Trade in services, intangible capital, and the profit-shifting hypothesis*

Nadia Accoto, Stefano Federico, and Giacomo Oddo

Banca d'Italia

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Abstract

This paper focuses on international trade in services related to intellectual property products (IPP) or intangible capital, and it explores to what extent IPP might be used as a channel to shift multinational firms' (MNEs) profits to tax havens. Using firm-level survey data collected by the Bank of Italy, we first describe the geographical and sectoral analysis of Italy's trade in IPP services, pointing to patterns that are compatible with the hypothesis that such services are used as a profit-shifting tool. We then estimate the amount of profit shifting by foreign-owned firms in our sample, applying the methodology put forward by Tørsløv et al. (2018). Finally, we document a significant correlation at the firm level between the estimated amount of shifted profits and the value of IPP services imports, which provides support to the hypothesis that the exchange of IPP services is motivated by tax planning considerations.

JEL: F14, F23, H26
Keywords: Trade in services, intellectual property products, MNEs, profit shifting

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1 Introduction

Intangible capital (i.e. intangible assets and immaterial goods that can be exchanged such as patents, trademarks, copyrights, software, managerial and accounting expertise, algorithms, and other intellectual property products) has been playing an ever-growing role in the balance-sheet of multinational corporations. Its growth is probably the most distinctive feature of the transition process towards what has been defined by the literature as the "knowledge economy", which begun in the last decade of the last century. As widely argued by Haskel and Westlake (2018) in their recent book, the effects produced by this structural change are wide and pervasive. Although intellectual property protection is not evenly enforced across jurisdictions, when it comes to buying and selling, intellectual property products (IPP) are easily and cheaply transferable. This feature, combined with the expansion of multinational groups characterised by global networks of affiliates in different countries, has opened new possibilities for strategic reallocation of profits and the implementation of tax avoidance schemes (fiscal planning). In more recent years, the phenomenon of fiscal base erosion and profit shifting (BEPS) went under the spotlight of policy makers, international fora, and economic intelligence.[1]

From the point of view of balance of payments statistics, the remuneration of intangible assets (i.e. fees and royalties paid by a user of intellectual property products to the foreign owner of such products) is a flow that qualifies as part of "trade in services". When trade in such services occurs between companies belonging to the same multinational group, it can become a channel for relocating part of the user's profits to the owner's account, in particular when the latter is residing in jurisdictions characterized by more favorable tax regimes. Although multinational companies are not new to practices and behaviors aimed at exploiting opportunities for fiscal arbitration, intangible capital makes it possible to achieve it in a more flexible and economic way, compared to other channels like, for example, transfer pricing on goods transactions or intra-group finance.[2] The diffusion of these strategies might have a significant impact on official statistics, distorting key macroeconomic aggregates such as gross

[1] See the policy note *Addressing the Tax Challenges of the Digitalisation of the Economy*, approved in early 2019 by the OECD working party on the BEPS initiative.

[2] Dharmapala (2014), Heckemeyer and Overesch (2017) and Beer et al. (2018) provide extensive reviews of empirical studies on profit-shifting strategies of multinational firms. These strategies include a variety of techniques: (i) non-financial transactions, such as merchandise trade or services trade between affiliates where transaction prices are different from market prices (e.g. firms over-report imports and/or under-report exports in order to minimize domestic profits and/or inflate profits generated by affiliated firms abroad); (ii) financial transactions, such as interest payments on infra-group loans (where interest rates are different from market interest rates) or derivatives; (iii) corporate restructuring, such as in the case of transfers of assets to a foreign country or even redomiciliation of the entire company (also known as corporate inversion). This happens when the parent company merges with a foreign company (usually located in a country with favorable taxation) and becomes a subsidiary of the new foreign parent, thus moving its tax residence to the foreign country. Strategies based on IPP services trade, which are the focus of this paper, can be classified under category (i).

national income.[3]

Prompted by these considerations, the aim of our paper is to provide new evidence, based on detailed firm-level data, on the the use of IPP transactions for profit shifting. To this purpose, taking advantage of the richness of survey data collected by the Bank of Italy on a representative sample of Italian firms, we describe the geographical and sectoral analysis of Italy's trade in IPP services, pointing to patterns that are compatible with the hypothesis that such services are used as a profit-shifting tool. As a second step, the paper applies the methodology of Tørsløv et al. (2018) for the quantification of profit shifting to Italian micro-data, based on a comparison of profitability ratios between foreign-owned and local firms. As a final contribution, the paper attempts a preliminary assessment of the relation (both at the aggregate and at the firm level) between estimates of shifted profits and imports of services related to intellectual property and intangible capital.

The structure of the paper is as follows. Section 2 reports descriptive evidence on trade in IPP services. Section 3 presents the methodology for the estimate of profit shifting and the main results. Section 4 focuses on the relation between IPP services and profit shifting. Section 5 concludes.

2 Firms trading in IPP services: micro-data at a glance

The analysis developed in this paper is based on a sample of 2,600 Italian non-financial firms over a five years time span (2013–2017). The sample is derived from survey data collected by the Bank of Italy for the compilation of balance of payments statistics, and it includes detailed information on firms' exports and imports of services. Each observation is a vector specifying firm's identity, flow direction, type of traded service, counterpart country, and time.[4] We merge data on trade in services with firms' balance sheet data from *Centrale dei Bilanci*.[5] The original dataset includes more than 30 types of services according to the Extended Balance of Payments Services (EBOPS) classification. We aggregate them into three categories:

IPP services: Services related to intellectual property products. This category includes: (i) royalties and users' fees related to intellectual property rights; (ii) software and computer services; (iii) research & development.

HQ services: headquarter services, i.e. services related to accounting and managerial expertise. This category includes: (i) accounting, auditing and tax advisory services; (ii)

[3] The recent case of Irish GDP was emblematic: Irish GDP was revised upwards by 26%, due to the reallocation in Ireland of large stocks of intangible capital from abroad (Tedeschi, 2018). With respect to long-term economic trends, an analysis conducted on US data suggests that the productivity slowdown observed in the last two decades could reflect, to some extent, the accumulation of value added generated by American multinationals in a limited number of tax havens (Guvenen et al., 2017).

[4] In our analysis we use firm-level data as reported by respondents, i.e. sample data were *not* expanded to the universe levels. The sample by construction includes only firms with non-zero exports or imports of services.

[5] *Centrale dei Bilanci* is a private registry containing balance-sheet information of incorporated companies in Italy. See the company's website `www.centraledeibilanci.it` for more details.

managerial and entrepreneurial consultancy, and public relations services; (iii) other services between associated companies not included elsewhere.

