

Working
Papers 2018

10

International trade in services: evidence for portuguese firms

João Amador | Sónia Cabral
Birgitte Ringstad



BANCO DE
PORTUGAL
EUROSYSTEM

Working
Papers 2018 **10**

International trade in services: evidence for portuguese firms

João Amador | Sónia Cabral
Birgitte Ringstad

APRIL 2018

The analyses, opinions and findings of these papers represent
the views of the authors, they are not necessarily those of the
Banco de Portugal or the Eurosystem

Please address correspondence to
Banco de Portugal, Economics and Research Department
Av. Almirante Reis, 71, 1150-012 Lisboa, Portugal
Tel.: +351 213 130 000, email: estudos@bportugal.pt



BANCO DE PORTUGAL
EUROSYSTEM

Lisbon, 2018 • www.bportugal.pt

International trade in services: Evidence for Portuguese firms

João Amador
Banco de Portugal
Nova SBE

Sónia Cabral
Banco de Portugal

Birgitte Ringstad
Nova SBE

May 2018

Abstract

This paper describes the main features of Portuguese international trade of non-tourism services, using a new transaction-level database on services trade merged with detailed balance-sheet data. We find that a few two-way traders with diversified service and geographical portfolios account for a substantial share of exports and imports. Compared with one-way traders, two-way traders are larger, older, more productive and more profitable. We also unveil new evidence on the bi-modality of the distributions of export intensity, with density concentrating on both ends of the distribution. Moreover, considering all margins of firms' services trade and controlling for several firm characteristics, the intensive margins of exports and imports of services are positively related to both productivity and profitability. Regarding the extensive margins, the number of different types of services imported by a firm is also positively associated with its performance.

JEL: F1, F14, L25

Keywords: International trade, Services, Trade margins, Firm-level data.

Acknowledgements: The authors are grateful to Fundação Francisco Manuel dos Santos for supporting this project. In particular, Birgitte Ringstad worked in the project while visiting the Economics and Research Department of Banco de Portugal and Nova School of Business and Economics under a grant by this institution. The opinions expressed in the paper are those of the authors and do not necessarily coincide with those of Banco de Portugal, the Eurosystem or Fundação Francisco Manuel dos Santos. Any errors and omissions are the sole responsibility of the authors.

E-mail: jamador@bportugal.pt; scabral@bportugal.pt; biringstad@gmail.com

1. Introduction

International trade in services has been growing strongly since the mid-eighties. This trend translated into rising shares of this sector in total gross output, employment and trade (Figure 1). The drivers of international trade in services are similar to those of trade in goods and include the fall of political and economic barriers to trade, the development of global value chains and the acceleration of technological progress. The latter aspect, in particular, has been key in moving services away from the traditional notion of non-tradables. The lower costs and the increased speed and reliability of transportation facilitate the travel of individuals to provide and/or consume services around the globe. In addition, the sharp progress in information and communication technologies and the dramatic fall in telecommunication costs led to the strong growth of exchanges of electronically transmitted business services. Hence, services like financial, computer and information and other commercial and business services are increasingly traded internationally. Overall, the rise of services has fundamentally altered the economic landscape across the world and it is likely to play a crucial role in the future. In the next decades, as new technological developments (like telepresence and telerobotics) reduce the costs of face-to-face interactions, more workers should start providing services abroad, even in those tasks that today require a physical presence (see Baldwin (2016) for a discussion of globalisation's *third unbundling*).

An important development in the empirical trade literature is the utilization of micro-level data to understand the reality of international trade. This literature has advanced significantly when it comes to goods trade but it is still relatively scarce for international trade in services. The seminal paper of Breinlich and Criscuolo (2011) for the UK provided a novel set of stylized facts on firms engaging in international trade in services and was followed by studies on the profiles of service traders using firm-level Balance of Payments data for other European countries. The list of these studies includes Federico and Tosti (2017) for Italy, Minondo (2016) for Spain and Ariu (2016) for Belgium. Comparable cross-country evidence on the characteristics of trading firms in service sectors is provided by Haller *et al.* (2014) and Damijan *et al.* (2015) for Finland, France, Ireland and Slovenia, while Ariu *et al.* (2017) analyse the role of firm heterogeneity in shaping aggregate service exports in Belgium, France, Germany and Spain.

This literature finds many similarities between services and goods trade at the firm level, suggesting that models of heterogeneous firms for goods trade are an appropriate starting point to explain trade in services. These studies show that a small number of firms engage in exports or imports (one-way traders) and even fewer firms are active in both dimensions (two-way traders). Moreover, firms participating in international trade in services are larger and have higher productivity, skill intensity and wages than non-traders. Available evidence also confirms the strong heterogeneity among firms in terms of traded values,

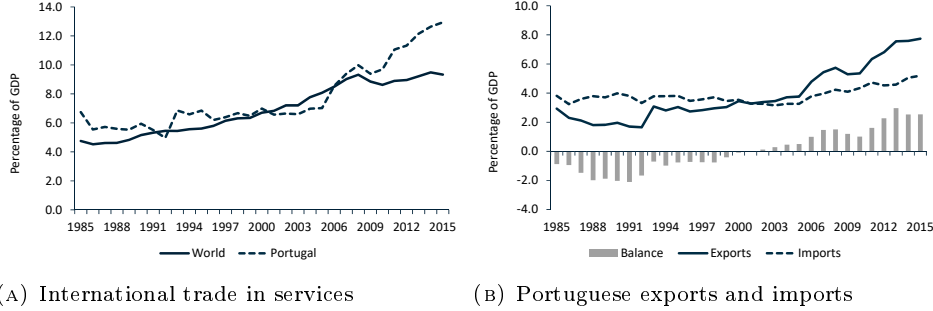


FIGURE 1: International trade of non-tourism services as a percentage of GDP

Source: CEPII-Chelem database.

Notes: Nominal Balance of Payments transactions and nominal GDP denominated in current US dollars. Exports and imports of services exclude transactions of the travel account.

number of partner countries and service types, as well as the concentration of services trade values both between and within firms.

This paper contributes to this literature by reporting a set of stylised facts using detailed firm-level data on Portuguese exporters and importers of services. Portugal is an interesting case-study as its export performance stands out as a key variable in the recovery from the latest sudden stop in external financing, triggered by the sovereign debt crisis in the euro area.

Portugal has been experiencing a progressive increase in its trade openness and there has been a growing importance of trade in services. Even if tourism remains the largest sector in Portuguese trade in services, accounting for around 45 percent of total exports and 28 percent of total imports of services, trade in non-tourism services has been gaining importance since the 2000s (Figure 1). In 2015, total Portuguese trade in non-tourism services represented around 13 percent of GDP, which compares to around 9.5 percent in the world economy. In addition, since the 2000s, Portugal has been recording surpluses in the non-tourism services account, which contrasts with the systematic deficits registered previously. In 2015, the Portuguese services account, excluding tourism, showed a surplus of 2.5 percent of GDP, with exports and imports representing 7.7 and 5.2 percent of GDP, respectively.

Our analysis relies on transaction-level data on Portuguese international trade in non-tourism services at a disaggregated breakdown level by partner country, as collected by the Statistics Department of Banco de Portugal, merged with firms' balance-sheet information for 2014 and 2015. This set of information makes it possible to improve the existing knowledge about services trade in Portugal, for instance in terms of the role of multi-service and multi-country firms. Throughout the paper, we distinguish between firms that only export,

that only import, and that engage in both international flows of services (two-way traders). We confirm most of the evidence on international traders of services observed for other countries, namely the strong level of firm-level heterogeneity in services trade and the concentration of trade flows between and within-firms. In particular, two-way traders with diversified service and geographical portfolios account for a large proportion of Portuguese exports and imports of services. In addition, two-way traders tend to be larger, older, more productive and more profitable than one-way traders. We also unveil new evidence on the bi-modality of the distributions of export intensities, common to both types of traders and to firms of different size classes and age groups.

Taking advantage of the transaction-level dimension of the data, we consider two extensive margins of firm-level trade (number of trading partners and number of services traded) and the intensive margin (trade per country-service type combination). We show that the intensive margin of firm-level trade is more important than the extensive margins to explain the differences in traded values among Portuguese traders of services, for both exports and imports. Moreover, larger and more productive firms have higher values of exports and imports of services, trade more per country and service type, and trade with more countries and in more types of services. Most of the correlations between firm productivity, profitability and size, on the one hand, and firm-level trade flows, on the other hand, are explained by the intensive margin of firm-level trade. Considering the different margins of a firm's trade together and controlling for several firm characteristics, there is a positive link between the average values traded per service-country and firms' productivity and profitability. The number of different types of services imported by a firm is also positively related with firm performance, pointing to the importance of foreign services as inputs for firms.

The paper is organized as follows. Section 2 briefly discusses the specificities related with the measurement of international trade flows of services, describes the main features of the two databases used and provides some basic descriptive statistics of the sample. Section 3 reports our findings along three main blocks. Firstly, we describe some basic attributes of the three types of service traders in terms of sector of activity, age, size, productivity and profitability. Secondly, we examine the portfolios of trading firms at the transaction-level, with regard to the number of services and partner countries. Thirdly, we assess how the intensive and extensive trade margins at the firm-level correlate with productivity and profitability. Finally, section 4 offers some concluding remarks.

2. Concepts, measurement and data

2.1. *Concepts and measurement*

Part of the explanation for the relatively limited number of firm-level studies on international trade in services relates with the difficulties in compiling and interpreting the data. In fact, the services sector has several specificities that lead to essential differences relatively to trade in goods.

Firstly, services are intangible and hence their international trade does not involve shipping. As a consequence, services are inherently harder to monitor, measure and tax. Secondly, services are non-storable, so its production and consumption tend to occur simultaneously. Thirdly, services are highly differentiated, as they are sometimes tailored to the needs of customers. Fourthly, all services require some form of interaction between producer and user, the so-called joint production. It can be a direct person-to-person contact (e.g., haircut), a telecommunication (e.g., internet banking) or an exchange of written documents. Some services may require the consumer to move to the location where the services are supplied (e.g., tourism), while others may require the producer to move his location (e.g., maintenance engineering). As a result, even with the strong improvements in information and communication technologies, services are still less tradable than goods.

Since services are intangible, in general, tariffs cannot be levied directly on their transactions, except for a few activities like transportation and tourism. Therefore, barriers to trade in services are mostly non-tariff barriers, like quotas, prohibitions and government regulations. These restrictions can take the form of limits on the market shares of foreign providers of services or on the scope of their activities. Moreover, regulations also include provisions on licensing and certification, technical and environmental standards or government procurement and sourcing policies. As discussed in OECD (2014), even though regulatory barriers to product market competition have been reduced since the mid-nineties, there is scope for further reforms, especially in professional services. In fact, services are the sectors in which most economic regulation is concentrated and where domestic regulations are most relevant for economic activity. Nordås and Rouzet (2017) use a recent OECD regulatory database on services trade restrictions and highlight the large potential costs of regulations that restrict trade and investment in services.

The intangible nature of trade in services also makes these flows difficult to measure. As such, finding efficient ways of collecting data on services international transactions is a statistical challenge. There are several studies devoted to the measurement of trade in services (see, for instance, Lipsey (2009) and Sturgeon *et al.* (2006)) and most country studies on trade in services also discuss this issue in detail. In line with the classical approach, Balance of Payments (BoP) data is still the main source used to measure international

trade in services. Nevertheless, there is a broad consensus that the growth of services trade is significantly underestimated, as we will discuss in detail below.

In order to understand the consequences on the analysis arising from alternative definitions of trade in services, it is useful to provide additional detail and examples. The United Nations Manual on Statistics of International Trade in Services (UN 2010) describes in depth the four modes through which services may be traded internationally, according to the General Agreement on Trade in Services (GATS), taking into account the location of both suppliers and consumers of traded services.

Mode 1 (cross-border supply) applies when suppliers in one country provide services to consumers in another country, without either of them moving into the territory of the other. This mode is similar to the traditional notion of trade in goods, where both the consumer and the supplier remain in their respective territory. Freight transport services, correspondence courses and telediagnosis are examples of cross-border supply of services.

Mode 2 (consumption abroad) comprises the cases when a consumer resident in one country moves to another country to obtain a service. Tourism services and related activities are typical examples of consumption abroad. Medical treatment of non-resident persons and language courses taken abroad are other examples.

Mode 3 (commercial presence) includes the situations when firms supply services internationally through the activities of their foreign affiliates. Medical services provided by a foreign-owned hospital and services supplied by a domestic branch of a foreign bank are examples of supplies through commercial presence. Most mode 3 services concern domestic sales of foreign affiliates that are not included in the BoP services data, as they are considered transactions between residents. Statistics on foreign affiliates trade in services (FATS) are the main sources of data on international trade in services through mode 3. The main exception refers to short-term construction projects done by unincorporated site offices, which are recorded in the BoP under construction services.

Finally, mode 4 (presence of natural persons) describes the process by which an individual moves temporarily to the country of the consumer in order to provide a service. This mode of supply includes trade in services in the BoP sense, like auditing services by a foreign auditor or entertainment services by a foreign artist on tour in the host country. In addition, mode 4 also includes non-permanent employment in the country of the consumer, which is recorded in the BoP as labour income.

