi-exporting: Products

Product group	Service type	Bundleability
Motor vehicles	Other business services	.170
Other transport equipment	Maintenance and repair	.149
Electrical equipment	Other business services	.132
Machinery	Maintenance and repair	.126
Motor vehicles	Maintenance and repair	.119
Other transport equipment	Other business services	.119
Electrical equipment	Maintenance and repair	.115
Other manufacturing	Computer services	.109
Electrical equipment	Computer services	.107
Machinery	Other business services	.105

- Some products are more 'bundleable' (i.e. sold together with services) than others
- Agriculture and food products almost never bundled. Transport equipment and machinery products more likely to be bundled...
- ... especially with maintenance and repair, other business services and computer services

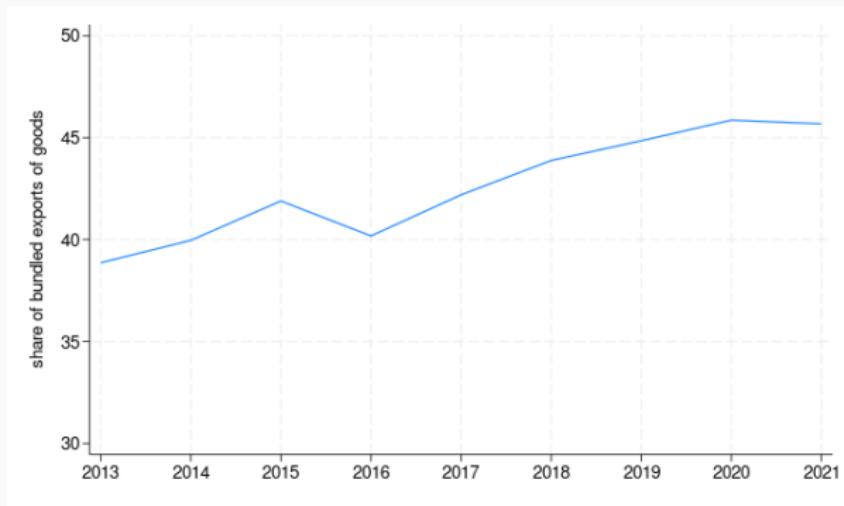
## Bi-exporting: Destinations

Bi-exporting (firm-country-year)	
Population	0.044***
GDP per capita	0.053***
Distance	-0.050***
Parent	0.517***
Affiliates	0.187***
Firm-year FE	Yes
No. obs.	261,156

- Bi-exporters sell goods and services to only 20% of the countries that they serve (compared to 67% where they sell only goods)
- In these countries, median share of services is 5% (mean: 22%)
- Bi-exporting more frequent in larger, richer and less distant countries and countries where parent and affiliate companies are located

## Bi-exporting: over time

- Bi-exporting has become more frequent over the last decade
- 46% of goods export flows are 'bundled' with services in 2021 (i.e. sold by firms that also sell services to the same country), up 7 pp since 2013 (balanced panel of 1,464 firms)



## Does trade in service boost exports of goods?

- Regress exports of goods on dummies indicating whether a firm exports or imports services to each country

$$\ln Y_{ipct} = \beta_1 X_{Serv_{ict}} + \beta_2 M_{Serv_{ict}} + Z_{ict} + \alpha_{pct} + \alpha_{it} + \epsilon_{ipct} \quad (1)$$

	Value	Unit values	Volumes	Volumes per customer (EU only)	Number of customers (EU only)
Exports services	0.18***	-0.01	0.19***	0.28***	-0.03**
Imports services	0.19***	-0.01	0.19***	0.04**	0.16**
Parent	0.08***	-0.03*	0.11***	0.18***	0.03
Affiliates	0.18***	-0.04***	0.22***	0.22***	0.05***
Prod-ctry-year FE	Yes	Yes	Yes	Yes	Yes
Firm-year FE	Yes	Yes	Yes	Yes	Yes
Obs.	4,077,228	4,041,004	4,041,004	2,573,973	2,595,917