Other services: a residual category containing all other services in the dataset but not included in the previous two categories.[6]

The first category follows the standard definition of IPP, which was introduced in National Accounts in 2008, and it is at the centre of the research question posed in this paper.[7] The second category contains services that by their nature are mainly exchanged within the group and, as suggested by Tørsløv et al. (2018), might be an alternative tool used by multinational groups to shift profits across different jurisdictions. Finally, the third category was added for completeness, and it merely represents the complement to the totality of services included in the sample.[8]

For each of these three categories of services, we look at exports and imports along various dimensions (partner country, industry, firm size and ownership structure). This exploratory analysis aims at detecting specific features and differences between IPP, HQ, and other services that might suggest the use of IPP services for profit-shifting purposes.

Table 1 provides a geographical breakdown of trade in services, where partner countries were grouped into (i) low taxation countries or "tax havens" and (ii) standard taxation countries or "non-havens".[9] IPP account for slightly more than a quarter of total services exports and about one fifth of imports (bottom line of table 1). The proportion of IPP *exports* to tax havens (32%) is broadly in line with other services, and significantly lower than HQ services. However, IPP *imports* come in a much larger proportion from tax havens than other services (43% vs 23%). Among tax haven countries, EU members have a very relevant weight, with Ireland and Netherlands being the two most important partners. The other main group of

[6] Since our data are taken from a business survey that does not include (i) banking and financial services, (ii) travel, and (iii) transportation services, such services are altogether excluded from the analysis and never appear in any aggregate nor in totals.

[7] Following the work of the *OECD Task Force on R&D and Other Intellectual Property Products*, IPP were recognised as an intangible form of *capital* and started to be treated as such in macroeconomic statistics; a well-defined notion of them was therefore established in the framework of national accounts (OECD, 2010). According to this notion, IPP are defined as intangible fixed assets, whether purchased or produced for own use, used in the production process, and include software, research & development, patents, entertainment and artistic originals.

[8] As mentioned in footnote 6, "total services" in this context corresponds to a subset of the "total services" aggregate as defined in balance of payments data.

[9] The list of countries considered as *tax havens* is taken from Tørsløv et al. (2018) and it includes 40 sovereign fiscal jurisdictions, states, and overseas dependencies (in **bold** type the countries that are also members of the European Union): Andorra, Anguilla, Antigua and Barbuda, Bahamas, Bahrain, Barbados, **Belgium**, Belize, Bermuda, Bonaire , British Virgin Islands, Cayman Islands, Curaçao, **Cyprus**, Gibraltar, Grenada, Guernsey, Hong-Kong, **Ireland**, Isle of Man, Jersey, Lebanon, Liechtenstein, **Luxembourg**, Macao, **Malta**, Marshall Islands, Mauritius, Monaco, **Netherlands**, Panama, Puerto Rico, Seychelles, Singapore, Sint Maarten, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Switzerland. Following their definition, we give here to "tax haven" a broader meaning, i.e. not necessarily a country that has a lower corporate tax rate, but more generally a country that has special fiscal provisions and/or regulatory institutions to attract foreign capital in general and intangible capital and IPP-related activities in particular.

counterpart countries for IPP import flows is represented by European non-EU tax havens, Switzerland being the most relevant among them.

Table 1: Distribution of trade in services by counterpart area

	Export				Import			
Counterpart Area	IPP	HQ	Other	Total	IPP	HQ	Other	Total
World	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Non-havens	68.1	56.1	68.6	66.6	57.0	66.4	77.4	71.5
Tax-havens	31.9	43.9	31.4	33.4	43.0	33.6	22.6	28.5
of which:								
Asian Tax-havens	1.3	2.4	1.2	1.4	0.1	1.8	2.5	1.9
EU Tax-havens*	13.3	19.0	16.5	16.0	36.8	22.6	13.1	19.6
European non-EU Tax-havens	17.1	22.2	13.1	15.5	6.1	9.2	6.3	6.6
Other tax-havens	0.3	0.3	0.5	0.4	0.0	0.1	0.7	0.4
% on total services	26.6	15.3	58.1	100.0	22.1	12.9	65.0	100.0

All values are in percentage terms, calculated as average on the 2013–2017 interval.
(*) See footnote 9 for the list of "tax-havens".

In the following step we look at sector of economic activity of the firms active in services trade. Consistently with what was found by Federico and Tosti (2017) and Moro and Tosti (2019), table 2 shows that manufacturing firms play a very important role in the international trade of services, and an even larger role when considering IPP services, as manufacturing firms account for two thirds of exports and about 39% of imports of such services (table 2, bottom line). This evidence is compatible with the claims of Tørsløv et al. (2018), according to whom profit shifting seems to be an across-the-board phenomenon, observable even in industries with lower intensity in intangibles, such as manufacturing.[10] Outside of manufacturing, the most important firms' sector for IPP services trade are Information & computer services, and Telecommunications & media; together with manufacturing, these sectors account for 80% of IPP services trade. Within manufacturing, there are significant differences between exports and imports of IPP services. The majority of exports are due to three sectors only: electronics, transport equipment, and pharmaceuticals. Imports instead are associated with a wider sectoral variety of importing firms, including (together with the above-mentioned three sectors) also chemicals, machinery, electrical equipment, food, and beverages. This finding might be interpreted as an indication that IPP services are an important production input for many branches of the manufacturing sector; on the other side, exports of IPP services are more concentrated in those manufacturing branches characterised by economies of scale, larger average firm's size, and high-tech intensity, all features that are usually associated with the production process of intangible goods and of services related to intellectual property (Haskel and Westlake, 2018).

The latter interpretation is supported also by the upper panel of table 3, which breaks down services trade into four classes based on firms' size; the role of large companies (i.e. those over a thousand employees) in IPP services trade is significantly greater than in other

[10] See also Figure L.1 in the Online Appendix of Tørsløv et al. (2018).