From the discussion above it results that the BoP trade in services broadly covers modes 1, 2, a significant part of mode 4 and a small part of mode 3. Therefore, the international trade in services is being underestimating when it is measured as BoP transactions in services. This underestimation can be significant since foreign direct investment (FDI) is an important channel for the international provision of services. Rueda-Cantuche *et al.* (2016) provide

recent evidence on the high relevance of mode 3, showing that it was the largest mode of supply of European exports of services in 2013.

Moreover, recent evidence shows that services are increasingly incorporated in exports of goods. Francois *et al.* (2015) examine in detail the value-added trade linkages between services and goods and find that most of the services exports on a value-added basis are embodied in exports of goods. In that context, Cernat and Dimitrova (2014) go beyond the four modes of services supply and suggest the so-called "mode 5" to account for services embodied in exports of manufacturing goods. Mode 5 services are a subset of servitisation and include the domestic intermediate services inputs that are incorporated in a country's goods exports.¹

2.2. Databases

The empirical analysis relies on transaction-level data of Portuguese firms trading services from the Portuguese BoP services account compiled by Banco de Portugal. This data is merged with detailed balance-sheet and income statement information from the Simplified Corporate Information (*Informação Empresarial Simplificada*, Portuguese acronym: IES). We link the databases by using a common and unique firm identifier. The period of analysis is 2014 and 2015, which are the years for which both databases are available.

The services account of the Portuguese BoP measures services transactions between resident and non-resident entities in accordance with the IMF (2016) Balance of Payments Manual (6th edition). As described in the previous section, this definition of international trade in services is narrower than the one of GATS, which has broadened the statistical concept of trade in services, moving away from a subset of the BoP and reflecting the modes by which services are supplied.

Banco de Portugal collects transaction-level data on international trade in non-tourism services on a monthly basis to compile the services account of the Portuguese BoP. No firm-level data for travel and tourism flows is available. The survey defines a non-reporting threshold of 100 thousand euros on the yearly value of all economic and financial operations of a firm with non-residents. Hence, no specific reporting threshold is imposed on the international transactions of services. The firm-level data covers more than 90 percent of Portuguese total exports of non-tourism services and around 80 percent of imports of non-tourism services as published in the the official BoP. We aggregated the data at the annual level and all values are expressed in current euros. For each external transaction, the database reports the firm identifier, classification of the service, partner country and time period. Types of services

1. See Baines *et al.* (2009) for a detailed discussion of servitisation, i.e., the rise of the participation of manufacturing firms in service activities.

are defined according to the Extended Balance of Payments Services (EBOPS) 2010 classification. We use a breakdown that comprises 29 categories of services as described in Table A.1 of the Appendix. Although this is a relatively disaggregated level in the EBOPS classification, it is much more aggregate than the usual product classifications available for trade in goods. Hence, the interpretation of our results on the contribution of the "extensive margin" of services trade (i.e., number of service types traded) should take this fact into consideration.

The balance-sheet data draws on annual information for Portuguese firms reported under Simplified Corporate Information (*Informação Empresarial Simplificada*, IES), which results from a collaboration between the Ministry of Finance, the Ministry of Justice, Statistics Portugal and Banco de Portugal. The IES follows the new accounting standards system from 2010 to 2015, and it covers virtually the universe of Portuguese non-financial corporations.²

The universal coverage of IES emerges from its nature, as it is the system through which corporations report mandatory information to the tax administration and statistical authorities. Under IES, firms provide detailed annual balance-sheet, profit and loss accounts. It further contains information on firms' characteristics such as number of employees, age and main sector of economic activity according to the Portuguese industrial classification Rev 3 – *Classificação Portuguesa das Actividades Económicas* (CAE).

Some filters were imposed on the data to eliminate erroneous, inconsistent or missing observations. Firstly, the analysis was restricted to firms for whom there was information available for a set of key variables, such as age and sector of activity. Secondly, we further restricted the sample to firms with positive values for gross value-added, employment, labour costs and total assets.

The sample used in this paper is based on common firms in the BoP and IES databases. Hence, it includes only Portuguese firms that are active in the international services market, i.e., firms that either export and/or import non-tourism services in 2014 and/or 2015. Given the merge with IES, the final sample excludes most of the banking and insurance sector. This leads to a reduced coverage of international trade of these types of services, even if the database contains information on financial services provided by non-bank institutions. Note that the classification of service types is different from the one

2. More precisely, it excludes firms whose main activity is in sections O - Public administration and defence, compulsory social security (division 84); T - Activities of households as employers; undifferentiated goods and services producing activities of households for own use (division 97 - 98); U - Activities of extraterritorial organisations and bodies (division 99) of the Portuguese statistical classification of economic activities Rev 3 – *Classificação Portuguesa das Actividades Económicas* (CAE). In addition, most corporations in section K - Financial and insurance activities (divisions 64 - 66), like banks and insurance companies, are also excluded from IES, since they have specific accounting reporting requirements and a distinct balance-sheet structure. However, other financial and insurance intermediaries and auxiliaries are available in the database.

used to assign firms to sectors of economic activity. Firms are officially classified in a sector of CAE according to their main reported activity and import and/or export one or more of the 29 services types of EBOPS classification, and these are independent classifications.

2.3. Descriptive aggregate statistics

We classify international traders of services into three categories according to their trading status: only export (one-way exporters), only import (one-way importers) or engaging in both activities (two-way traders). The general term exporters (importers) refers to firms exporting (importing) services regardless of the import (export) dimension. Throughout the analysis, we calculate the statistics using firm-year observations, implying that a firm active in services trade in both years is counted as a new observation in the respective year, i.e., it is counted twice in the pooled dataset. For simplicity, we use the term *firm* for *firm-year* and refer to non-tourism services only as services in the remaining of the paper. Finally, the tables and graphs represent pooled results for 2014 and 2015.

Firm type	Traders		Exports		Imports	
	Number	%	Value	%	Value	%
One-way exporters	4,506	28.0	2,389,858	10.9	–	–
One-way importers	4,430	27.5	–	–	736,306	6.4
Two-way traders	7,181	44.6	19,570,445	89.1	10,850,840	93.6
Exporters	11,687	72.5	21,960,303	100.0	10,850,840	–
Importers	11,611	72.0	19,570,445	–	11,587,146	100.0
Total	16,117	100.0	21,960,303	100.0	11,587,146	100.0

TABLE 1. Sample of Portuguese international traders of services, 2014-2015

Notes: Import and export values are in thousand euros. All values are based on firm-year observations.

The final sample contains 9,903 unique firms. Considering the two years, there are 16,177 firms-year, of which 4,506 only export, 4,430 only import and 7,181 engage in both activities, i.e, 11,687 firms-year report positive exports and 11,611 firms-year have positive imports (Table 1). For the UK, Breinlich and Criscuolo (2011) find that exporting services is more common than importing, while Federico and Tosti (2017) have the opposite result for Italy. In our sample, the proportions of one-way exporters and importers are very similar, each representing around 28 percent of traders. An interesting fact in Table 1 is that a substantial share of Portuguese firms that participate in international trade are active in both flows: two-way traders represent around 45 percent of trading

firms. Another feature that stands out in Table 1 is the striking concentration of trade values in two-way traders: these firms account for around 90 percent of total exports and around 94 percent of total imports.

Table 2 shows the representation of firms and trade flows according to 10 broad categories of services at the 2-digit level of EBOPS classification based on the 29 services types considered in the database. In terms of number of firms, "Other business services" is the largest category for both exporters and importers, followed by "Transport" on the export side and "Telecommunications, computer and information" on the import side. The two latter service categories are third in the ranking of number of importers and exporters, respectively. In terms of values traded, "Transport" accounts for almost half of the value exported (48.2 percent), followed by "Other business services" (30.6 percent). On the import side, "Other business services" rank first (35.7 percent) and "Transport" second (27.5 percent). "Telecommunications, computer and information" accounts for the third highest shares in exports and imports (10.6 and 15.6 percent, respectively). Hence, Portuguese international trade in non-tourism services is dominated by three main categories of services: "Other business services", "Transport" and "Telecommunications, computer and information". Within these broad categories of services, the most important types of services are "Air transport", "Telecommunications", "Computer services", "Scientific and other technical services", "Trade-related services" and "Other business services n.i.e", both on the export and import side.³

Code	Description	Exports	Exporters	Imports	Importers
SB	Maintenance and repairs	3.4	5.1	4.9	7.9
SC	Transports	48.2	19.1	27.5	11.6
SE	Construction	4.4	6.7	1.5	2.8
SF	Insurance	0.4	3.4	1.0	4.6
SG	Financial services	0.5	2.2	1.1	5.3
SH	Charges for the use of intellectual property	0.5	1.4	9.1	2.9
SI	Telecommunications, computer, and information	10.6	8.3	15.6	17.9
SJ	Other business services	30.6	50.0	35.7	41.0
SK	Personal, cultural, and recreational services	1.3	3.7	3.5	5.8
SL	Government goods and services	0.00	0.02	0.00	0.16
	Total	100.0	100.0	100.0	100.0

TABLE 2. Shares in total trade and firms by broad service categories, 2014-2015

Notes: The 29 types of services are aggregated in 10 broad categories at the 2-digit level of EBOPS 2010 for presentation purposes. Firms are counted each time they export/import a specific service type at the disaggregated breakdown level of 29 service types in the current year, implying that a firm-year can appear more than once across the broad categories of services listed. The share of each aggregate service category represents its percentage fraction in total exports or imports in both years.

3. A detailed breakdown of service types exported and imported according to the 29 service types of the EBOPS classification, comprising the trade values, number of firms-year, partner countries and transactions of each service is included in Tables A.2 and A.3 of the Appendix.

To examine the geographical composition of Portuguese international trade in services, Table 3 reports the ten largest export and import partner countries in terms of their percentage share in the respective trade flows and number of firms. The main trade partners are almost identical on the export and import side, where countries of the European Union (EU) and Portuguese speaking countries dominate. UK, Spain and France are the top export destinations, while Spain, UK and Germany are the top import origins. Interestingly, Spain represents a larger share of Portugal's imports than exports (17.7 versus 11.1 percent). In addition, Spain is also the country that accounts for the largest number of both exporters and importers. Regarding non-European countries, Angola and Brazil are more relevant in terms of exports than imports, while USA has a higher importance in imports than exports.

Countries	Exports	Exporters	Countries	Imports	Importers
UK	12.1	5.9	Spain	17.7	14.2
Spain	11.1	10.5	UK	13.4	8.8
France	10.3	7.6	Germany	10.2	7.5
Germany	7.9	6.8	USA	9.0	5.0
Angola	7.2	2.9	France	8.4	8.0
Brazil	5.7	1.6	Netherlands	6.2	5.3
USA	5.5	3.2	Switzerland	4.1	2.9
Switzerland	4.8	3.2	Belgium	3.9	3.8
Netherlands	3.7	4.7	Ireland	3.3	3.6
Italy	3.3	3.4	Brazil	3.3	1.7
Other	28.4	50.1	Other	20.6	39.1
Total	100.0	100.0	Total	100.0	100.0

TABLE 3. Main partner countries - shares in total trade and firms, 2014-2015

Notes: Firms are counted each time they export or import with a different partner country in the current year, implying that a firm-year can appear more than once across the listed countries. The share of each country represents its percentage fraction in total exports or imports in both years.

3. The portrait of Portuguese international traders of services

In this section, we report a set of stylized facts on Portuguese exporters and importers of services, distinguishing between one-way exporters, one-way importers and two-way traders. First, we describe some basic attributes of the three types of service traders along several dimensions like sector of activity, age, size, productivity and profitability. Second, we examine the portfolios of trading firms, both in terms of the number of services and of partner countries. Third, we assess how the intensive and extensive margins of trade at the firm level correlate with firm-level attributes, like productivity and profitability.

3.1. Characteristics of Portuguese international service traders

We start by examining the frequency and trade representativity of the different types of traders by their main sectors of economic activity. Table 4 illustrates

the sectoral distribution of trading firms, while Table 5 reports the same information for the values of exports and imports. The distribution of firms within sectors of activity reveals that there is a high heterogeneity between sectors regarding the shares of one-way and two-way traders. Trading firms in the wholesale sector are equally distributed among the three firm types, while, in the manufacturing industry, almost half of the firms only import services. In contrast, the sectors of transportation and professional activities are dominated by only exporters and two-way traders, while the latter firm type represents almost 80 percent of trading firms in the sector of information and communication.

