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DISCUSSION PAPER

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Keywords: trade, productivity, administrative data, learning-by-exporting

JEL classification: F1; O4; O3

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Abstract

Trade matters. There is indisputable evidence across countries that firms that participate in international markets are more productive. But literature is less clear as to why. What are the mechanisms driving the trade-productivity premia observed in the data? To investigate this, we use an innovative dataset originally developed by Wales et al. (2018), which combines administrative data on trade in goods with survey data on firm labour productivity. We extend this dataset to include trade in services and updated trade in goods information between 2017 and 2022. This dataset, covering the 2005 to 2022 period, allows us to build the most comprehensive picture of British traders and to, not only estimate the most up-to-date relationship between trade and productivity but also to disentangle the role of self-selection of productive firms into exporting, from other causal impacts of trade on productivity via, for instance, technological upgrading or learning-by-doing.

We find that firms in Great Britain that exported or imported goods or services were 35.4% more productive than their non trading counterparts, after controlling for differences in industry, age, employment and foreign ownership status. However, consistent with the literature, we find that most of the productivity gap is due to selection, ie. it is more productive firms that choose to enter international markets. Using trade in goods data for exporters born after 2005, we find that goods exporters-to-be are 59.0% more productive than firms that never export even before the time of first export. Using a differences-in-differences design among goods exporters-to-be only, where conditional on observable characteristics the timing of trade is assumed to be exogenous, we find that there are no significant differences in productivity before exporting, but labour productivity of exporters increases 11.9 % compared to exporters-to-be, in the first year of exporters' first entry in international markets. There is significant heterogeneity at the intensive margin, as our results show that these productivity benefits accrue only to large exporters.

While the estimated impact takes effect too quickly to be attributable to technological upgrading, our estimates suggest goods exporters increase capital investment and ICT, 5 years after entering international markets. These estimates are relevant for policymakers aiming to use trade policy as a lever to boost UK growth. Future extensions of the work should investigate the dynamic trade behaviour of the firm, integrating in the analysis changes in the product and country mix over time, leverage administrative data on trade in services and finally, take advantage of employer employee information to understand the impact of trade on workers.

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JEL Classification: F1; O4; O3

Keywords: trade, productivity, administrative data, learning-by-exporting

Main Points:

- Firms in Great Britain that participated in international markets (exporters or importers of goods or services) between 2011 and 2022 produced 35.4% more GVA per worker than firms that did not trade, controlling for differences in industry, employment, age and foreign ownership.
- Controlling for firm specific time invariant differences in productivity, the within firm productivity premium ie. the change in the productivity of the same firm after it begins exporting or importing is 7%. The lower productivity premia when following the same firm over time suggests that the differences between traders and non-traders, mostly reflect pre-existing differences in productivity.

Source: ONS estimates based on the Annual Business Survey, 2011 to 2022

- Indeed, when comparing firms that never trade with firms that will export goods in the future, before the time of first export, we estimate future exporters to be already 59% more productive, controlling for industry, year, and cohort fixed effects. This analysis, covering 2005 to 2022, is only possible for goods trade and only for firms born after 2005.
- Employing a differences-in-differences approach to explore the causal impact of trade, we find that exporting goods drives a 11.9% increase in labour productivity in the first year of engaging in international markets. This effect is driven by large (above median) exporters.

Source: ONS estimates based on the Annual Business Survey and HMRC Trade in Goods data, 2005 to 2022

1. Introduction

Trade matters. Export-led growth is at the forefront of industrial policy for the UK and other large economies. Policy often aims to build on the country's comparative advantages by interventions such as export support programs to help firms overcome barriers to trade. While it is widely understood that firms that trade are more productive, it is less clear if it is trade that leads to higher productivity or if it the most productive firms that are more likely to trade. As the world sees a wave of deglobalisation, following pandemic shocks to supply chains, the UK's redefined relationship with Europe and the rapid reshaping of the tariff landscape between large exporters, this focus on trade and understanding its role as a potential lever to deliver prosperity is as important as ever.