Table 2: Distribution of trade in services by firms' economic activity

		Export				Import			
Economic activity	NACE code	IPP	HQ	Other	Total	IPP	HQ	Other	Total
Food	[10]	3.4	3.1	1.8	2.4	2.3	3.5	1.3	1.8
Beverages	[11]	0.2	0.3	0.5	0.4	0.7	0.9	0.5	0.6
Textiles	[13]	0.0	0.2	0.0	0.0	0.0	0.2	0.3	0.2
Wearing apparel	[14]	2.1	0.1	0.1	0.6	0.7	1.8	1.8	1.5
Leather	[15]	3.8	7.7	0.4	2.4	2.0	4.9	1.5	2.0
Paper & print	[17 + 18]	0.3	0.2	2.0	1.3	0.5	0.9	0.3	0.4
Coke & ref. petroleum	[19]	0.3	0.1	0.7	0.5	1.9	1.1	2.8	2.4
Chemicals	[20]	2.7	4.6	1.8	2.5	5.1	4.3	1.7	2.8
Pharmaceuticals	[21]	6.7	5.7	2.3	4.0	5.3	7.5	1.6	3.1
Plastics & rubber	[22]	3.2	2.5	0.7	1.6	1.6	3.1	1.1	1.5
Non-metallic mineral prod.	[23]	0.6	4.3	1.6	1.7	0.5	0.6	0.8	0.7
Basic metals	[24]	0.0	0.5	0.7	0.5	0.3	0.9	0.7	0.7
Metal products	[25]	0.1	1.7	5.6	3.6	0.5	1.1	0.8	0.8
Electronics	[26]	17.4	6.5	7.1	9.7	1.9	1.9	3.7	3.1
Electrical equipment	[27]	5.3	3.7	0.6	2.3	3.3	2.5	3.3	3.2
Machinery	[28]	3.7	5.5	4.8	4.6	3.2	5.9	4.7	4.5
Transport equipment	[29 + 30]	16.5	9.1	9.3	11.1	8.0	8.4	6.3	6.9
Other manuf. products	[32]	0.2	0.2	0.1	0.1	0.8	0.4	0.2	0.3
Energy & gas	[D]	0.1	2.9	2.9	2.2	0.8	0.8	2.7	2.0
Construction	[F]	0.3	2.6	1.3	1.2	0.3	1.4	1.0	0.9
Wholesale & retail trade	[G]	4.7	11.6	12.4	10.2	8.3	13.8	12.5	11.8
Transportation services & storage	[H]	0.1	1.5	9.9	6.1	1.4	1.9	21.8	14.8
Accommodation & catering	[I]	0.1	0.1	0.1	0.1	0.3	0.5	0.1	0.2
Telecommunications & media	[J58 ...J61]	0.5	2.2	20.5	12.5	12.1	8.0	18.1	15.5
Information & computer serv.	[J62 + J63]	15.6	11.4	0.4	6.1	28.9	10.9	0.8	8.2
Finance & insurance	[K]	0.8	0.7	2.0	1.5	1.2	1.6	0.8	1.0
Business services	[M + N]	9.3	10.5	8.0	8.8	7.3	8.3	4.2	5.4
Residual activities	(*)	1.9	0.4	2.6	2.1	0.8	2.7	4.7	3.6
Total economy		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Memo item: Manufacturing	[C]	67.4	56.3	41.1	50.3	38.8	51.6	35.8	38.5

All values are in percentage terms, calculated as average on the 2013–2017 interval.
In squared brackets the NACE (Rev.2) code of the economic sector of the trading firms.
(*) Includes activities with the following NACE codes: A, B, E, L, P, Q, R, S, U, 12, 16, and 33.

types of services, and their role is larger on the exports than on imports side.[11]

Additional insights on the nature of IPP services can be gained considering the ownership status of trading firms. The lower panel of Table 3 considers three sets of firms: (i) foreign-owned firms, i.e. firms whose parent company is located abroad;[12] (ii) firms belonging to a

[11] A complementary information is the degree of trade concentration between firms. Table A1 in the Appendix shows that IPP services trade is more concentrated than other types of services: for example, the top 50 exporting firms account for over 80% of exported IPP services and about 70% of imported IPP services, a share that is significantly larger than what is found for HQ and other services.

[12] With the term "parent company" we mean here the ultimate controlling investor, not the immediate counterpart). The information on the location of the parent company is provided by the respondent Italian firm in

Table 3: Distribution of trade in services by firm size and ownership

	Export				Import			
	IPP	HQ	Other	Total	IPP	HQ	Other	Total
Panel A: Distribution by firm size								
1–99	4.4	2.7	11.8	8.5	2.3	4.6	6.7	5.5
100–499	10.2	22.7	27.1	21.9	20.1	24.7	25.8	24.4
500-999	14.8	23.9	22.4	20.6	14.8	25.7	20.1	19.7
1000 and above	70.7	50.6	38.7	49.0	62.8	45.0	47.4	50.5
All firms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Panel B: Distribution by firm ownership								
Foreign parent	51.5	68.5	40.2	47.5	59.2	71.6	37.0	46.4
Italian parent	47.1	26.8	58.2	50.5	34.0	25.8	60.0	49.8
No group	1.5	4.7	1.5	2.0	6.8	2.6	3.0	3.8
All firms	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

All values are in percentage terms, as average on the 2013–2017 interval

domestic multinational group (i.e. firms that are part of a multinational network of affiliates whose parent company is located in Italy); (iii) firms that do not belong to any group (independent firms).

Foreign-owned firms are responsible for almost half of international trade in services in our sample.[13] There are significant differences across exports and imports as well as across the three categories of services: the share accounted for by foreign firms ranges from about 40% for exports of other services to more than 70% for imports of HQ services. In the case of IPP services, the share accounted for by foreign firms is larger for imports than for exports (60% versus 51%, approximately).

As a final step for this section, we verify and summarise previous results by running a few log-linear regressions of trade in services on firms' characteristics: size (measured both in terms of employees and balance-sheet assets), sector, and ownership status. The most evident result in table 4, where we analysed exports and imports of the three service categories, is that the status of being foreign-controlled is always positively associated with IPP trade intensity (both on the import and the export side), even after controlling for size, sector, and year fixed effects, as we could reasonably expect from the descriptive statistics previously shown. On the other side, the role of size *per se* is somehow reduced after controlling for sector effects: it affects positively IPP trade, but only on the export side, while it is non-significant or negatively

the *Direct Reporting* questionnaire.

[13] Our dataset does not allow to disentangle intra-group trade flows from total flows. A proxy indicator for the aforementioned distinction can be obtained by joining two pieces of available information: the location of the parent company and the counterpart-country of the transaction. If the transaction takes place with the parent company (intra-group trade), then the counterpart-country coincides with the parent company's country of residence. Hence, the share of trade occurring vis-à-vis the country where the importer's parent company is located can be thought of as a proxy for intra-group trade. We find that about a third of IPP services and HQ services are imported from countries where the parent companies of importing firms are located, while for other services such a share is less than 10%. These numbers ought to be considered more as a lower bound estimate, since the proxy indicator presented above does not deal with intra-group trade between affiliates, which may be also relevant.

affecting IPP imports and other kinds of service trade. However, if we split IPP service imports between those originating from tax havens and those from non-havens, as done in table 5, we can see that size *does* affect imports too, but only those from tax havens.