Sector of activity	No. firms	Shares in total firms, exporters or importers					
		Within sectors			By sector		
		Exp Only	Imp Only	Exp & Imp	Exporters	Importers	
Primary	331	11.2	64.4	24.5	1.0	2.5	
Manufacturing	3,285	18.7	49.6	31.7	14.2	23.0	
Electricity, gas, water	211	9.0	55.9	35.1	0.8	1.7	
Construction	1,230	33.2	15.2	51.6	8.9	7.1	
Wholesale and retail trade	3,917	30.8	36.3	33.0	21.4	23.4	
Transportation and storage	1,993	41.6	4.1	54.3	16.4	10.0	
Hotels and restaurants	439	23.5	45.1	31.4	2.1	2.9	
Information and communication	1,016	14.9	7.0	78.1	8.1	7.4	
Financial and insurance activities	234	17.1	21.8	61.1	1.6	1.7	
Real estate activities	182	34.6	23.6	41.8	1.2	1.0	
Professional and other activities	1,862	28.5	9.1	62.4	14.5	11.5	
Administrative activities	963	45.1	12.8	42.2	7.2	4.6	
Others	454	15.9	27.3	56.8	2.8	3.3	
Total (column) and % share in total	16,177	28.0	27.5	44.6	100.0	100.0	

TABLE 4. International traders of services by firm type and sector of activity, 2014-2015

Notes: Values are based on firm-year observations, implying that a firm can appear more than once and change firm type category in the two years. The sample contains 16,177 firms-year, in which 4,506 only export, 4,430 only import and 7,181 engage in both activities. In the two last columns, an exporter (importer) is defined as a firm-year exporting (importing) services regardless of the import (export) dimension of the firm.

The last two columns of Table 4 show that wholesale is the largest sector in terms of the number of trading firms, accounting for more than 20 percent of both exporters and importers. As found for other countries, manufacturing firms represent also a significant part of total international traders of services. The fact that more than 14 percent of all firms exporting services belong to the manufacturing industry (23 percent for importers) links with recent evidence on the relevance of servitisation of manufacturing. Servitisation (or servicification) refers to the increase of purchases, production, sales and exports of services by manufacturing firms and can be considered as a shift from selling only goods to providing an integrated combination of goods and services that add value and contribute to product differentiation (see Baines *et al.* (2009) for a discussion). Other relevant sectors in terms of the number of traders of services are transportation, professional activities, and information and communication.

(A) Exports				
Sector of activity	Exports	Shares in total exports		
	Total	Within sectors		By sector
		Exp Only	Exp & Imp	Exports
Primary	51,988	15.7	84.3	0.2
Manufacturing	1,306,592	9.0	91.0	5.9
Electricity, gas, water	23,832	13.0	87.0	0.1
Construction	1,164,858	12.3	87.7	5.3
Wholesale and retail trade	1,359,003	13.9	86.1	6.2
Transportation and storage	10,801,095	7.9	92.1	49.2
Hotels and restaurants	36,283	30.5	69.5	0.2
Information and communication	2,445,279	1.7	98.3	11.1
Financial and insurance activities	161,383	5.7	94.3	0.7
Real estate activities	72,712	29.6	70.4	0.3
Professional and other activities	3,515,690	23.4	76.6	16.0
Administrative activities	818,762	15.5	84.5	3.7
Others	202,825	19.7	80.3	0.9
Total (column) & % share in total	21,960,303	10.9	89.1	100.0

(B) Imports				
Sector of activity	Imports	Shares in total imports		
	Total	Within sectors		By sector
		Imp Only	Exp & Imp	Imports
Primary	56,922	25.7	74.3	0.5
Manufacturing	1,502,506	16.1	83.9	13.0
Electricity, gas, water	113,364	18.4	81.6	1.0
Construction	385,898	7.3	92.7	3.3
Wholesale and retail trade	1,542,319	12.8	87.2	13.3
Transportation and storage	4,239,237	0.8	99.2	36.6
Hotels and restaurants	125,885	22.8	77.2	1.1
Information and communication	2,388,423	1.0	99.0	20.6
Financial and insurance activities	204,187	24.8	75.2	1.8
Real estate activities	48,964	42.6	57.4	0.4
Professional and other activities	598,366	5.3	94.7	5.2
Administrative activities	197,202	13.9	86.1	1.7
Others	183,876	9.7	90.3	1.6
Total (column) & % share in total	11,587,146	6.4	93.6	100.0

TABLE 5. Trade values of services by firm type and sector of activity, 2014-2015

Notes: Trade values are in thousand euros. The table gives total exports or imports per sector, the percentage share of firm types in exports or imports per sector, and the percentage share of each sector in total exports or imports.

The representativity of sectors and firm types differs when assessing their importance in the values of exports and imports, rather than in the number of firms (Table 5). On the export side, the relevance of wholesalers in terms of total exports declines, as they represent 21.4 percent of exporters but only 6.2 percent of overall exports. The same is visible for the manufacturing industry, which accounts for 14.2 of total exporters of services and 5.9 percent of total exports. On the import side, the change in the importance of both wholesalers and manufacturers is smaller, as each of them accounts for about 23 percent of importers and 13 percent of imports. Thus, firms in the wholesale and manufacturing sectors appear to be more relevant on the import than on the export side, suggesting that sourcing of services inputs is important in these sectors. The opposite pattern applies to transportation, which is the largest

sector in terms of trade values, representing around half of total exports and more than one third of imports. Firms in information and communication account for around 20 percent of total imports, whilst its share in exports is smaller (11.1 percent). The opposite applies to professional activities, which have a stronger relevance for exports than for imports (16.0 percent and 5.2 percent, respectively).

Another feature that stands out in Table 5 is that the concentration of exports and imports of services in two-way traders is common to most sectors of activity. In two of the main sectors in Portuguese services trade – transportation, and information and communication – two-way traders are responsible for 99 percent of the imports of the respective sector and for more than 90 per cent of the sector’s exports. One-way traders have an above average importance in exports of professional activities, accounting for more than 23 percent of the flows.

Table 6 presents the joint distribution of traded values and traders by firm type and size categories. The four size categories are defined according to the EU official classification, which combines number of employees, turnover and balance-sheet total.⁴ Large firms account for the majority of international trade flows of services in Portugal, representing 63 percent of exports and 67 percent of imports. However, most international traders of services are micro and small firms. In particular, around half of one-way exporters are micro firms, while more than 40 percent of one-way importers are small firms. The proportion of large firms is higher in two-way traders, representing more than 11 percent of total firms. The distribution of firms and international trade flows of services along size classes is in line with that identified for Portuguese international trade in goods (Amador and Opromolla 2013).

The joint distributions of Portuguese international trade of services on the age and firm type dimensions are shown in Table 7. Older firms are responsible for a substantial proportion of Portuguese international trade in services. Firms with more than 20 years represent 37.3 percent of total exporters and 43.3 percent of importers and account for around 60 percent of both trade flows. On average, one-way importers tend to be older than the other two types of trading firms, with almost half of them having more than 20 years.

4. The criterion for the classification by size categories was taken from the “Commission Recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises”. According to this definition, the category of micro, small and medium-sized enterprises (SMEs) is made up of firms which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance-sheet total not exceeding EUR 43 million. Within the SME category, a small firm is defined as a firm which employs fewer than 50 persons and whose annual turnover and/or annual balance-sheet total does not exceed EUR 10 million. Within the SME category, a micro-firm is defined as a firm which employs fewer than 10 persons and whose annual turnover and/or annual balance-sheet total does not exceed EUR 2 million. All other firms not classified as SMEs are considered as large firms.

(A) Exports								
Firm size	Exports			Exporters			By firm type	
	Only Exp	Exp & Imp	Total	Only Exp	Exp & Imp	Total	Only Exp	Exp & Imp
Micro	1.7	2.5	4.1	19.2	14.4	33.6	49.7	23.4
Small	3.1	10.2	13.2	14.2	24.1	38.2	36.7	39.2
Medium	2.3	17.4	19.6	4.5	16.0	20.5	11.7	26.0
Large	3.9	59.1	63.0	0.7	7.0	7.7	1.9	11.4
Total	10.9	89.1	100.0	38.6	61.4	100.0	100.0	100.0

(A) Imports								
Firm size	Imports			Importers			By firm type	
	Only Imp	Exp & Imp	Total	Only Imp	Exp & Imp	Total	Only Imp	Exp & Imp
Micro	0.3	2.3	2.6	8.9	14.5	23.4	23.4	23.4
Small	1.4	8.3	9.8	16.6	24.2	40.8	43.5	39.2
Medium	1.8	18.6	20.4	10.2	16.1	26.2	26.6	26.0
Large	2.8	64.4	67.2	2.5	7.0	9.5	6.5	11.4
Total	6.4	93.6	100.0	38.2	61.8	100.0	100.0	100.0

TABLE 6. Joint distribution of trade values and traders by firm type and size category

Notes: Each cell represents the percentage of total exporters (importers) or exports (imports) associated with firms-year belonging to a certain size class (row category) and firm type (column category) in 2014-2015. The four size classes are defined according to the EU official classification (for more details, see footnote 4 of the main text).

(A) Exports								
Firm age	Exports			Exporters			By firm type	
	Only Exp	Exp & Imp	Total	Only Exp	Exp & Imp	Total	Only Exp	Exp & Imp
1-5	0.7	3.7	4.4	5.2	6.2	11.5	13.6	10.1
6-10	1.3	9.7	11.0	7.7	11.4	19.1	20.0	18.5
11-20	2.3	21.6	23.9	12.7	19.4	32.1	32.9	31.6
>20	6.6	54.1	60.7	12.9	24.4	37.3	33.5	39.7
Total	10.9	89.1	100.0	38.6	61.4	100.0	100.0	100.0

(B) Imports								
Firm age	Imports			Importers			By firm type	
	Only Imp	Exp & Imp	Total	Only Imp	Exp & Imp	Total	Only Imp	Exp & Imp
1-5	0.5	5.0	5.4	2.8	6.3	9.1	7.3	10.1
6-10	1.1	8.0	9.1	5.8	11.4	17.2	15.1	18.5
11-20	1.8	23.1	24.9	10.9	19.6	30.5	28.5	31.6
>20	3.0	57.6	60.6	18.7	24.6	43.3	49.1	39.7
Total	6.4	93.6	100.0	38.2	61.8	100.0	100.0	100.0

TABLE 7. Joint distribution of trade values and traders by firm type and age group

Notes: Each cell represents the percentage of total exporters (importers) or exports (imports) associated with firms-year belonging to a certain age group (row category) and firm type (column category) in 2014-2015.

Figure 2 illustrates the distribution of values traded by one-way exporters, one-way importers and two-way traders. The main message is that the majority of firms export and/or import values below 250 thousand euros. This pattern is particularly pronounced on the import side, where more than 90 percent of one-way importers and more than 70 percent of two-way traders are located in the first bin of the respective histograms. The percentage of firms exporting less than 250 thousand euros amounts to 73.8 percent for one-way exporters and to 52.1 percent for two-way traders. The spikes on the last bin of the

histograms of two-way traders indicate that some of these firms have very high trade flows. This feature is more important on the export than on the import side: the percentage of two-way traders exporting more than 3000 thousand euros reaches 10.5 percent, while the corresponding shares for imports is 6.7 percent.

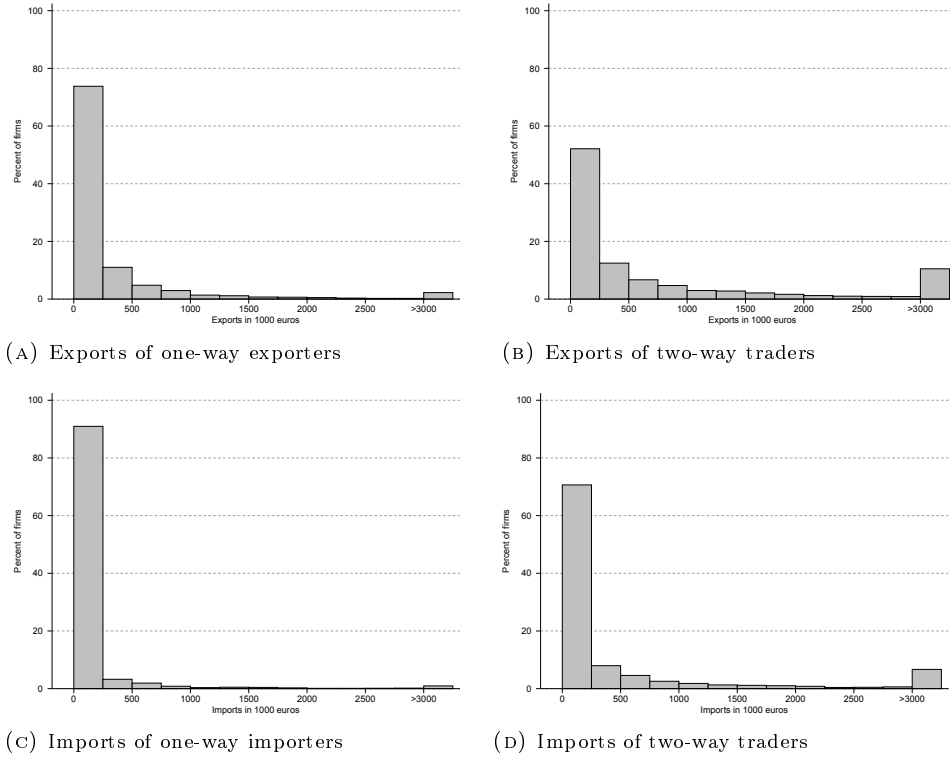


FIGURE 2: Distribution of trade values by firm type, 2014-2015

Notes: Exports and imports are in thousand euros. Distributions are based on firm-year observations in 2014-2015.