- Exports of services enable firms to sell larger volumes per customer
- Imports of services allow companies to reach a larger number of customers

## Concluding remarks

- We build a new micro data set which allows to study the interconnection between trade in goods and services at a granular level (firms, products, destinations)
- We find evidence of significant complementarities between goods and services trade...
- ... that are growing over the last decade
- Trade in goods and services should not be looked at separately (by statisticians, economists and trade negotiators)

Thank you for your attention

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## Goods and services: definitions

- System of National Accounts (SNA) 2008
- Goods:
  - 'Physical, produced items over which ownership rights can be established and whose economic ownership can be passed from one institutional unit to another by engaging in transactions'
- Services
  - 'Result of a production activity that changes the conditions of the consuming units, or facilitates the exchange of products or financial assets'
- Key distinction: in contrast to goods, services 'cannot generally be separated from their production'

# Trade in goods and services: concepts

- Goods
  - Trade statistics concept, based on border crossing
  - Exports/imports: goods that leave/enter an economic territory
- Services
  - National accounts / Balance of payments concept, based on residence principle
  - Exports/imports: transactions between resident unit and non-resident unit
- Memo: Sales through foreign affiliates (e.g. GATS mode 3 for services) are not included

## Methodological and statistical issues

- Transaction-level data available only for (intra-EU) goods, not available for services: we do not know whether both goods and services are sold to the same buyer
- Timing of services provision/purchase may differ with respect to timing of goods sale
- Thresholds differ between (intra and extra-EU) trade in goods and trade in services
- Customs valuation rules: might valuation of goods also include the value of services?
  - Provision of additional complementary services is regarded as a separate service export in the customs valuation process (WTO 2018)

# Complementarities between goods and services?

- Yes
  - Demand complementarities (e.g. maintenance services on a product after purchase)
  - Services as input in production process for goods (e.g. advertising services)
- No
  - Adjustment costs from moving factors from goods to services or viceversa (trapped factors)
  - Product/service cannibalizations
  - Adapting services in response to provision in Restrictions to trade in goods

# Service categories

EBOPS*	Description
SB	MAINTENANCE AND REPAIR
SC4	POSTAL AND COURIER
SG	FINANCIAL
SH	CHARGES FOR THE USE OF INTELLECTUAL PROPERTY
SI1	TELECOMMUNICATIONS
SI2	COMPUTER
SI3	NEWS AND INFORMATION
SJ1	R&D
SJ211, SJ212	LEGAL, ACCOUNTING, AUDITING, BOOKKEEPING AND TAX CONSULTING
SJ213	BUSINESS AND MANAGEMENT CONSULTING AND PUBLIC RELATIONS
SJ22	ADVERTISING, MARKET RESEARCH AND PUBLIC OPINION POLLING
SJ311, SJ312	ARCHITECTURAL AND ENGINEERING
SJ313, SJ321	SCIENTIFIC AND OTHER TECHNICAL
SJ33	OPERATING LEASING
SJ34	TRADE-RELATED
SJ35OBS	OTHER BUSINESS N.I.E.
SJ35SRE	BETWEEN RELATED ENTERPRISES NOT INCLUDED ELSEWHERE
SK, SL	PERSONAL, CULTURAL, AND RECREATIONAL SERVICES, GOVERNMENT

## Further details on sample

- Sample covers medium-large firms...

Variables	Mean	p25	p50	p75
Employees (persons)	767	50	199	555
Sales (EUR mln)	381	53	135	297

- ... in both manufacturing and services sectors

Sector	% No. of	% Exp	% Exp	% Imp	% Imp
	firms	G	S	G	S
Manufacturing	42.2	86.7	43.2	56.5	40.6
Services	46.8	10.5	53.8	34.6	55.2
Construction	3.6	0.2	1.4	0.1	1.3
Others	7.4	2.6	1.5	8.8	2.9