Table 4: Trade in services and firms' characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
		Exports			Imports	
	IPP	HQ	Other	IPP	HQ	Other
Foreign control	0.259***	0.854***	0.684***	0.739***	1.112***	0.445***
	(0.0664)	(0.0850)	(0.130)	(0.0849)	(0.0817)	(0.117)
Log employees	0.0502	0.0581*	-0.0207	-0.00654	0.0854*	-0.230***
	(0.0281)	(0.0269)	(0.0448)	(0.0392)	(0.0375)	(0.0546)
Log assets	0.101***	-0.0354	-0.109*	0.0584	-0.146**	0.160*
	(0.0225)	(0.0421)	(0.0504)	(0.0446)	(0.0474)	(0.0697)
Constant	-1.184***	0.214	2.333***	-0.260	1.422***	0.747
	(0.201)	(0.381)	(0.473)	(0.356)	(0.394)	(0.613)
Year FE	yes	yes	yes	yes	yes	yes
Sector FE	yes	yes	yes	yes	yes	yes
adj. R^2	0.062	0.045	0.066	0.101	0.072	0.085
N	8557	8544	8422	8572	8570	8501

Regression of log exports (or imports) of a given service type by firm i in year t on foreign control dummy, log employees, log assets, year and sector FE.
Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Imports of services and firms' characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
	Imports from non-havens			Imports from tax-havens		
	IPP	HQ	Other	IPP	HQ	Other
Foreign control	0.590***	0.797***	0.300**	0.173***	0.315***	0.285***
	(0.0710)	(0.0640)	(0.0994)	(0.0482)	(0.0460)	(0.0714)
Log employees	0.00956	0.0440	-0.144**	-0.0253	0.0411	-0.172***
	(0.0258)	(0.0259)	(0.0465)	(0.0266)	(0.0216)	(0.0315)
Log assets	-0.0286	-0.0896**	0.111	0.0948***	-0.0559	0.0679*
	(0.0294)	(0.0302)	(0.0606)	(0.0274)	(0.0311)	(0.0314)
Constant	0.565*	0.935***	0.530	-0.872***	0.484	0.555
	(0.243)	(0.255)	(0.518)	(0.211)	(0.265)	(0.321)
Year FE	yes	yes	yes	yes	yes	yes
Sector FE	yes	yes	yes	yes	yes	yes
adj. R^2	0.086	0.062	0.080	0.040	0.027	0.054
N	8574	8571	8523	8579	8577	8554

Regression of log imports of a given service type from non-havens or tax-havens by firm i in year t on foreign control dummy, log employees, log assets, year and sector FE.
Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

3 Profit shifting estimation

In this section we present the methodology proposed by Tørsløv et al. (2018) for the quantification of profits shifted to tax havens by multinational firms. We then apply this methodology to our sample of Italian firms, deriving estimates of shifted profits for the foreign firms in our sample (both at the aggregate level and at the industry level). In the next section, as a final step, we will look at the relation between our estimates of shifted profits and imports of intellectual property products and other services, with a view to understanding to what extent trade in services might act as a channel for profit shifting.

3.1 The methodology proposed by Tørsløv et al. (2018)

The approach proposed by Tørsløv et al. (2018) moves its first step from an empirical finding: foreign firms display on average lower profitability than local firms in high-taxation countries (non-haven countries), while the opposite is found in countries where taxation is relatively low (tax havens). Local firms, instead, display similar profitability both in tax havens and non-haven countries. They interpret the profitability gap between foreign and local firms as the effect of profit shifting activities implemented by cross-border multinational groups, relocating profits from non-haven to tax havens. As an index of firm's profitability, they consider the ratio z of pre-tax corporate profits (π) to wages (w):

$$z = \pi / w \tag{1}$$

Using the above notation to summarize their empirical finding, we have:

$$z_f^h > z_l^h \quad ; \quad z_f^n < z_l^n \tag{2}$$

where subscripts f and l refer to foreign and local firms respectively, and superscripts h and n indicate their location: tax haven and non-haven countries, respectively.[14] Pre-tax corporate profits π are defined as the difference between gross operating surplus, and the sum of net interest payments and depreciation.[15] Wages w include not only salaries but also non-wage employee compensation (such as retirement benefits, health benefits, payroll taxes, etc.).

Tørsløv et al. (2018) then compute the "hypothetical" profits that foreign firms would display if they had the same observed profitability of local firms ($z_f = z_l$). The difference between "hypothetical" or "adjusted" profits and reported profits can be thought of as a measure of shifted profits:

$$\text{Shifted profits} = \pi_f^* - \pi_f = z_l w_f - z_f w_f = (z_l - z_f) w_f \tag{3}$$

[14] For details on the set of tax haven countries, recall note 9.

[15] According to National Accounts definitions, value-added is made up by (i) cost of employees and (ii) gross operating surplus, which in turn can be split into (ii.a) net operating surplus and (ii.b) depreciation. Net operating surplus is made up by (ii.a.1) net interest paid and (ii.a.2) corporate profits. It is the latter component which is the taxable revenue of firms, as both depreciation and interest paid are tax-deductible.

where adjusted foreign firms profits (π_f^*) are obtained under the assumption of foreign and local firms having the same z, so that shifted profits are given algebraically by foreign firms' cost of employees (w_f), multiplied by the profitability ratio differential ($z_l - z_f$). The underlying assumption is that in all countries foreign and local firms in each sector have a Cobb-Douglas production function. Under this assumption, any observed difference between z_l and z_f must be due to profit shifting, since in this case different capital intensities do not reflect into profit shares. This result holds under more general production functions, to the extent that there are not significant differences in terms of capital intensity between foreign and local firms.[16]

In order to produce the measure of shifted profits in (3), the authors take a "macro" approach, using a combination of macroeconomic and structural business statistics, so that they can include in the analysis the largest possible number of countries and obtain comparable results. National Accounts statistics (NA) provide information on corporate value-added and on its subdivision between compensation of employees and gross operating surplus for the entire economy (i.e. for all resident firms, both local and foreign, as a whole aggregate). To separate these quantities for local and foreign firms, they resort to Foreign Affiliates Statistics (FATS), which report value added and compensation of employees (w_f) for foreign-control resident firms.[17] However, π_f is not easily obtained, because foreign-control firms' value added needs to be cleared of compensation of employees, interest paid, and depreciation in order to get pre-tax corporate profits. The authors therefore draw on FDI income statistics to derive an estimate of net cross-border interest payments made by foreign firms. Depreciation of foreign firm can then be obtained as a residual, after subtracting income, costs, and taxes from gross operating surplus.[18]

There are four potential weaknesses of this methodology, reflecting in all cases the limitations of the available data. The first is the combination of FATS and FDI data, since the two definitions of *foreign* firms do not entirely coincide: while FATS data are based on the criterion of the ultimate controlling country, FDI data are based instead on the immediate counterpart country.[19] While the overlap between resident firms that are "foreign" according to the FATS

[16] If we drop the hypothesis of Cobb-Douglas production function and allow for elasticity of substitution σ between capital and labor to differ from one, then a difference between capital intensities of foreign and local firms *does* reflect into profit shares, and hence into $z_l - z_f$ and profit-shifting estimates. The larger the distance of σ from one, the larger the impact of capital intensities differential on profit shifting estimates.

[17] Foreign affiliates statistics – FATS describe the activities of firms residing in a country, which are *controlled* or *owned* by other (multinational) enterprises residing outside that country. A firm is labelled as *foreign* if non-resident investors own more than 50% of ordinary shares or voting power. FATS are compiled according to the ultimate controlling investor criterion (UCI): if the foreign investor in local firm A is a foreign enterprise B that is in turn owned by a local firm C, then local firm A is *not* labelled as foreign and it is not included in FATS statistics.