Figure 3 plots the distributions of services export and import intensities for the three firm types, measured as the ratio of each flow on total (foreign and domestic) sales of services. Export intensity reflects the importance of external markets in a firm's total sales of services, while import intensity indicates the importance of external markets as origins of services in such activity. The distribution of import intensity (panel B) shows that most service importers have low import intensities. On the export side, panel A suggests that service exporters have a bi-modal distribution, with two-way firms somewhat more concentrated in the first mode and one-way exporters in the second one. This high concentration of firms on both ends of the distribution of export intensity

contrasts with one important stylised fact in firms' international trade in goods: most exporters sell the majority of their output domestically. However, our finding is in line with recent evidence of Defever and Riaño (2017) on the existence of a bi-modal distribution of export intensities. These authors use harmonised firm-level data for the manufacturing sector in 72 countries and show that these "twin peaks" in the distributions are typical of two-thirds of the countries in the sample. Even if Figure 3 gives strong evidence on bi-modality, we perform a formal test: the so-called dip statistic proposed by Hartigan and Hartigan (1985), which measures the departure of a sample from uni-modality. The results of the test clearly reject the null hypothesis of uni-modality in the distribution of export intensity of both types of Portuguese international traders of services at a 0.1 percent significance level.

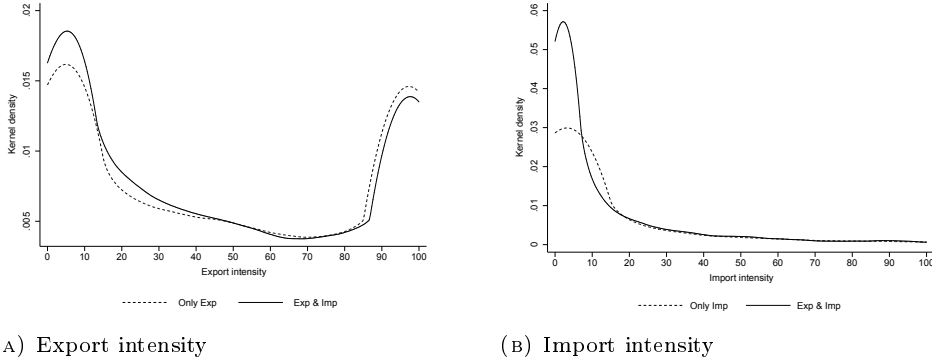


FIGURE 3: Distribution of trade intensities by firm type, 2014-2015

Notes: Export (import) intensity equals the percentage share of exports (imports) in total (domestic and foreign) sales of services. Export intensity is based on all 11,687 firms-year exporting services in 2014-2015. Import intensity is truncated at 100 and excludes 1,259 firms-year that have zero total sales of services. Hence, import intensity is based on 8,790 firms-year importing services in 2014-2015.

The distributions of export and import intensities of firms of the four different size classes and age groups are shown in Figure 4. The evidence of bi-modality of the distribution of export intensity of Portuguese international traders of services is common to firms of distinct sizes and ages, but with some differences between groups. The smaller the exporters, the higher the density in high export intensities, that is, smaller firms seem relatively more engaged in exports. The older the exporters, the higher the density in the lower export intensities, that is, younger firms appear to be relatively more engaged in exports. This feature is especially clear for micro-firms and for firms with at most 5 years: in both cases, at least 25 percent of the firms sell all of their services in external markets, i.e., they have an export intensity of 100 percent. As for the import side, small and micro firms present a high concentration in

low import intensity ratios, while large firms have a more dispersed distribution of import intensity. In addition, the high concentration of firms in low import intensity ratios is evident for all age classes, though it is somewhat less marked for firms with more than 20 years.

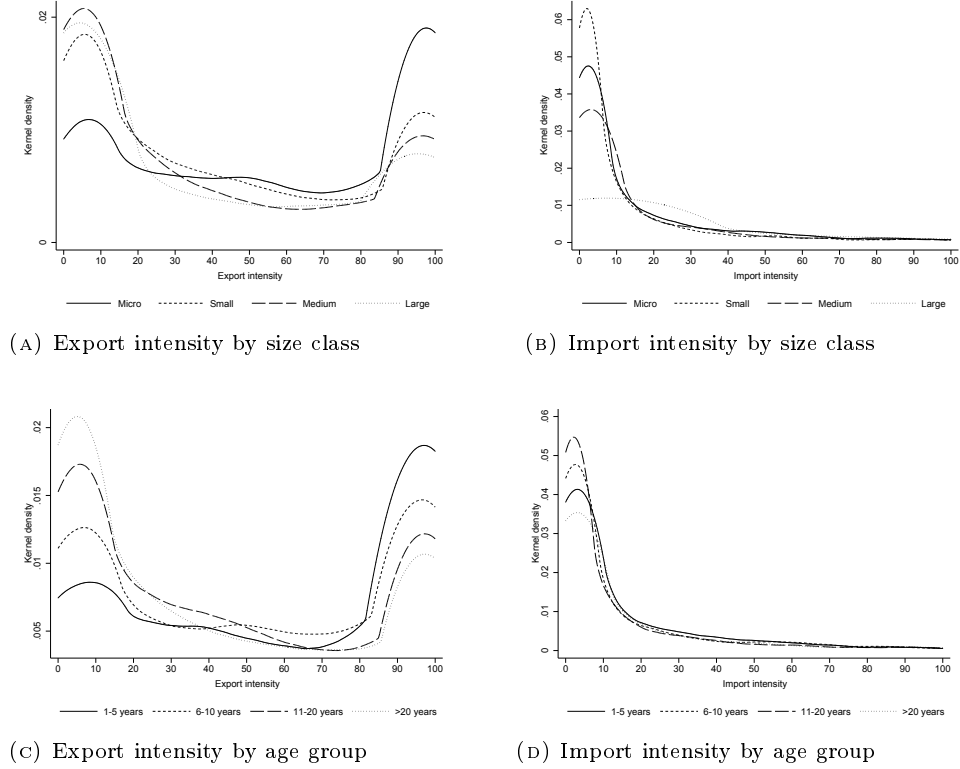


FIGURE 4: Distributions of trade intensities by size class and age group, 2014-2015

Notes: Export (import) intensity equals the percentage share of exports (imports) in total domestic and foreign sales of services. Export intensity is based on all 11,687 firms-year exporting services in 2014-2015. Import intensity is truncated at 100 and excludes 1,259 firms-year that have zero total sales of services. Hence, import intensity is based on 8,790 firms-year importing services in 2014-2015. The four size categories are defined according to the EU official classification (for more details, see footnote 4 of the main text).

The two panels of Figure 5 depict the distributions of productivity and profitability of the three types of Portuguese international traders of services. Labour productivity is defined as gross value added per worker and profitability is defined as the ratio of earnings before interest, taxes, depreciation and amortization (EBITDA) over total assets, which is an approximate measure of a firm's operating cash flow based on income statement data. This is an indicator commonly used for profitability assessment and usable for small and

large firms. We tested alternative measures like earnings before taxes over total assets or simple price-cost margins and the results were very similar. All distributions of labour productivity are markedly right-skewed, but two-way traders tend to have higher productivity levels. In addition, firms that only import services appear to be somewhat more productive than those that just export. The profitability distributions are closer to a normal distribution, but the distribution for two-way traders presents less density at lower profit rates. Therefore, this set of firms tends to be not only more productive but also more profitable than one-way traders of services.

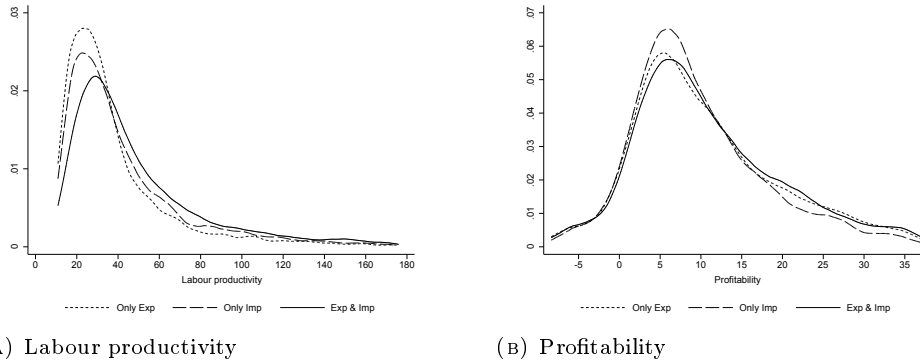


FIGURE 5: Distribution of labour productivity and profitability, 2014-2015

Notes: Labour productivity is in thousand euros and it is defined as a firm's gross value added divided by the number of employees. Profitability is defined as the percentage share of a firm's earnings before interest, taxes, depreciation and amortization (EBITDA) in total assets. Firms-year with values in the lower 5th and upper 95th percentiles are excluded.

To conclude this section, we use descriptive regressions to provide evidence of the magnitude of the differences between one-way and two-way traders along a number of firm attributes. More precisely, we regress several firm-level variables in logs on a dummy variable identifying two-way traders of services, i.e., one-way traders are the reference group. The regressions include also year and industry fixed-effects to control for differences in firm characteristics across sectors. The control for the main sector of activity of the firm is defined at the CAE 2-digit level, comprising 80 different sectors. These estimates, although showing simple correlations, have the advantage that the coefficients can be interpreted in percentage terms. As found by Damijan *et al.* (2015), firms that both export and import tend to outperform one-way traders in most variables. The estimates of Table 8 show that two-way traders of services are more than 100 percent larger in terms of employment, total sales of services and gross

value added than one-way traders.⁵ However, there is no significant difference between Portuguese international traders of services in terms of capital labour ratios and of average wages per employee. Firms that both export and import services tend to be older than one-way traders and have a higher leverage ratio. Finally, the advantage of two-way traders in terms of labour productivity is around 25 percent and the profitability premia is about 5 percent, on average. As discussed in Muûls and Pisu (2009) for international trade in goods, the significance of most of these results suggests that there are additional spillovers between importing and exporting, which two-way traders benefit from.

	(1) Employment	(2) Total sales of services	(3) Gross value added	(4) Age	(5) Capital labour ratio	(6) Average wages	(7) Productivity	(8) Profitability	(9) Leverage ratio
Two-way traders	0.732*** (0.028)	1.110*** (0.044)	0.956*** (0.032)	0.086*** (0.015)	0.036 (0.039)	0.046 (0.024)	0.223*** (0.017)	0.051** (0.020)	0.046** (0.016)
Adjusted R2	0.225	0.368	0.192	0.096	0.241	0.246	0.198	0.048	0.028
Observations	16,117	16,117	16,117	16,117	15,343	16,117	16,117	14,319	14,859

TABLE 8. Characteristics of two-way traders of services, 2014-2015

Notes: The dependent variables are reported in the column headings: total employment, total domestic and foreign sales of services, gross value added, number of years of age, capital to labour ratio, average wages as total labour costs divided by total employment, labour productivity defined as gross value added per worker, profitability defined as EBITDA over total assets, leverage ratio as total assets to equity ratio. All variables are in log-form. Each one of them is regressed on a dummy variable identifying two-way traders of services. Only firms with positive capital labour ratio, profitability and leverage ratio are included in the respective regressions. All regressions include a constant, 2-digit sector and year fixed-effects. See the main text for more details. Standard errors in parenthesis are clustered at the firm-level and are robust to heteroscedasticity. Stars indicate significance levels of 5% (*), 1% (**), and 0.1% (***).

3.2. Trade patterns of Portuguese international service traders

This section takes advantage of the availability of transaction-level data for Portuguese international trade in services to examine trade patterns along several dimensions, differentiating between the three types of traders.

Table 9 presents some basic descriptive statistics on the service and geographical portfolios of international traders of services. Two-way traders not only have higher levels of exports and imports than one-way traders, but

5. Since the differences between one-way and two-way traders are often large, the log approximation understates the size of these differences. For example, taking exponents of the employment coefficient in column (1) of Table 8, two-way traders have, on average, 107.9 percent more employment ($100 * (\exp(0.732) - 1) = 107.9$).

they also have broader portfolios of partner countries and service types for both flows. For instance, the average one-way exporter ships 1.1 services to 4.1 countries and receives about 530 thousand euros, while the average two-way trader exports 1.6 services to 6 countries for 2,725 thousand euros. The median one-way trader exports 1 service to 1 country for 78 thousand euros, and the median two-way trader exports 1 service to 3 countries for 217 thousand euros. Considering the 25th and 75th percentiles, the number of partner countries ranges between 1 and 7 for two-way exporters and between 1 and 3 for one-way exporters. The 25th/75th percentile dispersions are always higher in the case of the number of partner countries than in the case of the number of service types traded, which should be related to the more aggregate breakdown level of services in the database. These simple statistics reveal the high variance and skewness in the underlying distributions of the number of service types, and especially, the number of partner countries and traded values between firms.