Estimates of labour productivity have found exporters to be 20-40% more productive than non-exporters (Breinlich et al. 2023). Estimates based on French businesses find exporters 22% more productive (Eaton et al. 2011) and 12-24% more productive in the US (Bernard and Jensen 1999). For the UK, goods exporters between 2005 and 2016 were 21% more productive than businesses that did not trade, even after controlling for firm characteristics such as employment size, industry and foreign ownership (Wales et al. 2018).

While the trade-productivity premium is an empirical regularity, there is much debate as to the mechanisms driving this wedge. Why are firms that participate in trade more productive? International markets can open firms up to greater choice of suppliers allowing them to source cheaper or better intermediate inputs (Tybout and Westbrook 1995, Kasahara and Rodrigue 2008). Trade can also expose firms to new ideas via international supply chain relationships allowing them to improve their production processes. (Crespi et al. (2008), Baldwin and Gu (2004), De Loecker (2004, Aw, Chung and Roberts (2000), Chile, Tokatli (2006), Castellani (2002), Girma et al (2004), Greenaway and Kneller 2008, 2004, and Van Biesebroeck (2005))

But productivity also drives trade. Growing firms are often distinguished by the quality of their management practices, that enables them to be more entrepreneurial in their endeavours, better at navigating uncertainty (Bloom et al. 2022) and resilient to adverse economic change (Jones et al. 2024). These firms are more likely to seek out and identify opportunities available via access to international markets, in which case trade participation could be due to pre-existing differences in productivity rather than a driver of them. In fact, an important part of the literature argues that trade-productivity premia are predominantly due to selection of more productive firms into becoming exporters rather than benefits accruing to exporters through their engagement in international markets (Arnold and Hussinger (2005), Clerides et al. (1998), Isgut (2001), Bernard and Jensen (1999), Haidar (2012), Delgado et al. (2002), Melitz (2003), Melitz and Ottaviano (2003) and Bernard et al. (2003)[1].

In this paper, we contribute to the literature that tries to disentangle the mechanisms by which trade affects productivity. We use a novel dataset, comprised of administrative data from the UK's tax authority's (Her Majesty's Revenues and

[1] For a more comprehensive literature review see Breinlich et al (2023) and Wagner (2005)

Customs (HMRC)) customs declarations matched to the Inter-Departmental Business Register (IDBR). The dataset was originally developed by Wales et al. 2018 and has been improved and extended to cover trade in goods between 2005-2022 as well as trade in services. We link this dataset to the Annual Business Survey and the Longitudinal Business Database to contribute to estimates of the trade-productivity premium in British firms.

Consistent with literature estimates, we find that, controlling for a firm's industry, employment size, age and foreign ownership status, firms that engage in international markets by exporting or importing goods or services are 35% more productive than their non trader counterparts. Controlling for firm specific time invariant differences in productivity, the within firm productivity premium ie. the change in the productivity of the same firm after it begins exporting or importing is 7%.

We employ a differences-in-differences approach to separate the contribution of self-selection from other causal drivers of the trade-productivity premium. Investigating goods exporters born after 2005, we find that exporters-to-be are 59% more productive than firms that never export even before the time of first export. Using a differences-in-differences design among goods exporters-to-be only, where conditional on observable characteristics the timing of trade is assumed to be exogenous, we find that there are no significant differences in productivity before exporting, but labour productivity of exporters increases 11.9% compared to exporters-to-be, in the year after exporters' first entry in international markets. This productivity uplift is driven by large exporters. While the estimated impact takes effect too quickly to be attributable to technological upgrading, our estimates suggest goods exporters increase capital investment and ICT, 5 years after entering international markets.

These estimates are relevant for policymakers aiming to use trade policy as a lever to boost UK growth. The work also makes the case for the importance of leveraging administrative data to further understand the complex dynamics in firms' trade behaviour, showcasing how further developments of the data infrastructure available, could expand the possibilities of this research.

2. Data

In this work, we expand and update the data infrastructure created by Wales et al. (2018) by linking administrative data on trade in goods with survey data on firm-level productivity and trade in services between 2005 and 2022.