[18] Retained earnings, net dividends paid and net interest paid by foreign-control firms are sourced from direct investment income statistics. Data on corporate tax income paid by foreign-control firms are, with a few exceptions (e.g. United States), not available, therefore the authors estimate them by applying to foreign firms the effective tax rate faced by all resident firms (local and foreign) in the economy. Therefore, in formula: gross operating surplus (sourced from FATS) – net interest paid (sourced from FDI) – net dividends paid (sourced from FDI) – retained earnings (sourced from FDI) – corporate income taxes (estimated) = depreciation of foreign firms.

[19] For instance, an Italian firm controlled by a Dutch company, which in turn is owned by an Italian investor,

criterion and resident firms that are "foreign" according to the FDI criterion is large, there might still be a non-negligible bias.

The second weakness is in the implicit assumption that local firms do not shift profits abroad, so that their profitability can be taken as a benchmark for calculating the profitability gap of foreign-control firms and, from that, estimating shifted profits. Indeed, this assumption may be reasonable to the extent that local firms are *not* multinational firms. Using inward FATS to single out foreign control firms from all resident firms means that all resident firms whose headquarters are based in Italy are included in the group of "local control" firms, even though they could well be part of a group with some foreign affiliates located abroad. Since also these "local" firms may implement profit-shifting strategies with the help of their foreign affiliates (intra-group transactions), the assumption of no profit-shifting for local firms holds only to a limited extent. In the light of this caveat, we ought to consider shifted profits estimated with this methodology more as a lower bound, rather than a point estimate.

Third, the assumption of similar capital intensities in foreign and domestic firms may not always hold empirically. Tørsløv et al. (2018) find that in the United States such a difference in capital intensities is modest and it can explain only a small fraction (less than 10%) of the observed profitability gap between foreign and local firms.[20] In the next subsection we apply a sensitivity analysis which takes into account a variety of assumptions on relative capital intensity and on the elasticity of substitution between labor and capital.

The fourth weakness is related to the residual approach for the estimation of depreciation, which might lead to implausible values for some countries, as we shall see.

Table 6 reports the amount of shifted profits in 2015 for the three major European economies and the three largest tax havens in the European Union, as estimated by Tørsløv et al. (2018) and converted in euro at 2015 exchange rate. Germany and Italy display a positive flow of shifted profits ($\pi_f^* > \pi_f$), meaning that some of the profits earned by their resident MNEs get relocated abroad (to tax havens). For Italy, their estimate of foreign firms' profits shifted to tax havens in 2015 amounts to €24 billion ($26 billion), or 67% of adjusted profits (i.e. with respect to the sum of both booked and shifted profits). This number is much larger than what was found for the world average by the same authors (40%). For tax havens like Ireland, Luxembourg, and Netherlands, the flow of shifted profits has instead negative sign, meaning that these countries are the final destination for (some of) the profits relocated abroad by non-resident MNEs.

As we mentioned above, depreciation of foreign firms was obtained from gross operating surplus (sourced from FATS), after subtracting net interest paid, net dividends paid, and reinvested earnings (from FDI data, see note 18). An overestimation of foreign firms' depreciation would reduce their reported profitability and therefore reflect into an overestimation of profit shifting. Indeed, this methodology attributes to foreign firms in Italy and in Germany the highest depreciation-to-gross-operating-surplus ratio with respect to any other advanced

is considered an Italian *local*-control firm in FATS data and a *foreign*-owned firm residing in Italy in FDI data.

[20] This issue may be particularly relevant in the case of developing countries, where foreign-owned firms typically display much higher labor productivity, wages, and capital intensity with respect to local firms (Willmore, 1986; Ahiakpor, 1986).

Table 6: Estimates of shifted profits in selected European countries by to Tørsløv et al. (2018)

Country	π_f	w_f	π_l	w_l	z_f	z_l	$z_l - z_f$	Shifted profits	As % of adj. profits
Estimates by Tørsløv et al. (2018)									
Italy	12	73	180	371	0.2	0.5	0.3	24	67%
Germany	39	212	462	895	0.2	0.5	0.3	71	64%
France	29	139	141	650	0.2	0.2	0.0	1	3%
Netherlands	81	71	76	185	1.1	0.4	-0.7	-52	n.a.
Ireland	105	14	29	43	8.0	0.7	-7.3	-96	n.a.
Luxembourg	46	10	4	9	4.6	0.4	-4.2	-43	n.a.
Estimates based on an alternative depreciation rate (our estimates)									
Italy	24	73	168	371	0.3	0.5	0.1	9	28%

The table reports the estimates of shifted profits in selected European countries according to Tørsløv et al. (2018). All values are in EUR billion (converted from USD dollars at the average exchange rate). Year 2015.

country in the sample: for both countries the ratio is 73%, against an average of 48% among other advanced economies (for France it is 40%).

To give an idea of how sensitive these estimates are to the assessment of depreciation, in the bottom line of table 6 we adjusted Italy's value for π_f (and hence also π_l) in order to be consistent with a depreciation-to-gross-operating-surplus ratio in line with the OECD average (i.e. 48%, instead of 73%). As a result, the estimate of shifted profits goes down by 60%, at 9 € billion: correspondingly, the share of shifted profits falls from 67 to 28%. This simple calculation shows how the estimate of the capital stock depreciation rate might dramatically affect the estimate of profit shifting. Depreciation could indeed be higher in foreign firms for structural reasons: for example, their production function could be more intensive in intangible capital, whose depreciation is faster than for physical capital. At the same time, the large depreciation rate might simply be an artefact of the residual approach used for its calculation, reflecting statistical inconsistencies across the various domains or other issues. This caveat should be kept in mind when evaluating results from this methodology.

3.2 Estimating profit shifting in our sample of Italian firms

We now adapt the methodology proposed by Tørsløv et al. (2018) and apply it to firm-level data, i.e. to our sample of Italian companies that are active in services trade. As a preliminary step, we check whether our data provide support for the hypothesis that there is an actual profitability gap between foreign and local firms.[21] Table A2 in the Appendix reports the results of a simple regression model for firms' profitability: the dummy variable denoting foreign-control firms is always strictly negative and statistically significant, indicating that foreign firms display indeed lower profitability with respect to local firms. This result is robust

[21] Definition of "foreign" and "local" firms follows what was posed in section 2; we recall it here for the sake of clarity: *foreign* firms are enterprises residing in Italy belonging to a multinational group whose parent company is located abroad; *local* firms are all the remaining firms. With respect to the three sets displayed in panel B of table 3, the set of local firms hence contains both firms which are part of a multinational group with an Italian parent and resident firms not belonging to any group.

to the inclusion of controls for size (measured by the log of employees and/or the log of assets), sector of economic activity, and time fixed effects.