(A) Exports						
Firm-level	Only Exp			Exp & Imp		
	No. services	No. countries	Exports	No. services	No. countries	Exports
Mean	1.1	4.1	530	1.6	6.0	2,725
Median	1	1	78	1	3	217
1st quartile	1	1	10	1	1	27
3rd quartile	1	3	264	2	7	939
Standard deviation	0.4	8.4	10,102	1.2	9.9	41,469

(B) Imports						
Firm-level	Only Imp			Exp & Imp		
	No. services	No. countries	Imports	No. services	No. countries	Imports
Mean	1.8	2.2	166	2.5	5.3	1,511
Median	1	1	5	2	3	53
1st quartile	1	1	1	1	1	6
3rd quartile	2	3	36	3	6	370
Standard deviation	1.3	2.7	1,075	2.1	8.5	17,321

TABLE 9. Summary statistics of the trade portfolios of Portuguese international service traders, 2014-2015

Notes: Values of exports and imports are in thousand euros. The firm-level statistics are based on firm-year observations in 2014-2015.

In order to examine the heterogeneity of exports and imports of services between firms, Table 10 reports the joint distribution of traders and trade values over the number of services types and partner countries. Panels A.1 and B.1 show that most exporters and importers trade only one service type, representing around 75 ($34.6 + 40.2$) and 51 ($22.9 + 27.9$) percent of total, respectively. In addition, most of them have a single trading partner country. For example, one-way exporters that sell one service type to one country account for 18.5 percent of all exporters. This pattern is similar for the three types of traders examined, even if the relative number of multi-service firms is always higher on the import side. As it is also the case with Portuguese

international trade in goods (Amador and Opromolla 2013), firms that only sell/buy one type of service represent much smaller shares in total traded values than in the number of firms. This fact is especially clear for one-way exporters (9.9 and 34.6, respectively) and one-way importers (2.0 and 22.9, respectively).

(A.1) Exporters						(A.2) Exports					
No. of countries	Number of services					No. of countries	Number of services				
	1	2	3	>3	Total		1	2	3	>3	Total
Only Exp						Only Exp					
1	18.5	1.0	0.1	0.0	19.7	1	1.5	0.1	0.0	0.0	1.7
2	5.4	0.9	0.2	0.0	6.5	2	0.7	0.2	0.0	0.0	0.9
3	2.8	0.4	0.1	0.0	3.3	3	0.5	0.1	0.0	0.0	0.6
4-10	5.5	0.7	0.2	0.1	6.4	4-10	1.9	0.2	0.1	0.0	2.2
11-50	2.1	0.2	0.0	0.1	2.3	11-50	1.9	0.1	0.0	0.1	2.1
50+	0.3	0.0	0.0	0.0	0.4	>50	3.4	0.0	0.1	0.0	3.5
Total	34.6	3.1	0.6	0.2	38.6	Total	9.9	0.7	0.3	0.1	10.9
Exp & Imp						Exp & Imp					
1	16.0	1.9	0.3	0.1	18.3	1	2.7	0.8	0.4	0.3	4.2
2	6.2	3.2	0.6	0.2	10.1	2	2.1	1.0	0.2	0.1	3.4
3	3.7	1.8	0.6	0.3	6.5	3	1.6	0.7	0.2	0.5	3.0
4-10	10.1	4.0	2.1	1.4	17.5	4-10	7.6	3.5	1.7	2.0	14.8
11-50	4.1	2.1	1.0	1.2	8.4	11-50	9.9	7.2	3.0	6.8	26.9
>50	0.1	0.1	0.1	0.3	0.6	>50	5.9	2.7	0.3	27.9	36.9
Total	40.2	13.0	4.7	3.6	61.4	Total	29.9	15.9	5.7	37.5	89.1

(B.1) Importers						(B.2) Imports					
No. of countries	Number of services					No. of countries	Number of services				
	1	2	3	>3	Total		1	2	3	>3	Total
Only Imp						Only Imp					
1	17.8	2.1	0.6	0.4	20.9	1	0.8	0.1	0.1	0.4	1.4
2	2.9	3.5	0.8	0.5	7.5	2	0.2	0.2	0.1	0.1	0.6
3	1.0	1.3	0.9	0.6	3.9	3	0.3	0.1	0.1	0.3	0.7
4-10	1.0	1.2	1.2	1.9	5.3	4-10	0.3	0.3	0.4	1.3	2.3
11-50	0.1	0.1	0.0	0.2	0.5	11-50	0.3	0.3	0.1	0.5	1.2
>50	0.0	0.0	0.0	0.0	0.0	>50	0.1	0.0	0.0	0.0	0.1
Total	22.9	8.2	3.5	3.7	38.2	Total	2.0	1.0	0.9	2.6	6.4
Exp & Imp						Exp & Imp					
1	13.0	2.2	0.9	0.6	16.7	1	4.3	1.6	0.9	0.1	6.9
2	4.6	4.0	1.3	0.9	10.8	2	1.3	0.4	0.3	0.6	2.7
3	2.6	2.0	1.6	1.4	7.7	3	0.7	0.6	0.3	0.8	2.4
4-10	5.8	3.9	3.3	6.8	19.8	4-10	3.1	4.0	2.1	9.6	18.8
11-50	1.8	0.9	0.7	3.1	6.5	11-50	5.0	2.7	1.8	22.0	31.5
>50	0.1	0.0	0.0	0.2	0.3	>50	0.1	0.0	0.1	31.1	31.4
Total	27.9	13.0	7.9	13.0	61.8	Total	14.6	9.3	5.6	64.2	93.6

TABLE 10. Joint distribution of trade values and traders by number of services and partner countries, 2014-2015

Notes: Each cell represents the percentage of total exporters (importers) or exports (imports) associated with firms-year exporting (importing) a certain number of services types (column category) to (from) a certain number of partner countries (row category) in 2014-2015.

Another pattern evident in Table 10, and also found for trade in goods, is that large fractions of exports and imports are concentrated among a few two-way traders, which trade multiple services types with many countries. For instance, two-way traders exporting more than 3 services types to more than

50 countries represent only 0.3 percent of exporters but 27.9 percent of exports (panels A.1 and A.2). A similar concentration is found on the import side as 0.2 percent of total importers account for 31.1 percent of overall imports (panels B.1 and B.2). The importance of two-way traders that trade more than 3 types of services is particularly strong on the import side, as they account for 64.2 percent of total imports and 13.0 of total importing firms.

Evidence on the concentration of traded values in a small group of firms is corroborated by the fact that the top 1 percent exporters account for 59 percent of the total export value, while the top 10 percent exporters represent 86 percent of total exports. These percentages are similar to those reported by Minondo (2016) for Spain. The values are very similar for imports, with the top 1 percent and 10 percent importers accounting for 60 and 91 percent of total import value, respectively. Again, the vast majority of these top exporters and importers are two-way traders.

This strong concentration of Portuguese trade in services is in line with one of the main findings of empirical studies that use transaction-level data to examine international trade in goods: exports and imports are dominated by "superstars" trading many goods with many countries. Empirical analyses of international trade in services reached the same conclusions. Breinlich and Criscuolo (2011) for the UK, Federico and Tosti (2017) for Italy and Minondo (2016) for Spain also found that the values of services traded are highly concentrated among a small group of firms that tends to trade several service types and to have a large geographical coverage. For Portugal, we further show that firms in this small group of "super-traders" are predominantly two-way traders.

It is also interesting to examine how exports and imports of services are concentrated within a firm in terms of its service and geographical portfolio. Table 11 shows the average share of a firm's exports and imports accounted for by its top five service types and partner countries. On both the export and import side, and for all firm types, the top service type accounts for the majority of a firm's trade, while the lower ranked services types have a much smaller role. For instance, the first and second most sold services account, on average, for 73.9 and 17.0 percent of exports of a one-way exporter selling more than 3 service types. The relative importance of the main type of services seems to be somewhat smaller for imports than for exports, in particular for firms with larger portfolios.

Export and import shares present a similar pattern when considering partner countries instead of service types, but the role played by the top country appears to be less dominant, especially as the geographical scope broadens. However, even for firms trading with more than 50 countries, the main partner accounts for more than 20 and 30 per cent of the respective firm flow, for one-way and two-way traders, respectively. This evidence of within-firm concentration of international trade flows of services is similar to that of other countries and also to that of Amador and Opromolla (2013)

regarding Portuguese exports of goods. However, one should be careful with this latter comparison regarding the concentration by type of services, because the disaggregation level for goods is much larger than for services.

(A) Exports											
Service rank	Number of services				Country rank	Number of countries					
	1	2	3	>3		1	2	3	4-10	11-50	>50
Only Exp					Only Exp						
1	100.0	82.7	74.7	73.9	1	100.0	83.9	75.7	63.7	41.0	22.4
2		16.8	19.8	17.0	2		16.1	18.9	20.1	18.1	12.8
3			5.1	5.7	3			5.4	8.5	10.8	9.0
4				2.7	4				4.2	7.1	6.6
5				4.4	5				2.6	4.9	5.4
No. firms	4,044	364	71	27	No. firms	2,295	757	390	749	274	41
Exp & Imp					Exp & Imp						
1	100.0	87.9	79.7	73.3	1	100.0	85.3	76.1	63.3	45.0	33.1
2		12.1	16.5	18.7	2		14.6	18.7	20.3	18.3	15.8
3			3.8	5.6	3			5.0	8.8	10.8	10.4
4				1.8	4				4.2	7.1	7.2
5				0.9	5				2.5	4.9	5.4
No. firms	4,699	1,516	547	419	No. firms	2,146	1,186	758	2,045	980	66
(B) Imports											
Service rank	Number of services				Country rank	Number of countries					
	1	2	3	>3		1	2	3	4-10	11-50	>50
Only Imp					Only Imp						
1	100.0	83.8	75.1	67.0	1	100.0	82.2	73.4	64.7	50.5	24.7
2		16.1	19.9	21.0	2		17.6	20.0	19.9	20.0	17.7
3			4.8	7.5	3			6.1	8.8	10.5	10.7
4				3.1	4				4.1	6.6	9.0
5				1.7	5				2.5	4.0	4.6
No. firms	2,654	949	402	425	No. firms	2,427	876	449	615	61	2
Exp & Imp					Exp & Imp						
1	100.0	85.8	78.7	69.1	1	100.0	84.1	76.9	65.5	47.3	33.5
2		14.0	17.0	19.3	2		15.9	18.2	19.6	19.5	16.4
3			4.3	7.3	3			4.9	8.4	10.9	11.0
4				2.7	4				3.8	6.9	7.6
5				1.4	5				2.1	4.5	4.9
No. firms	3,239	1,508	919	1,515	No. firms	1,946	1,252	891	2,301	752	39

TABLE 11. Concentration of firms' exports and imports by service type and partner country, 2014-2015

Notes: For the services rank, values report the average share of a firm's exports (imports) accounted for by its five most important service types exported (imported) for firms-year exporting (importing) 1, 2, 3 or >3 services types. For the countries rank, values report the average share of a firm's exports (imports) accounted for by its five most important export (import) partner countries for firms-year exporting (importing) to exactly 1, 2, 3, 4-10, 11-50 or >50 countries. Service types and partner countries are ranked within each firm according to their share in total exports or imports of that firm in 2014-2015.

Following Breinlich and Criscuolo (2011), we analyse the contribution of the intensive and extensive margins to the differences in the traded values between firms. We consider two extensive margins of firm-level trade – number of trading partners (destination and source countries) and number of services traded – and

the intensive margin (trade per country-service type combination). In order to assess the role of the different margins, we run separate regressions of the log of each component on the log of firm-level trade. For exports, the regression is as follows:

$$\log Y_{it} = \alpha + \beta_1 \log X_{it} + \gamma_j + \gamma_t + \varepsilon_{it}, \quad (1)$$

where Y_{it} is the dependent variable of interest (number of destination countries, number of service types, and exports per country-service type) of firm i in year t and X_{it} are total exports of firm i in year t . γ_t are time fixed-effects, γ_j is a vector of sector fixed-effect at the CAE 2-digit level, and ε_{it} is a standard error term. In addition, we also estimate Equation (1) separately for one-way exporters and two-way traders. The same exercise is performed for imports and the results for both flows and types of firms are presented in Table 12. All variables are in logs and, thus, the reported coefficients add up to unity.

Panel A - Exports									
	Total sample of exporters			One-way exporters			Two-way traders		
	(1) Value ser- vice/country	(2) Number of services	(3) Number of countries	(4) Value ser- vice/country	(5) Number of services	(6) Number of countries	(7) Value ser- vice/country	(8) Number of services	(9) Number of countries
Value of exports	0.770*** (0.0048)	0.046*** (0.0020)	0.184*** (0.0038)	0.834*** (0.0066)	0.013*** (0.0017)	0.153*** (0.0062)	0.760*** (0.0059)	0.054*** (0.0026)	0.185*** (0.0045)
Adjusted R2	0.841	0.148	0.437	0.883	0.052	0.419	0.834	0.156	0.447
Observations	11,687	11,687	11,687	4,506	4,506	4,506	7,181	7,181	7,181
Panel B - Imports									
	Total sample of importers			One-way importers			Two-way traders		
	(1) Value ser- vice/country	(2) Number of services	(3) Number of countries	(4) Value ser- vice/country	(5) Number of services	(6) Number of countries	(7) Value ser- vice/country	(8) Number of services	(9) Number of countries
Value of imports	0.718*** (0.0042)	0.109*** (0.0023)	0.173*** (0.0027)	0.786*** (0.0061)	0.093*** (0.0033)	0.121*** (0.0041)	0.700*** (0.0055)	0.109*** (0.0030)	0.191*** (0.0036)
Adjusted R2	0.827	0.272	0.453	0.864	0.247	0.316	0.793	0.262	0.442
Observations	11,611	11,611	11,611	4,430	4,430	4,430	7,181	7,181	7,181

TABLE 12. Intensive and extensive margins of firm-level services trade, 2014-2015

Notes: The table reports OLS estimates of Equation (1) for exports in panel A and for imports in panel B. The dependent variables are reported in the column headings: log of average trade value per country-service type combination, log of number of traded service types, log of number of partner countries. Each of them is regressed on the log of trade value of the firm. The regressions are estimated separately for the different types of service traders. All regressions include a constant, 2-digit sector and year fixed-effects. See the main text for more details. Standard errors in parenthesis are clustered at the firm-level and are robust to heteroscedasticity. Stars indicate significance levels of 5% (*), 1% (**), and 0.1% (***).