## Sample: firms with null services trade

Year	No. firms	of which: null trade
2013	2869	797
2014	2784	762
2015	2909	832
2016	2823	783
2017	2899	817
2018	2808	812
2019	3358	1256
2020	3317	1256
2021	3319	1244

## Balanced sample

Year	No. firms	% Sample Exports		% Sample Imports	
		G&S	G&S	G&S	G&S
2013	1464	71.0		76.8	
2014	1464	71.5		76.1	
2015	1464	70.9		73.6	
2016	1464	73.4		75.9	
2017	1464	74.1		76.7	
2018	1464	74.5		78.6	
2019	1464	74.0		75.9	
2020	1464	75.6		77.0	
2021	1464	73.8		72.3	

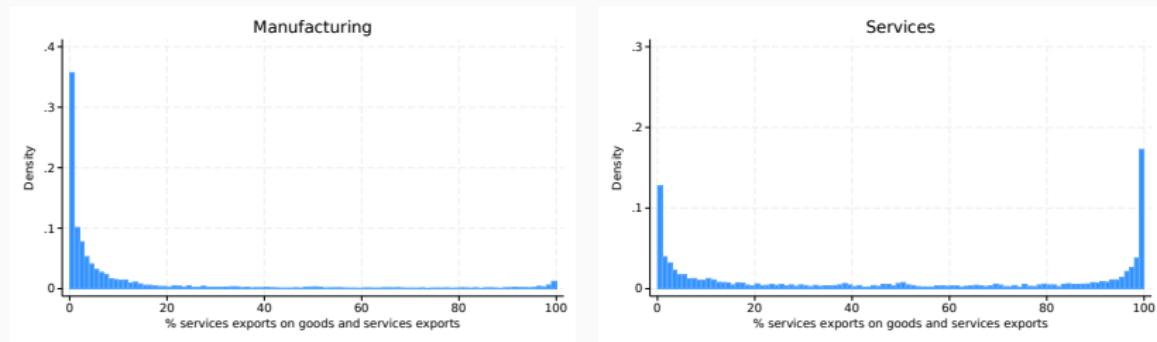
# Firms (1)

- Bi-exporters: Firms that export both goods *and* services in a given year
  - 32% of firms in our pooled sample...
  - ... accounting for 67% of exports
  - Bi-exporting less frequent than bi-importing (53% of firms) Bi-importers
  - Share of bi-exporters higher in manufacturing than in services (47% versus 29%)

	Number of firms	Exports G&S	Exports G	Exports S
Bi-exporters	32.3	66.8	64.6	85.8
Only goods exp.	33.4	31.8	35.4	0.0
Only services exp.	9.7	1.5	0.0	14.2
Non-exporters	24.6	0.0	0.0	0.0

## Firms (2)

- We compute the share of services exports on exports of goods and services at the firm level for bi-exporters
- For manufacturing firms, services represent a minor share of exports (13% for average firm)...
- For services, services exports' share rises to 50%, but bimodal distribution (wholesale and retail trade to the left, business services to the right)



## Firms (3)

- Which firms are more likely to be bi-exporters?
- Regress firm-level characteristics on trade status and industry-year FE
- Omitted category: 'only goods exporter' (non-exporters dropped from sample)
- Bi-exporters are larger, employ more skilled labor, have lower tangible capital intensity but more intangibles, more likely to be foreign-owned than 'only goods exporters'

	Empl	Sales	VA prod.	% White collars	Tang. K/L	% Intang.	Foreign
Only services	-0.01	-0.19***	-0.05**	0.08***	-0.71***	0.09***	0.09***
Bi-exporter	0.66***	0.53***	0.03**	0.09***	-0.16***	0.04***	0.22***
Ind-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. obs.	19,734	19,814	19,074	19,734	19,424	19,545	19,815

## Bi-importers

- Bi-importers: Firms that import both goods *and* services in a given year
  - 53% of firms in our pooled sample...
  - ... accounting for 86% of imports
  - Bi-importing more frequent than bi-exporting (32% of firms)