We then aggregate the variables in equation 3 across firms following three alternative approaches, depending on the level of aggregation. First, we compare profitability of foreign and local firms across the entire sample of foreign firms, irrespective of their sector of activity: this yields a direct estimate of shifted profits for the total economy. In the second approach, we compare profitability rates of local and foreign firms on a sector-by-sector basis, and then sum up our estimates of shifted profits across sectors to get a value for the entire economy (sum across sectors). Finally, we compare profitability at the firm level: each foreign firm is compared with the average of local firms in the same sector; firm-level estimates are then summed up to calculate shifted profits for total economy (sum across firms). Since results from the firm-level approach are very similar to those from the sector-level approach, we have chosen not to report them. However, we will use firm-level estimates of shifted profits in the context of a comparison with imports of services in section 4.

Table 7 reports our estimates of profit shifting in our sample of firms, based on 2015 data.[22] The first approach (direct estimate for the entire economy, reported in the bottom line) indicates that the size of shifted profits would amount to 32% of adjusted profits (i.e. sum of booked profits and shifted profits). The alternative approach, which derives profit shifting for the entire economy as the sum of sector-level profit shifting, points to a significantly smaller amount (15% of adjusted profits). The discrepancy between the direct approach and the sector-level approach is relatively large, thus suggesting that macro estimates which ignore sectoral composition, such as the macro approach by Tørsløv et al. (2018), may suffer from a significant bias.[23] When looking at results across sectors, we find wide heterogeneity in terms of profit shifting intensity. Within the manufacturing sector, larger shares of shifted profits on adjusted profits are observed in the fashion industry (textiles, clothing, and leather), pharmaceuticals, basic metals, metal products, and machinery. Energy & gas and information services are among the services sectors with larger intensity of profit shifting. Finally, profit shifting is negative in 6 out of 27 sectors, thus reflecting the higher profitability of resident foreign-control firms in those sectors.[24] Differences across sectors tend to be fairly stable over time: the correlation of profit shifting intensity (i.e. the annual ratio of shifted profits over adjusted profits) in 2015 and in 2016 or 2017 is almost 80%.

[22] Since Tørsløv et al. (2018) provide estimates for the year 2015 only, we produced our estimates for that same year, in order to make the two results comparable.

[23] It is worth noticing that if we discard sectors associated with a negative estimate of shifted profits, then the sector-level approach would deliver an estimate of overall profit shifting that is much closer to the result of the direct approach: it would amount to 29% of adjusted profits.

[24] The relatively small number of firms included in sectoral clusters might explain this result: average profitability of foreign or local firms might indeed be affected by idiosyncratic shocks to one or few large firms.

Table 7: Estimates of profit flows shifted by Italian firms, by firms' economic classification

Sector	Local		Foreign		Profitability		Shifted profits	
	π_l	w_l	π_f	w_f	z_l	z_f	$(z_l - z_f)w_f$	% of π_f^*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Food	1272	1867	421	729	0.68	0.58	76	0.15
Beverages	377	226	346	301	1.67	1.15	157	0.31
Textiles	148	283	1	15	0.52	0.07	7	0.87
Wearing apparel	743	858	-20	57	0.87	-0.36	69	1.41
Leather	538	345	58	157	1.56	0.37	187	0.76
Paper & print	286	714	68	201	0.40	0.34	13	0.16
Coke and refined petroleum	313	1350	175	370	0.23	0.47	-89	-1.03
Chemicals	766	1046	1045	959	0.73	1.09	-343	-0.49
Pharmaceuticals	1438	1120	921	1379	1.28	0.67	849	0.48
Plastics & rubber	501	635	265	514	0.79	0.52	141	0.35
Non-metallic mineral products	436	1118	98	253	0.39	0.39	1	0.01
Basic metals	706	916	50	452	0.77	0.11	299	0.86
Metal products	540	726	55	306	0.74	0.18	173	0.76
Electronics	374	1206	332	1241	0.31	0.27	53	0.14
Electrical equipment	584	869	436	1031	0.67	0.42	257	0.37
Machinery	1645	2715	546	1677	0.61	0.33	470	0.46
Transport equipment	1109	4939	694	2148	0.22	0.32	-212	-0.44
Other manuf. products	189	521	24	26	0.36	0.92	-14	-1.53
Energy & gas	11531	3095	-374	71	3.73	-5.28	639	2.42
Construction	660	2451	50	222	0.27	0.23	10	0.16
Wholesale & retail trade	2666	6982	1175	4201	0.38	0.28	429	0.27
Transportation & storage	7490	12044	-34	569	0.62	-0.06	388	1.10
Accommodation & catering	165	650	12	67	0.25	0.17	5	0.31
Telecommunications & media	8337	5037	2407	694	1.66	3.47	-1259	-1.10
Information & computer serv.	1322	3157	85	369	0.42	0.23	70	0.45
Finance & insurance	351	148	130	62	2.37	2.07	19	0.13
Business services	3485	7464	1421	1799	0.47	0.79	-581	-0.69
Total economy (sum across sectors)							1,813	0.15
Total economy (direct estimate)	47,974	62,481	10,383	19,869	0.77	0.52	4,873	0.32

Methodology of Tørsløv et al. (2018) and authors' calculations on Italian data.

All values are in millions of euros and relative to year 2015. A negative sign in column (7) means inward profit-shifting.

As discussed in section 3.1, our estimates are based on the assumption that there are no differences in terms of capital intensity between foreign-owned and local companies or, alternatively, that the production function is Cobb-Douglas (if the elasticity of substitution between capital and labor is equal to unity, different intensities of capital are not reflected in the profit shares and have a null effect on the estimates). In the more general context of a CES production function, considering balance sheet data on the intensity of tangible capital between foreign-owned local firms[25] and assumptions on the elasticity of substitution between labor and capital, the range of estimates for profit shifting under the direct approach interval widens considerably (between 4 and 42 per cent).[26]

How do our results compare with other estimates of profit-shifting in Italy? Our estimate based on the direct approach is significantly lower than the estimate provided by Tørsløv et al. (2018), but it would be broadly in line both with their estimate under an alternative – and probably more realistic – depreciation rate (see bottom line of table 6), as well as with their world average of profit shifting. However, our sector-level approach suggests that these macro estimates might be upward biased, and it points to a significantly lower, although still far from negligible, volume of profit shifting. Interestingly, our estimate based on sector-level data is quite close to the estimate obtained by Sallusti (2019), whose analysis employs a sophisticated quantitative approach based on a large dataset of firm-level data (about 63,000 firms); his estimate quantifies shifted profits to be about 13% of adjusted profits (32 € billion). A relevant methodological difference is that his estimate of profit shifting covers not only foreign-control firms, but also affiliates of *domestic* multinational groups, while our approach only includes the former group.[27]

Table 8 summarises our estimates for the amount of shifted profits as a share of adjusted profits.

[25] Foreign-owned firms tend to display a lower stock of tangible assets, even controlling for industry composition. A caveat applies however to balance sheet measures of capital stock, as they are usually based on historical cost and might not properly reflect the economic depreciation of the underlying assets.