The first 3 columns of each panel of Table 12 show that the intensive margin is much more important than the extensive margins in explaining the differences in traded values among Portuguese firms, for both exports and imports (77 percent for exports and 72 percent for imports). Regarding the two extensive margins, the country margin is more relevant than the services margin, in particular for exports. However, the relatively broad service classification used (29 service types) tends to underestimate the relevance of the services extensive margin. These results are broadly in line with those of other countries like the UK (Breinlich and Criscuolo 2011), Italy (Federico and Tosti 2017), Germany (Kelle and Kleinert 2010), and Spain for exports (Minondo 2016). In these countries the contribution of the intensive margin was found to be around 70 percent and the country extensive margin was also more relevant than the service margin. Nevertheless, the importance of the intensive margin seems to be somewhat higher in Portugal than in these countries.

Differentiating between the distinct types of traders (next columns of both panels), the intensive margin is specially relevant for one-way traders, accounting for around 84 percent of the differences in exports across this type of firms (79 percent for one-way importers).⁶ Regarding the extensive margins, the highest value of both margins is estimated for two-way importers, accounting for 30 percent of inter-firm variation of imports.

3.3. Trade margins, productivity and profitability

The empirical literature on international trade in goods and firm performance has grown exponentially since the seminal paper of Bernard *et al.* (1995). One of the key stylised facts of this literature is the positive association between productivity and participation in external markets. In the decade following the publication of Bernard *et al.* (1995), the picture that emerged from dozens of micro-econometric studies is that exporters are more productive than non-exporters, and that the more productive firms self-select into export markets, while exporting does not necessarily improve productivity (Wagner 2007). This strand of research continued to grow and more important facts emerged on the relations between international trade (exports and imports) and several dimensions of firm performance (productivity, wages, profitability and survival), namely on the positive link between importing and productivity in manufacturing firms, and on the productivity premia of two-way traders

6. We also estimated Equation (1) including interactions between all variables considered and a dummy variable identifying two-way traders. The coefficients estimated from the fully interacted model and from the separate regressions for one-way and two-way traders depicted in Table 12 are equivalent, even if, in the separate regressions, the variance of the different types of traders is allowed to differ. From the fully interacted model, we can see that the contributions of the three margins differ between the two types of traders in a statistically significant way for both exports and imports at a level of significance of 0.1 percent. All results are available from the authors upon request.

(Wagner 2012). In parallel, new trade theories have been developed to capture these features of the data, with a focus on international activities of heterogeneous firms, which was pioneered by Melitz (2003) (see Melitz and Redding (2014) for a review).

More recently, the use of transaction-level data on goods exports or imports of firms has allowed for the study of the different margins of trade at the firm-level and their links with several characteristics of the firm (Wagner 2016). Among the main findings of these studies is the fact that productivity is not only positively related to export participation, but also to the extensive margins of exports (the number of goods exported and the number of export destination countries). Motivated by this vast literature on international trade in goods, this section assesses whether the margins of international trade in services at the firm-level are related with firm-level attributes, like productivity and profitability.

Firstly, we examine the correlation of the margins of firm's trade with firm-level characteristics, differentiating between the various types of traders. For exports, we estimate several regressions of the form:

$$\log Y_{it} = \alpha + \beta_1 \log X_{it} + \gamma_j + \gamma_t + \varepsilon_{it}, \quad (2)$$

where Y_{it} is the dependent variable of interest (total exports, number of destination countries, number of service types, and exports per country-service type) of firm i in year t and X_{it} represents three different firm-level attributes taken separately: firm size (proxied by total employment), labour productivity (defined as gross value added per worker) and profitability (proxied by EBITDA over total assets). 2-digit level sector and time fixed-effects are included in γ_j and γ_t , respectively, and ε_{it} is a standard error term. Again, since all variables are in logs, the reported coefficients of the three trade margins add up to the coefficient of total exports. As before, we also estimate Equation (2) separately for one-way and two-way exporters. The same exercise is performed for imports and Table 13 includes the results for both flows and types of firms.⁷ We also estimated a different version of Equation (2) using pairs of covariates, namely employment and productivity together (as in Breinlich and Criscuolo 2011) and employment and profitability together. The results are very similar to the ones shown in Table 13 where each covariate is regressed alone and are available from the authors upon request.

As identified for the UK (Breinlich and Criscuolo 2011) and Italy (Federico and Tosti 2017), higher employment is associated with a higher value of firm-level exports and imports and also with all three margins of both flows. For exports, the largest coefficient is the one of the geographical extensive margin,

7. Again, we also estimated a fully differentiated model of Equation (2) including interactions between all variables and a two-way trader dummy and the differences in the parameters between the two types of traders are always statistically significant. All results are available from the authors upon request.

Panel A - Exports												
	Total sample of exporters				One-way exporters				Two-way traders			
	(1) Total value	(2) Average value	(3) Number services	(4) Number countries	(5) Total value	(6) Average value	(7) Number services	(8) Number countries	(9) Total value	(10) Average value	(11) Number services	(12) Number countries
Employment	0.444*** (0.020)	0.146*** (0.017)	0.076*** (0.0039)	0.221*** (0.0072)	0.206*** (0.035)	0.037 (0.030)	0.011** (0.0033)	0.159*** (0.012)	0.492*** (0.025)	0.192*** (0.021)	0.082*** (0.0052)	0.218*** (0.0091)
Productivity	0.601*** (0.038)	0.466*** (0.032)	0.047*** (0.0055)	0.087*** (0.013)	0.595*** (0.051)	0.518*** (0.046)	0.011 (0.0062)	0.065*** (0.019)	0.513*** (0.048)	0.440*** (0.041)	0.032*** (0.0074)	0.041** (0.016)
Profitability	0.140*** (0.028)	0.161*** (0.025)	-0.006 (0.0044)	-0.015 (0.011)	0.213*** (0.041)	0.199*** (0.038)	-0.003 (0.0045)	0.017 (0.014)	0.094* (0.037)	0.143*** (0.033)	-0.010 (0.0064)	-0.039** (0.014)

Panel B - Imports												
	Total sample of importers				One-way importers				Two-way traders			
	(1) Total value	(2) Average value	(3) Number services	(4) Number countries	(5) Total value	(6) Average value	(7) Number services	(8) Number countries	(9) Total value	(10) Average value	(11) Number services	(12) Number countries
Employment	0.822*** (0.022)	0.419*** (0.019)	0.159*** (0.0053)	0.245*** (0.0070)	0.696*** (0.038)	0.440*** (0.032)	0.108*** (0.0076)	0.147*** (0.0094)	0.785*** (0.025)	0.358*** (0.021)	0.165*** (0.0065)	0.262*** (0.0085)
Productivity	0.750*** (0.041)	0.540*** (0.033)	0.101*** (0.0082)	0.108*** (0.011)	0.553*** (0.063)	0.403*** (0.053)	0.066*** (0.011)	0.084*** (0.013)	0.734*** (0.049)	0.541*** (0.039)	0.101*** (0.011)	0.093*** (0.015)
Profitability	0.044 (0.034)	0.041 (0.028)	0.013 (0.0074)	-0.010 (0.010)	0.121* (0.052)	0.072 (0.044)	0.024* (0.010)	0.025* (0.012)	-0.051 (0.041)	-0.008 (0.033)	-0.000 (0.0096)	-0.043** (0.013)

TABLE 13. Employment, productivity, profitability and margins of firm-level services trade, 2014-2015

Notes: The table reports OLS estimates of Equation (2) for exports in panel A and for imports in panel B. The dependent variables are reported in the column headings: log of total trade value of the firm, log of average trade value per country-service type combination, log of number of traded service types, log of number of partner countries. Each of them is regressed individually on the log of total employment, on the log labour productivity, and on the log of profitability of the firm. Labour productivity is defined as gross value added per worker and profitability is defined as EBITDA over total assets. Only firms with positive profitability are included in the respective regressions. The regressions are estimated separately for the different types of service traders. The number of observations in each regression is the same as in Table 12, with the exception of the regressions using profitability that include 10,364, 3,981 and 6,383 observations for the total sample of exporters, one-way exporters and two-way exporters, respectively; and 10,338, 3,955 and 6,383 for the total sample of importers, one-way importers and two-way importers, respectively. All regressions include a constant, 2-digit sector and year fixed-effects. See the main text for more details. Standard errors in parenthesis are clustered at the firm-level and are robust to heteroscedasticity. Stars indicate significance levels of 5% (*), 1% (**), and 0.1% (***).

while, for imports, it is the parameter of the intensive margin. Moreover, all estimates are higher for two-way traders than for one-way traders, with the exception of the intensive margin of imports. Labour productivity is also positively and significantly correlated with the value of exports and imports of a firm, especially with the average values per country and service type (intensive margin). By type of traders, the correlations between productivity and firm's imports are higher for two-way traders but the opposite happens on the export side. The links between profitability and firms international trade in services are less clear. The intensive margin of exports explains most of the correlations

between profitability and firm-level trade flows, for both types of firms, and the parameter is higher for one-way exporters. On the import side, most estimates are not statistically significant.

Secondly, we analyse how firm-level productivity and profitability are associated with the different margins of firms' exports and imports taken together, while controlling for other features like size, age and capital intensity. More precisely, we estimate regressions of the form:

$$\log Y_{it} = \alpha + \beta_1 \log X_{it} + \beta_2 \log M_{it} + \beta_3 Z_{it} + \varepsilon_{it}, \quad (3)$$

where Y_{it} is the dependent variable of interest: labour productivity (defined as gross value added per worker) or profitability (proxied by EBITDA over total assets), in log form. X_{it} and M_{it} are the log of the total value of exports and imports of a firm, respectively. A number of firms' characteristics that potentially affect productivity and profitability (and may be correlated with different levels of trade in services) are included in the vector Z_{it} , namely age, capital labour ratio, average wage per employee, leverage ratio, all in log form, and a dummy variable identifying large firms, according to the EU official classification (described in footnote 4). 2-digit sector and year fixed-effects are also included. In a more detailed version of Equation (3), we substituted the total value of exports and imports of a firm by the respective margins of firm-level trade, namely the average export and import value per country-service, number of exported and imported service types, number of export and import partner countries. Again all trade variables are in log form. All regressions were also estimated separately for two-way traders to take into account that, as described previously, these firms differ from one-way traders in several dimensions.

The estimates in columns (1) and (5) of Table 14 show that the total value of exports and imports of a firm correlate positively with its labour productivity and profitability and the parameters are very similar for both flows.⁸ For two-way traders, no statistically significant relation is found between profitability and international trade in services (column (6)). On the contrary, the link between imports and exports of services and productivity is stronger for two-way traders than for other firms.

Taking into account the several margins of a firm's exports and imports, columns (3)-(4) and (7)-(8), the results indicate that the intensive margin of exports and imports of services, i.e., the average trade value per country-service type combination, is positively related to both productivity and profitability. Regarding the extensive margins of trade in services, the only statistically significant estimates are those of the number of different types of services imported, for both productivity and profitability. This evidence suggests that

8. All controls have the expected signs. Results reporting the complete set of estimates are available from the authors upon request.

having access to a large number of different foreign inputs is advantageous for firms. Moreover, all estimated parameters of both margins are always greater for two-way traders.

The non statistically significant association between the geographical extensive margins and productivity for Portuguese international traders of services contrasts with results obtained for international trade in goods in several countries (Wagner 2016). This finding may be driven by the fact that the positive relation between firm size and exports results primarily from the number of partner countries. Hence, after controlling for firm size in the estimation of Equation (3), the link between firm performance and the number of its export destinations is not statistically significant.