	Number of firms	Imports G&S	Imports G	Imports S
Bi-importers	53.4	86.0	85.6	89.1
Only goods imp.	19.8	12.9	14.4	0.0
Only services imp.	11.5	1.1	0.0	10.9
Non-importers	15.3	0.0	0.0	0.0

# Products (1)

- 'Bundleability' (Ariu et al. 2020): frequency of firm-product-country-year combinations with positive services exports
- Highest for transport equipment and machinery products, lowest for agriculture and food products

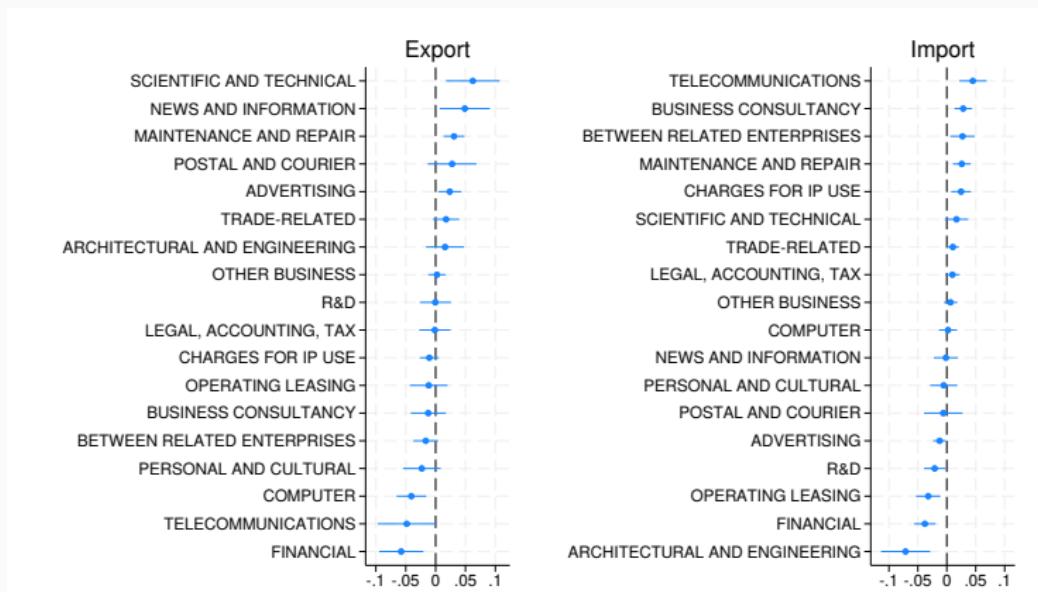
Product group	Bundleability
Motor vehicles	.376
Electrical equipment	.362
Other transport equipment	.344
Machinery	.332
Other manufacturing	.314
Plastics and rubber	.304
Leather	.291
Apparel	.283
Energy	.281
Metals	.276
Stone and Glass	.241
Chemicals	.232
Pharmaceuticals	.205
Textiles	.203
Food and beverage	.086
Agriculture	.075

## Products (2)

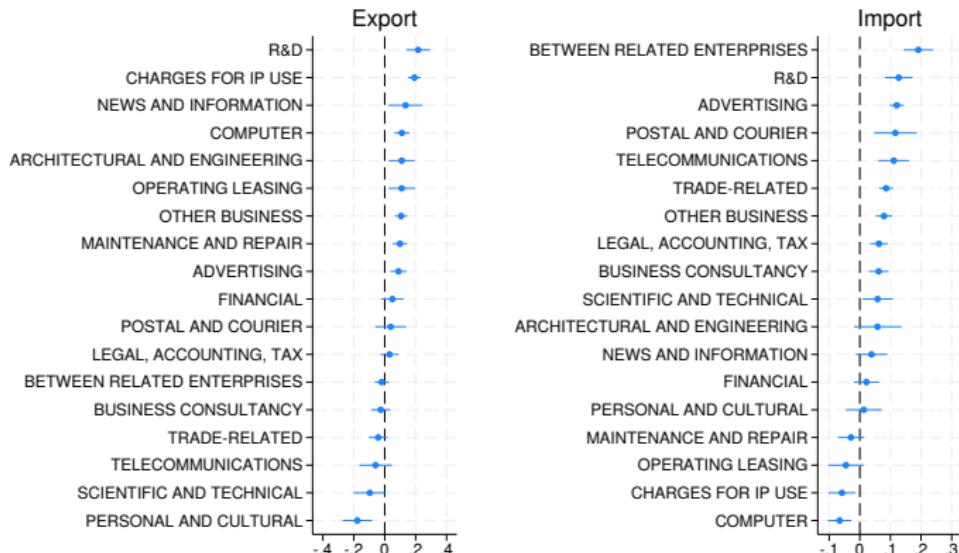
- Going at a more granular level (6-digit product - service type pair), much starker differences in bundleability
- Highest values of bundling for machinery products (HS6: 84...) bundled with maintenance and repair services