[26] The interval's width comes from the assumption that the elasticity of substitution between labor and capital lies within a range of 0.7 and 1.3, in line with the existing literature.

[27] The estimation strategy implemented by Sallusti (2019) is also based on the comparison of profitability levels between groups of firms, but with some methodological differences. Firms are divided into MNEs (i.e. belonging to a multinational group) and non-MNEs, a classification which is not entirely consistent with the local-vs-foreign ownership concept. The starting point of his analysis is the identification of a control group for every MNE in the sample: the ten "most similar" non-MNEs for each Italian MNE are selected using propensity score matching techniques, under a set of similarity constraints. The matched pairs "MNE–control-group" are then clustered in terms of profitability, in order to identify the MNEs with an "abnormally" low profitability. As a second step, the clustering is adjusted and validated using *receiver-operating-characteristic* (ROC) techniques, in order to determine to what extent the "abnormality" status signaled at the previous step can be reliably confirmed. Once MNEs have been robustly classified into two clusters of profit-shifting and non-profit-shifting firms, the amount of shifted profits can be estimated by comparing the profits across the two groups, and adjusting the profitability of profit-shifting MNEs for the amount needed to bring it in line with that of non-profit-shifting MNEs.

Table 8: Summary of micro-data based estimates of percentage of shifted profits

Estimation approach	PS as % of adj. profits
Direct approach	32%
Sum across sectors	15%
Sum across sectors*	29%

(*) Excluding sectors with negative estimates.

All values are referred to 2015.

4 The relation between shifted profits and imports of IPP services

We now compare our estimates of profits shifted abroad by foreign firms with the value of services traded by the *same* group of firms. We focus on imports of IPP and HQ services, either from the rest of the world or from tax havens only.[28] Our underlying assumption is that shifted profits are channelled abroad via the cross-border payments made by resident firms as compensation for the consumption of imported IPP services (i.e. paying fees for the use of intellectual property, buying R&D services, purchasing software or other computer services). Profit shifting occurs insofar the counterparts for such payments are located in tax havens. Profit shifting may be more intense if such transactions are over-invoiced, as IPP and HQ services transactions are more easily susceptible to over-invoicing than other types of services or even goods (whose market prices for each product can be easily observed by the tax agency).[29]

Table 9 reports the two aggregates, both for the economy as a whole and at industrial sector level, comparing foreign firms' shifted profits with their respective imports of IPP and HQ services. Overall, imports of IPP and HQ services can in principle accommodate profit shifting flows, if we consider our more conservative estimate of shifted profits (1.8 € billion according to the sum of sector-level values in our sample): IPP and HQ imports made by foreign-controlled firms in our sample jointly amount to 4.6 € billion. If we assume that estimated shifted profits are moved abroad exclusively via imports of IPP and HQ services, this would imply that about 40% of such imports are overstated, i.e. such flows are reflecting transactions at an artificially high price in order to move profits to another country. If we instead consider only imports from tax havens (1.6 € billion for IPP and HQ services combined), we would have to conclude that 100% of these imports are made for profit shifting purposes,

[28] An alternative approach could be based on cross-country differences in the corporate tax rate. However, the corporate tax rate does not necessarily take into account all possible determinants of the actual fiscal burden borne by resident firms; indeed, special arrangements, subsidies, cooperation treaties, and favourable treatment of intangible assets can significantly lower the fiscal burden of firms even in countries with a high corporate tax rate. For this reason, we preferred to adhere to the tax havens list compiled by Tørsløv et al. (2018).

[29] As mentioned in section 1, profit shifting may happen through other channels, including financial transactions or transfer of assets or headquarters (via corporate inversions). There are might also be broader restructurings of corporate activities where functions are reorganized in such a way to concentrate more profitable activities in low-tax countries.

which might seem a rather extreme hypothesis.

Table 9: Foreign firms' profit shifting and imports of IPP and HQ services

Sector	shifted profits	IPP	HQ	IPP + HQ	of which: tax havens
Food	76	105	67	172	111
Beverages	157	35	38	73	35
Textiles	7	0	3	3	2
Wearing apparel	69	1	11	12	2
Leather	187	0	201	201	178
Paper & print	13	5	28	34	4
Coke & ref. petroleum	-89	49	32	81	24
Chemicals	-343	215	111	327	78
Pharmaceuticals	849	68	118	186	44
Plastics & rubber	141	53	36	89	41
Non-metallic mineral prod.	1	23	4	27	4
Basic metals	299	15	36	51	16
Metal products	173	19	26	45	13
Electronics	53	14	61	75	50
Electrical equipment	257	150	33	183	102
Machinery	470	111	136	247	70
Transport equipment	-212	250	132	382	65
Other manuf. products	-14	0	6	7	0
Energy & gas	639	23	20	43	25
Construction	10	1	18	19	0
Wholesale & retail trade	429	288	323	611	266
Transportation & storage	388	47	46	93	54
Accommodation & catering	5	14	14	28	6
Telecommunications & media	-1259	358	137	495	1
Information & computer services	70	393	304	696	336
Finance & insurance	19	41	28	69	5
Business services	-581	125	179	304	49
Total economy (sum of sectors)	1,813	2,405	2,148	4,553	1,581
Total economy (direct estim.)	4,873	2,405	2,148	4,553	1,581

All values are in millions of euros and relative to year 2015.

Looking at industry-level data, estimates of profit-shifting exceed imports of IPP and HQ services in quite a few sectors, such as pharmaceuticals, energy & gas, transportation, metals & metal products, and machinery. Conversely, there are a few sectors with significant imports of IPP and HQ services but low or even negative estimates of shifted profits: telecommunications, business services, chemicals, information services, and transport equipment.

The former discrepancy (shifted profits larger than imports of IPP and HQ services) could be interpreted as suggestive evidence that imports of IPP and HQ services are not the only channels through which profit shifting occurs: other ways to transfer profits abroad include transfer pricing practices on goods and other services, or strategic pricing of intra-group liquidity transactions (see note 2). The latter discrepancy (shifted profits smaller than imports of IPP and HQ services) might reflect instead either an underestimate of profit shifting or an

authentic use of IPP and HQ services as real input of firms' production process.

The comparison presented in table 9 indeed keeps the door open to the hypothesis that imports of IPP and HQ services may actually be used as a profit-shifting channel, insofar the overall size of the channel is compatible with the overall size of the flow to be shifted. However, importing firms might not necessarily be the same firms which shift profits abroad. We have therefore computed the correlation between shifted profits and imports of IPP and/or HQ services *at the firm level*, to verify to what extent the two variables reported in table 9 reflect activities from the same firm. Correlation results are quite convincing, albeit only for IPP services, as we can see in table 10: apparently there is no correlation between imports of HQ services and profit-shifting. Remarkably, only firms importing IPP services *from tax havens* are associated with non-zero estimates of shifted profits, while the correlation vanishes when considering IPP services imported from non-haven countries. The correlation gets even stronger if we restrict the analysis to firms importing non-zero amounts of IPP services and/or to firms associated with positive estimates of shifted profits (cf. 3rd column and/or 2nd row of table 10).