	Productivity				Profitability			
	(1) All firms	(2) Two-way traders	(3) All firms	(4) Two-way traders	(5) All firms	(6) Two-way traders	(7) All firms	(8) Two-way traders
Total exports	0.023*** (0.0017)	0.043*** (0.0050)			0.005** (0.0018)	0.007 (0.0058)		
Total imports	0.029*** (0.0016)	0.045*** (0.0046)			0.009*** (0.0019)	0.010 (0.0054)		
Average exports			0.025*** (0.0020)	0.052*** (0.0059)			0.006** (0.0023)	0.013* (0.0066)
Average imports			0.029*** (0.0021)	0.052*** (0.0054)			0.010*** (0.0026)	0.013* (0.0064)
Number services exported			-0.037 (0.022)	-0.008 (0.025)			-0.029 (0.026)	-0.017 (0.030)
Number services imported			0.116*** (0.016)	0.126*** (0.020)			0.045* (0.020)	0.048* (0.024)
Number export countries			0.017 (0.011)	0.022 (0.014)			0.010 (0.013)	-0.013 (0.018)
Number import countries			-0.013 (0.012)	-0.016 (0.015)			-0.016 (0.016)	-0.012 (0.019)
Adjusted R2	0.368	0.395	0.370	0.400	0.213	0.224	0.213	0.225
Observations	14198	6348	14198	6348	13076	5845	13076	5845

TABLE 14. Productivity, profitability and firm-level international trade in services, 2014-2015

Notes: The table reports OLS estimates of Equation (3) for labour productivity and profitability, both in log form. Labour productivity is defined as gross value added per worker and profitability is defined as EBITDA over total assets. Only firms with positive profitability are included in the respective regressions. The regressors are reported in the row headings: log of total exports and imports of the firm, log of average export and import per country-service type combination (intensive margin), log of number of traded service types, log of number of partner countries. All regressions include a constant. Firm-level controls include age, capital labour ratio, average wage per employee, leverage ratio, all in log form, a dummy variable identifying large firms, and 2-digit sector and year fixed-effects. See the main text for more details. Standard errors in parenthesis are clustered at the firm-level and are robust to heteroscedasticity. Stars indicate significance levels of 5% (*), 1% (**), and 0.1% (***).

4. Concluding remarks

This paper contributes to the growing firm-level literature on international trade in services by examining the Portuguese case and identifying some empirical regularities. Two datasets in the period 2014-2015 – the Balance of Payments Statistics compiled by Banco de Portugal and the Simplified Corporate Information (IES) – are merged to create a representative database of Portuguese international trade of non-tourism services at the transaction-level with balance-sheet and income statement information on the trading firms. Throughout the analysis, we distinguish between three groups of international traders of services: firms that only export; firms that only import; and firms that import and export. The richness of the data, which includes information on partner countries and types of services traded, allows us to provide a comparison with the stylised facts on service traders reported by previous literature, such as those of Breinlich and Criscuolo (2011) for the UK and Federico and Tosti (2017) for Italy, as well with the previous findings on Portuguese international trade in goods as in Amador and Opromolla (2013). Overall, a set of stylized facts is provided on international trade in services, some confirming existing empirical research, while others are new to the literature.

A new contribution to the literature on services trade is the evidence on a bi-modal distribution of export intensities, in line with recent findings of Defever and Riaño (2017) for international trade in goods but in contrast with one of main stylised facts of goods trade. Portuguese exporters of services have a bi-modal distribution of export intensities, with some firms exporting most of their output and others only a small share. This feature is common to one-way and two-way traders and to firms belonging to different size classes and age groups.

We find that a significant proportion of Portuguese firms that participate in international trade are active in both flows (45 percent). In addition, there is a striking concentration of trade values in these firms: two-way traders account for 90 percent of total international trade in services. This concentration of exports and imports of services in two-way traders is common to most sectors of economic activity. As documented for other countries, firms that both export and import tend to outperform one-way traders in variables like size, age, productivity and profitability.

Two-way traders not only have higher levels of exports and imports than one-way traders, but they also have broader portfolios of partner countries and service types for both flows. In fact, a large proportion of Portuguese services trade is concentrated among a few two-way traders, which trade multiple services types with many countries, i.e., the so-called "superstars". However, even if these traders have diversified portfolios of service types and partner countries, we still find evidence of within-firm concentration of trade values, i.e., the main service/partner country accounts for a substantial share of a firm's trade.

Taking advantage of the transaction-level detail in our data, the paper also examines the intensive margin (trade per country and service type) and the extensive margins (number of trading partners and number of services traded) of firm-level trade. In line with findings for other countries, the intensive margin is much more important than the extensive margins in explaining the differences in traded values among Portuguese firms, for both exports and imports. In addition, larger and more productive firms have higher values of exports and imports of services, trade more per country and service type, and trade with more countries and in more types of services. For the three types of traders, the intensive margin of firm-level trade explains most of the correlations between firm productivity and size, on the one hand, and firm-level trade flows, on the other hand. The main exception is the link between firm size and exports, which depends mainly on the geographical extensive margin. The correlations between firm-level exports and imports of services and profitability are less clear, but more profitable firms tend to have higher total export values and to export more per country-service type.

Considering all different margins of a firm's services trade together, while controlling for features like size, age or capital intensity, we show that the intensive margins of exports and of imports are positively related to both productivity and profitability. Regarding the extensive margins of trade, the number of different types of services imported is significantly and positively linked to these two dimensions of firm performance, suggesting that access to a wide range of foreign inputs is beneficial for firms.

From a policy perspective, the positive link between firm performance and international trade in services highlights the importance of services for economic growth and structural transformation. In recent decades, the rapid growth of services trade was mostly driven by technological progress, and trade opportunities are likely to expand even more in the future as new digital technologies allow a greater range of services to be traded internationally. In parallel, there are still pervasive and complex barriers to trade in services around the globe. Large potential gains could be reaped through greater liberalization of services trade and investment. Expanding trade in services requires the implementation of trade policy frameworks that focus, for instance, on intellectual property protection rights, professional licensing, government procurement, mutual recognition of professional credentials and other regulations, as well on the reduction of restrictions to the operation of foreign affiliates (see Hufbauer *et al.* (2012) for a discussion).

References

- Amador, João and Luca David Oromolla (2013). "Product and destination mix in export markets." *Review of World Economics*, 149(1), 23–53.
- Ariu, Andrea (2016). "Services versus goods trade: A firm-level comparison." *Review of World Economics*, 152(1), 19–41.
- Ariu, Andrea, Elena Biewen, Sven Blank, Guillaume Gaulier, María Jesus González, Philipp Meinen, Daniel Mirza, Cesar Martín, and Patry Tello (2017). "Firm heterogeneity and aggregate business services exports: micro evidence from Belgium, France, Germany and Spain." Working Paper Series 2097, European Central Bank (ECB).
- Baines, T.S., H.W. Lightfoot, O. Benedettini, and J.M. Kay (2009). "The servitization of manufacturing: A review of literature and reflection on future challenges." *Journal of Manufacturing Technology Management*, 20(5), 547–567.
- Baldwin, Richard (2016). *The Great Convergence: Information Technology and the New Globalization*. The Belknap Press of Harvard University Press, Cambridge, Massachusetts.
- Bernard, Andrew B., J. Bradford Jensen, and Robert Z. Lawrence (1995). "Exporters, Jobs, and Wages in U.S. Manufacturing: 1976-1987." *Brookings Papers on Economic Activity. Microeconomics*, 1995, 67–119.
- Breinlich, Holger and Chiara Criscuolo (2011). "International trade in services: A portrait of importers and exporters." *Journal of International Economics*, 84(2), 188 – 206.
- Cernat, Lucian and Zornitsa Kutlina Dimitrova (2014). "Thinking in a Box: A "Mode 5" Approach to Service Trade." *Journal of World Trade*, 48(6), 1109–1126.
- Damijan, Jože, Stefanie A. Haller, Ville Kaitila, Črt Kostevc, Mika Maliranta, Emmanuel Milet, Daniel Mirza, and Matija Rojec (2015). "The Performance of Trading Firms in the Services Sectors – Comparable Evidence from Four EU Countries." *The World Economy*, 38(12), 1809–1849.
- Defever, Fabrice and Alejandro Riaño (2017). "Twin Peaks." CEP Discussion Papers 1505, Centre for Economic Performance (CEP), London School of Economics and Political Science.
- Federico, Stefano and Enrico Tosti (2017). "Exporters and Importers of Services: Firm-Level Evidence on Italy." *The World Economy*, 40(10), 2078–2096.
- Francois, Joseph, Miriam Manchin, and Patrick Tomberger (2015). "Services Linkages and the Value Added Content of Trade." *The World Economy*, 38(11), 1631–1649.
- Haller, Stefanie A., Jože Damijan, Ville Kaitila, Črt Kostevc, Mika Maliranta, Emmanuel Milet, Daniel Mirza, and Matija Rojec (2014). "Trading firms in the services sectors: Comparable evidence from four EU countries." *Review of World Economics*, 150(3), 471–505.

- Hartigan, J. A. and P. M. Hartigan (1985). “The Dip Test of Unimodality.” *The Annals of Statistics*, 13(1), 70–84.
- Hufbauer, Gary Clyde, J. Bradford Jensen, and Sherry Stephenson (2012). “Framework for the International Services Agreement.” Policy Brief 12-10, Peterson Institute for International Economics (PIIE).
- IMF (2016). *Balance of Payments Manual, Sixth edition*. International Monetary Fund, Washington, D.C.
- Kelle, Markus and Jorn Kleinert (2010). “German Firms in Service Trade.” *Applied Economics Quarterly*, 56(1), 51–72.
- Lipsey, Robert E. (2009). “Measuring International Trade in Services.” In *International Trade in Services and Intangibles in the Era of Globalization*, edited by Marshall Reinsdorf and Matthew J. Slaughter, chap. 1, pp. 27–70. University of Chicago Press.
- Melitz, Marc J. (2003). “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity.” *Econometrica*, 71(6), 1695–1725.
- Melitz, Marc J. and Stephen J. Redding (2014). “Heterogeneous Firms and Trade.” In *Handbook of International Economics, Handbook of International Economics*, vol. 4, edited by Gita Gopinath, Elhanan Helpman, and Kenneth Rogoff, chap. 1, pp. 1–54. Elsevier.
- Minondo, Asier (2016). “The Geography, Variety and Dynamics of Services Exports in Spain: A Firm-Level Analysis.” *Revista de Economía Aplicada*, XXIV(71), 121–142.
- Muûls, Mirabelle and Mauro Pisu (2009). “Imports and Exports at the Level of the Firm: Evidence from Belgium.” *World Economy*, 32(5), 692–734.
- Nordås, Hildegunn K. and Dorothée Rouzet (2017). “The Impact of Services Trade Restrictiveness on Trade Flows.” *The World Economy*, 40(6), 1155–1183.
- OECD (2014). “Reducing regulatory barriers to competition: Progress since 2008 and scope for further reform.” In *Economic Policy Reforms 2014: Going for Growth Interim Report*, chap. 2, pp. 65–89. OECD Publishing, Paris.
- Rueda-Cantuche, J. M., Riina Kerner, Lucian Cernat, and Veijo Ritola (2016). “Trade in services by GATS modes of supply: Statistical concepts and first EU estimates.” DG Trade Chief Economist Note 3/2016, European Commission.
- Sturgeon, Timothy J., Frank Levy, Clair Brown, J. Bradford Jensen, and David Weil (2006). “Working Group on Services Offshoring: Final Report.” MIT IPC Working Papers 06-006, MIT Industrial Performance Center (IPC).
- UN (2010). *Manual on Statistics of International Trade in Services*. United Nations (UN), New York.
- Wagner, Joachim (2007). “Exports and Productivity: A Survey of the Evidence from Firm-level Data.” *World Economy*, 30(1), 60–82.
- Wagner, Joachim (2012). “International trade and firm performance: a survey of empirical studies since 2006.” *Review of World Economics*, 148(2), 235–267.
- Wagner, Joachim (2016). “A survey of empirical studies using transaction level data on exports and imports.” *Review of World Economics*, 152(1), 215–225.

Appendix: Detailed breakdown of the 29 service types traded

EBOPS code	Description
SB	Maintenance and repair services n.i.e.
SC1	Sea transport
SC2	Air transport
SC3	Other modes of transport
SC4	Postal and courier services
SE	Construction
SF	Insurance and pension services
SG	Financial services
SH1	Franchises and trademarks licensing fees
SH3	Licenses to reproduce and/or distribute computer software
SH4	Licenses to reproduce and/or distribute audio-visual and related products
SI1	Telecommunications services
SI2	Computer services
SI3	Information services
SJ1	Research and development services
SJ211	Legal services
SJ212	Accounting, auditing, bookkeeping, and tax consulting services
SJ213	Business and management consulting and public relations services
SJ22	Advertising, market research, and public opinion polling services
SJ311	Architectural services
SJ312	Engineering services
SJ313	Scientific and other technical services
SJ32	Waste treatment and de-pollution, agricultural and mining services
SJ33	Operating leasing services
SJ34	Trade-related services
SJ35	Other business services n.i.e.
SK1	Audio-visual and related services
SK2	Other personal, cultural, and recreational services
SL	Government goods and services n.i.e.

TABLE A.1. Description of the 29 service types

Notes: The table reports the 29 service types considered and the corresponding code according to the Extended Balance of Payments Services (EBOPS) 2010 classification. The breakdown used is a combination of 2, 3 and 5 digit levels of the EBOPS 2010 classification.