The unit of analysis in our work is the firm at reporting unit level. A reporting unit can be part of a larger enterprise and can have multiple physical sites known as local units. These classifications, comprising a business' cartography for the purposes of the Inter-Departmental Business Register (IDBR), the comprehensive list of UK businesses used by the government for statistical purposes, aim to capture the presence of a firm in its various manifestations as a tax paying entity, a survey respondent and finally, a collection of physical sites (more on these structures in Appendix A1).

The IDBR covers roughly 2.7 million businesses and sources information on firm activity from Value Added Tax (VAT), Pay As You Earn (PAYE) records and Companies House. The IDBR covers all sectors but only firms who are VAT and/or PAYE registered. Since VAT and PAYE records have reporting thresholds, some small businesses operating below these thresholds will not be included. For more information on the structure of the IDBR see appendix A.1 and Lemma et al. (2023).

Data Sources and Variables:

HMRC Trade in Goods

We use 2005 to 2022 HMRC Trade in Goods (HMRC-TiG) data linked to the IDBR to identify British firms that export or import goods and measure the value and volume of goods traded by each firm each year by product and partner country. HMRC collects data on trade via firms' customs declarations. For firms trading goods with countries outside the EU this data is a comprehensive account of all trade, excluding low value trade (currently defined as trade with a value of less than £873). For trade in goods with EU countries, data is collected via the Intrastat survey which samples firms only above a certain threshold (roughly £250,000 for exports and £600,000-1.5 million for imports, detailed thresholds for each year are reported in Appendix A1). The threshold is set so that trade returns cover roughly 95% of trade in goods value, but it means that trade by some smaller exporters and importers may be missed.

After 2021, all trade, including trade with the EU, is reported by customs declarations[2].To make sure the data used in our analysis is consistent over time we exclude trade from firms that began exporting with the EU after 2021, but have submitted declarations below the Intrastat threshold, as these firms wouldn't have been sampled by the survey in previous years. The performance of this adjustment is given in appendix A1.4.

The HMRC Trade in Goods data provides an almost comprehensive record of any goods trade by any British firm since 2005. However, the data is collected at a firm's VAT reference unit, which can correspond to multiple reporting units used in survey

[2] Goods traded with the EU via Northern Ireland are still reported using the Intrastat survey.

data and at times even multiple enterprises. To allow us to link administrative data at the VAT reference level with ONS survey data measured at the reporting unit level, an apportionment of trade values is required.

When the VAT reference and the reporting unit don't match uniquely, we use employment, and the product composition of trade compared to the industry composition of the multiple reporting units to apportion trade to each firm for which we have survey information. Appendix A1 describes in greater detail the apportionment methodology used in this work. Appendix A2 provides descriptive statistics on the quality of the linkage methodology tested against the international trade activities firms report in the Annual Business Survey.

Annual Business Survey (ABS)

The ABS is Great Britain's structural business survey conducted by the ONS once a year to collect important information about a business' income, expenditure, capital assets, trade behaviour and research and development activity, to feed into the UK's national accounts. The survey samples approximately 62,000 firms and covers the non-financial business sector only. Across this analysis we additionally drop private sector firms in section O (Public administration and defence; compulsory social security), section P (Education), and section Q (Human health and social work activities).

The ABS asks businesses about their income from and expenditure on services from organisations based outside the UK and, since 2011, the survey asks businesses whether they exported or imported goods from abroad as well. From these questions we can identify respondents' trade status for the years they have responded to the survey for both goods and services, and the value traded for services trade only. Our outcome of interest in this work is labour productivity. We calculate labour productivity for each firm by dividing the firm's gross value added provided in the ABS by firm employment.

The ABS includes firms with fewer than 9 employees and so allows us to identify exporting and importing by firms whose trade may fall under the reporting cutoffs in the HMRC TiG-IDBR data. However, firms with fewer than 250 employees may be sampled only a few times over the course of the 17 years in our sample and many may appear only once. This limits our ability to carry out longitudinal analysis and measure trade activity within the same firm over time.