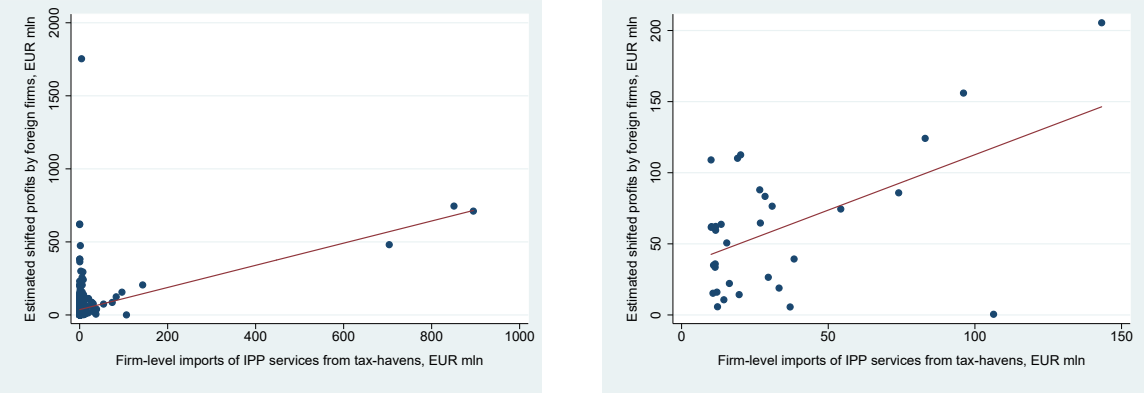
The scatter diagram (Figure 1, left-hand panel) shows indeed that, while a large majority of foreign firms import low or negligible amounts of IPP services from tax havens, there is a small subset of firms which display a clear positive correlation between the two variables. If we restrict the analysis to foreign firms importing IPP services from tax havens in large amounts (e.g. above the threshold of 10 million €; cf. right-hand panel of Figure 1), the correlation becomes stronger, topping to a striking 0.9 (cf. 4th column of Table 10).

Table 10: Correlations between shifted profits and services imports at firm-level

	Imports of IPP services			
	From Non-havens	From Tax havens	From Tax havens > 0	From Tax havens > 10
Profit-shifting	0.03	0.24	0.29	0.87
Profit-shifting > 0	0.18	0.38	0.43	0.97
	Imports of HQ services			
	From Non-havens	From Tax havens	From Tax havens > 0	From Tax havens > 10
Profit-shifting	0.07	0.04	0.05	0.07
Profit-shifting > 0	0.13	0.07	0.07	0.00

The table reports correlation coefficients between firm-level shifted profits and imports of IPP services (upper panel) or imports of HQ services (lower panel), from non-havens and tax-havens countries, in the latter case excluding firms with zero imports (3rd column) or firms with imports less than EUR 5 millions (4th column).

Figure 1: Imports of IPP services from tax havens made by foreign firms and their shifted profits



Both graphs exclude foreign firms associated with negative profit shifting estimates. The left-hand side graph reports 897 observations. The graph in the right-hand panel contains only 63 observations because it excludes also firms with IPP imports smaller than 10 million and it does not display firms with imports of IPP services larger than 150 EUR million, in order to provide a more "zoomed-in" representation of what depicted on the left-hand panel. The red line is obtained by OLS linear interpolation on reported data.

5 Conclusions

The rising relevance of intangible capital in the balance-sheets of multinational corporations has led to a worldwide surge in trade of services related to intellectual property. Some studies have claimed that the underlying intangible assets can be strategically located in fiscally favourable jurisdictions, so that IPP services imports (i.e. the remuneration of intangible assets) can easily become a conveyor belt to shift profits to tax havens.

This paper aims at bringing new evidence on this question. Using detailed firm-level data for Italy, we first document that trade in IPP services shows indeed quite peculiar features. More than 40% of IPP services are imported from tax havens, compared to less than 30% for the other services. Trade in IPP services is highly concentrated among firms, with foreign firms accounting for two-thirds of IPP imports. Imports of IPP services are not made only by firms specialised in ICT sectors, but are relatively widespread across sectors (including manufacturing). This might indicate either that IPP services are a production input for several sectors, or that they are used in many different sectors as a profit-shifting tool (or alternatively both motivations may exist at the same time).

We have then estimated the amount of profits shifted to tax havens by foreign firms, applying the methodology proposed by Tørsløv et al. (2018) to our firm-level data. We find that baseline estimates of profit-shifting vary between 15% and 30% of adjusted profits (i.e. the sum of officially reported and shifted profits), depending on whether the methodology is applied on a sector-by-sector level or on all the firms as a whole.

Finally, we look at whether our estimates of profit-shifting are consistent with the size of imports of IPP services by Italian firms, under the hypothesis that such imports flows are used by MNEs to relocate profits to tax havens. If we take into account imports from tax havens only, their size is smaller than our best (and most conservative) estimate of shifted profits. It becomes almost equivalent only if imports of IPP and HQ services are jointly considered.

Even under this hypothesis, the implication that IPP and HQ imports from tax haven countries were made *only* for strategic transfer pricing transactions seems a quite strong and presumably unrealistic assumption. Two alternative interpretations seem therefore more plausible, namely that either only a fraction of profit shifting is executed through IPP or HQ imports (with other channels playing a role such as transfer pricing in goods transactions or non-market interest rates in intra-group loans) or that our estimate of profit shifting is subject to some unavoidable uncertainty (in the same way as macro estimates of profit shifting are also subject to considerable uncertainty).

This aggregate evidence is complemented by a correlation analysis at the firm-level, which points to a positive relation between firms' imports of IPP services and profit shifting. Remarkably, only imports from tax haven countries are correlated with profit-shifting, corroborating the hypothesis that such imports are motivated to a significant extent by tax avoidance strategies.

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Appendix

Table A1: Cumulative distribution of trade in services

	Export			Imports		
	IPP	HQ	Other	IPP	HQ	Other
Top 10 firms	43.3	38.1	32.1	38.6	28.5	35.3
Top 50 firms	83.1	72.2	68.9	69.0	53.9	62.8
Top 100 firms	92.8	85.2	82.7	80.2	68.7	74.1

All values are in % terms, 2013–2017 averages.

Table A2: Profitability and foreign ownership

	(1)	(2)	(3)	(4)
	$y =$ profitability index z			
Foreign control	-0.218***	-0.360***	-0.301***	-0.213***
	(-4.58)	(-7.78)	(-6.59)	(-4.79)
Log employees			-0.190***	-0.584***
			(-8.77)	(-14.16)
Log assets				0.513***
				(13.47)
Year FE	yes	yes	yes	yes
Sector FE	no	yes	yes	yes
Observations	8525	8525	8511	8475
Adjusted R^2	0.070	0.158	0.173	0.231

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$