Code	Description	Exports		Firms		Countries		Transactions	
		Level	Share	No.	Share	No.	Share	No.	Share
SB	Maintenance and repair services n.i.e.	750,845	3.4	853	5.1	104	3.3	2,357	3.3
SC1	Sea transport	1,278,382	5.8	606	3.6	179	5.6	6,919	9.8
SC2	Air transport	7,238,084	33.0	528	3.2	198	6.2	4,632	6.5
SC3	Other modes of transport	1,871,417	8.5	1,947	11.7	156	4.9	9,263	13.1
SC4	Postal and courier services	204,204	0.9	100	0.6	123	3.9	571	0.8
SE	Construction	975,247	4.4	1,118	6.7	90	2.8	2,148	3.0
SF	Insurance and pension services	80,207	0.4	566	3.4	87	2.7	1,340	1.9
SG	Financial services	99,430	0.5	359	2.2	84	2.6	820	1.2
SH1	Franchises and trademarks licensing fees	53,349	0.2	85	0.5	40	1.3	145	0.2
SH3	Licenses to reproduce or distribute computer software	5,250	0.0	43	0.3	47	1.5	166	0.2
SH4	Licenses to reproduce or distribute audio-visual	60,574	0.3	100	0.6	74	2.3	462	0.7
SI1	Telecommunications services	1,037,562	4.7	212	1.3	191	6.0	1,560	2.2
SI2	Computer services	1,261,934	5.7	1,026	6.2	156	4.9	4,402	6.2
SI3	Information services	29,770	0.1	149	0.9	70	2.2	613	0.9
SJ1	Research and development services	168,137	0.8	166	1.0	56	1.8	468	0.7
SJ211	Legal services	283,157	1.3	248	1.5	140	4.4	2,659	3.8
SJ212	Accounting, auditing, bookkeeping, and tax consulting	223,073	1.0	266	1.6	118	3.7	1,714	2.4
SJ213	Business and management consulting and public relations	542,116	2.5	673	4.0	110	3.5	2,129	3.0
SJ22	Advertising, market research, and public opinion polling	540,719	2.5	819	4.9	102	3.2	2,783	3.9
SJ311	Architectural services	92,774	0.4	268	1.6	88	2.8	851	1.2
SJ312	Engineering services	457,938	2.1	394	2.4	110	3.5	1,325	1.9
SJ313	Scientific and other technical services	750,156	3.4	1,546	9.3	131	4.1	4,018	5.7
SJ32	Waste treatment and de-pollution, agricultural and mining	34,678	0.2	166	1.0	37	1.2	266	0.4
SJ33	Operating leasing services	216,728	1.0	448	2.7	103	3.2	1,506	2.1
SJ34	Trade-related services	531,173	2.4	1,881	11.3	196	6.2	8,956	12.7
SJ35	Other business services n.i.e.	2,883,445	13.1	1,453	8.7	139	4.4	5,285	7.5
SK1	Audio-visual and related services	114,485	0.5	148	0.9	115	3.6	775	1.1
SK2	Other personal, cultural, and recreational services	175,293	0.8	470	2.8	133	4.2	2,645	3.7
SL	Government goods and services n.i.e.	177	0.0	4	0.0	2	0.1	4	0.0
	Total	21,960,303	100.0	16,642	100.0	3,179	100.0	70,782	100.0

TABLE A.2. Service types exported: Values, firms, countries and transactions, 2014-15

Notes: Exports are in thousand euros. Values are pooled for 2014 and 2015. Firms are counted each time they export a particular service type at the disaggregated breakdown level in the current year, implying that a firm-year can appear more than once across the listed services types. For that reason the total number of firms-year differs from the one reported in the main text where no service breakdown is used in the count. Countries are counted within the respective service type (service-country combination), thus independent of firm and year. A transaction is defined as firm-year-service-country in the database, i.e., an observation in the sample.

Code	Description	Imports		Firms		Countries		Transactions	
		Level	Share	No.	Share	No.	Share	No.	Share
SB	Maintenance and repair services n.i.e.	567,084	4.9	2,038	7.9	104	3.5	4,258	6.4
SC1	Sea transport	183,295	1.6	522	2.0	145	4.9	2,945	4.5
SC2	Air transport	2,704,447	23.3	936	3.6	175	5.9	3,968	6.0
SC3	Other modes of transport	155,889	1.3	1,312	5.1	103	3.5	3,406	5.2
SC4	Postal and courier services	143,842	1.2	218	0.8	135	4.5	744	1.1
SE	Construction	172,660	1.5	715	2.8	109	3.7	1,670	2.5
SF	Insurance and pension services	119,101	1.0	1,187	4.6	79	2.7	1,773	2.7
SG	Financial services	130,646	1.1	1,366	5.3	152	5.1	2,939	4.4
SH1	Franchises and trademarks licensing fees	671,716	5.8	388	1.5	54	1.8	583	0.9
SH3	Licenses to reproduce or distribute computer software	109,629	0.9	135	0.5	30	1.0	253	0.4
SH4	Licenses to reproduce or distribute audio-visual	277,265	2.4	227	0.9	75	2.5	916	1.4
SI1	Telecommunications services	950,790	8.2	1,001	3.9	198	6.7	2,689	4.1
SI2	Computer services	836,546	7.2	2,783	10.8	118	4.0	7,056	10.7
SI3	Information services	25,721	0.2	808	3.1	63	2.1	1,610	2.4
SJ1	Research and development services	255,436	2.2	423	1.6	60	2.0	913	1.4
SJ211	Legal services	72,105	0.6	1,140	4.4	142	4.8	2,775	4.2
SJ212	Accounting, auditing, bookkeeping, and tax consulting	86,996	0.8	670	2.6	112	3.8	1,427	2.2
SJ213	Business and management consulting and public relations	382,631	3.3	1,398	5.4	110	3.7	3,139	4.7
SJ22	Advertising, market research, and public opinion polling	374,203	3.2	2,635	10.3	120	4.0	6,971	10.5
SJ311	Architectural services	48,517	0.4	320	1.2	91	3.1	849	1.3
SJ312	Engineering services	120,851	1.0	373	1.5	79	2.7	886	1.3
SJ313	Scientific and other technical services	652,998	5.6	490	1.9	118	4.0	2,072	3.1
SJ32	Waste treatment and de-pollution, agricultural and mining	36,362	0.3	401	1.6	53	1.8	749	1.1
SJ33	Operating leasing services	451,107	3.9	1,645	6.4	115	3.9	2,815	4.3
SJ34	Trade-related services	490,265	4.2	418	1.6	102	3.4	2,041	3.1
SJ35	Other business services n.i.e.	1,166,330	10.1	609	2.4	122	4.1	2,346	3.5
SK1	Audio-visual and related services	249,962	2.2	246	1.0	82	2.8	816	1.2
SK2	Other personal, cultural, and recreational services	150,535	1.3	1,241	4.8	110	3.7	3,451	5.2
SL	Government goods and services n.i.e.	218	0.0	41	0.2	21	0.7	51	0.1
	Total	11,587,146	100.0	25,686	100.0	2,977	100.0	66,111	100.0

TABLE A.3. Service types imported: Values, firms, countries and transactions, 2014-15

Notes: Imports are in thousand euros. Values are pooled for 2014 and 2015. Firms are counted each time they import a particular service type at the disaggregated breakdown level in the current year, implying that a firm-year can appear more than once across the listed services types. For that reason the total number of firms-year differs from the one reported in the main text where no service breakdown is used in the count. Countries are counted within the respective service type (service-country combination), thus independent of firm and year. A transaction is defined as firm-year-service-country in the database, i.e., an observation in the sample.

Working Papers

2016

- 1|16 A mixed frequency approach to forecast private consumption with ATM/POS data
Cláudia Duarte | Paulo M. M. Rodrigues | António Rua
- 2|16 Monetary developments and expansionary fiscal consolidations: evidence from the EMU
António Afonso | Luís Martins
- 3|16 Output and unemployment, Portugal, 2008–2012
José R. Maria
- 4|16 Productivity and organization in portuguese firms
Lorenzo Caliendo | Luca David Opromolla | Giordano Mion | Esteban Rossi-Hansberg
- 5|16 Residual-augmented IVX predictive regression
Matei Demetrescu | Paulo M. M. Rodrigues
- 6|16 Understanding the public sector pay gap
Maria M. Campos | Evangelia Papapetrou | Domenico Depalo | Javier J. Pérez | Roberto Ramos
- 7|16 Sorry, we're closed: loan conditions when bank branches close and firms transfer to another bank
Diana Bonfim | Gil Nogueira | Steven Ongena
- 8|16 The effect of quantitative easing on lending conditions
Laura Blattner | Luísa Farinha | Gil Nogueira
- 9|16 Market integration and the persistence of electricity prices
João Pedro Pereira | Vasco Pesquita | Paulo M. M. Rodrigues | António Rua
- 10|16 EAGLE-FLI | A macroeconomic model of banking and financial interdependence in the euro area
N. Bokan | A. Gerali | S. Gomes | P. Jacquinot | M. Pisani
- 11|16 Temporary contracts' transitions: the role of training and institutions
Sara Serra
- 12|16 A wavelet-based multivariate multiscale approach for forecasting
António Rua
- 13|16 Forecasting banking crises with dynamic panel probit models
António Antunes | Diana Bonfim | Nuno Monteiro | Paulo M. M. Rodrigues
- 14|16 A tale of two sectors: why is misallocation higher in services than in manufacturing?
Daniel A. Dias | Carlos Robalo Marques | Christine Richmond
- 15|16 The unsecured interbank money market: a description of the Portuguese case
Sofia Saldanha
- 16|16 Leverage and risk weighted capital requirements
Leonardo Gambacorta | Sudipto Karmakar
- 17|16 Surviving the perfect storm: the role of the lender of last resort
Nuno Alves | Diana Bonfim | Carla Soares
- 18|16 Public debt expansions and the dynamics of the household borrowing constraint
António Antunes | Valerio Ercolani

2017

- 1|17 The diffusion of knowledge via managers' mobility
Giordano Mion | Luca David Opromolla | Alessandro Sforza
- 2|17 Upward nominal wage rigidity
Paulo Guimarães | Fernando Martins | Pedro Portugal
- 3|17 Zooming the ins and outs of the U.S. unemployment
Pedro Portugal | António Rua
- 4|17 Labor market imperfections and the firm's wage setting policy
Sónia Félix | Pedro Portugal
- 5|17 International banking and cross-border effects of regulation: lessons from Portugal
Diana Bonfim | Sónia Costa
- 6|17 Disentangling the channels from birthdate to educational attainment
Luís Martins | Manuel Coutinho Pereira
- 7|17 Who's who in global value chains? A weighted network approach
João Amador | Sónia Cabral | Rossana Mastrandrea | Franco Ruzzenenti
- 8|17 Lending relationships and the real economy: evidence in the context of the euro area sovereign debt crisis
Luciana Barbosa
- 9|17 Impact of uncertainty measures on the Portuguese economy
Cristina Manteu | Sara Serra
- 10|17 Modelling currency demand in a small open economy within a monetary union
António Rua
- 11|17 Boom, slump, sudden stops, recovery, and policy options. Portugal and the Euro
Olivier Blanchard | Pedro Portugal
- 12|17 Inefficiency distribution of the European Banking System
João Oliveira
- 13|17 Banks' liquidity management and systemic risk
Luca G. Deidda | Ettore Panetti
- 14|17 Entrepreneurial risk and diversification through trade
Federico Esposito
- 15|17 The portuguese post-2008 period: a narrative from an estimated DSGE model
Paulo Júlio | José R. Maria
- 16|17 A theory of government bailouts in a heterogeneous banking system
Filomena Garcia | Ettore Panetti
- 17|17 Goods and factor market integration: a quantitative assessment of the EU enlargement
FLorenzo Caliendo | Luca David Opromolla | Fernando Parro | Alessandro Sforza

2018

- 1 | 18 Calibration and the estimation of macro-economic models
Nikolay Iskrev
- 2 | 18 Are asset price data informative about news shocks? A DSGE perspective
Nikolay Iskrev
- 3 | 18 Sub-optimality of the friedman rule with distorting taxes
Bernardino Adão | André C. Silva
- 4 | 18 The effect of firm cash holdings on monetary policy
Bernardino Adão | André C. Silva
- 5 | 18 The returns to schooling unveiled
Ana Rute Cardoso | Paulo Guimarães | Pedro Portugal | Hugo Reis
- 6 | 18 Real effects of financial distress: the role of heterogeneity
Francisco Buera | Sudipto Karmakar
- 7 | 18 Did recent reforms facilitate EU labour market adjustment? Firm level evidence
Mario Izquierdo | Theodora Kosma | Ana Lamo | Fernando Martins | Simon Savsek
- 8 | 18 Flexible wage components as a source of wage adaptability to shocks: evidence from European firms, 2010–2013
Jan Babecký | Clémence Berson | Ludmila Fadejeva | Ana Lamo | Petra Marotzke | Fernando Martins | Pawel Strzelecki
- 9 | 18 The effects of official and unofficial information on tax compliance
Filomena Garcia | Luca David Opromolla
Andrea Vezulli | Rafael Marques
- 10 | 18 International trade in services: evidence for portuguese firms
João Amador | Sónia Cabral | Birgitte Ringstad