HS6	HS6 description	Service type	Bundleability
846595	Drilling or mortising machines	Maintenance and repair	.802
846490	Machine tools for working stones	Maintenance and repair	.724
845929	Drilling machines for working metal	Other business services	.718
848060	Moulds for mineral materials	Maintenance and repair	.691
848060	Moulds for mineral material	Financial services	.623
846594	Bending or assembling machines	Maintenance and repair	.619
846591	Sawing machines	Maintenance and repair	.611
400110	Natural rubber latex	Other business services	.606
846592	Planing, milling machines	Maintenance and repair	.605
846593	Grinding, sanding machines	Maintenance and repair	.598

# Unit values

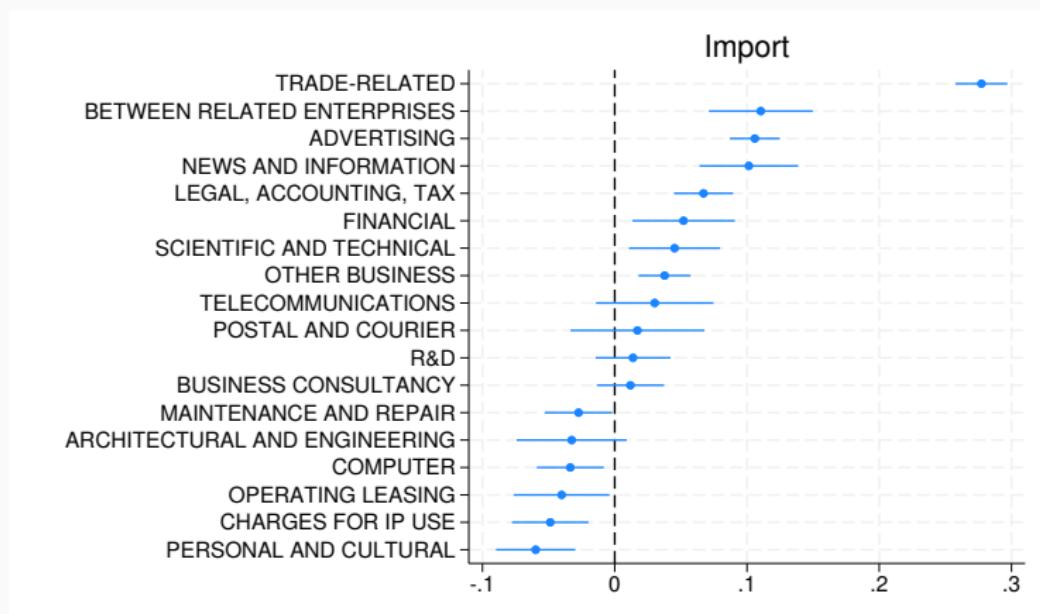


# Volumes



# Number of customers

- Imports of services help firms reaching a larger number of customers for goods exports: esp. trade-related, intra-group, advertising, news, legal and accounting



## Average volume per customer

- Exports of services help firms selling larger volumes per customer: esp. news, R&D, maintenance and repair