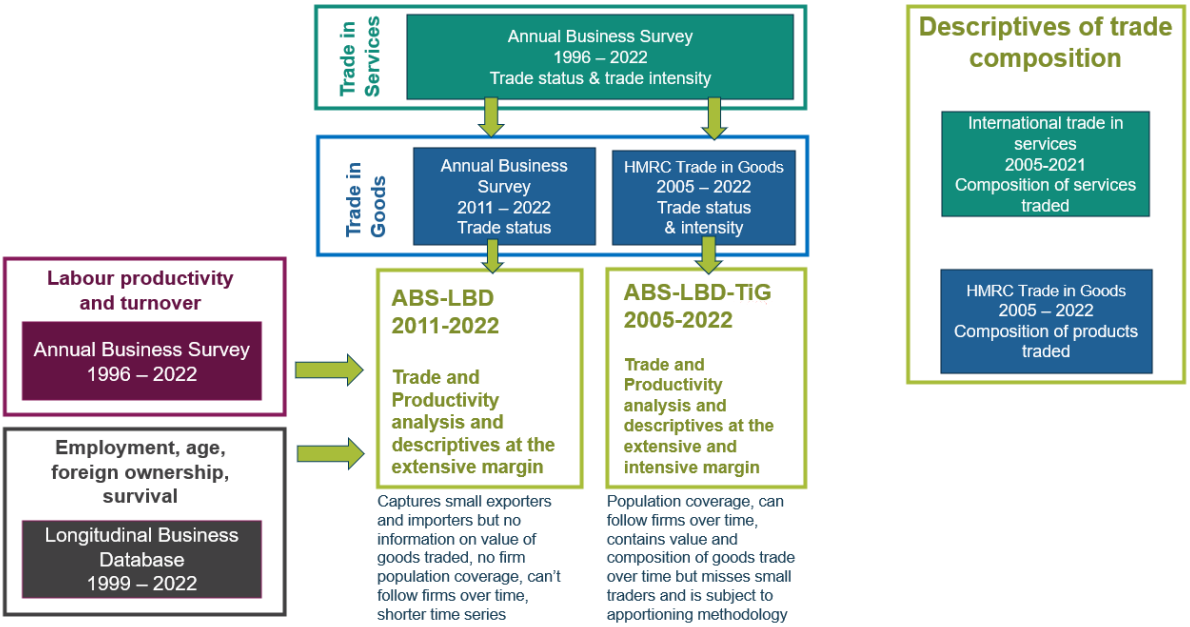
The Longitudinal Business Database (LBD)

The LBD is an experimental ONS data infrastructure that links IDBR snapshots together to provide a quarterly comprehensive picture of the business population. The LBD applies an additional economic activity criterion to better estimate firm activity at a given point in time. In our analysis, we use the LBD to extract firm survival rates. For more information on the LBD see Lemma et al. (2023).

In Figure 1 below, we show how these different datasets come together in our analysis. Our analysis requires three ingredients: information on firms' trade behaviour (in blue and green), labour productivity (in purple) and firm characteristics

(in grey). As shown in Figure 1, labour productivity and firm turnover comes from the ABS, while firm characteristics, aside from turnover, are sourced from the LBD. Services trade information always comes from the ABS, while trade in goods can come from the ABS or from the HMRC-TiG dataset. In sections 3 and 4, we use both the ABS-LBD and the ABS-LBD-(HMRC-TiG) versions of the dataset. As set out earlier, and denoted in the diagram below, that's because the two datasets have complementary strengths and weaknesses and using both alongside each other allows us to more thoroughly understand the relationship between trade and productivity. As shown in Figure 1, we do not use the International Trade in Services (ITIS) survey or the product composition information in the ABS/HMRC TiG dataset but for producing detailed descriptives on the services and product composition of trade given in Appendix B2. Across this work we additionally use derived deflators from UK's balanced supply and use estimates. For more information and a detailed account of the impact of deflators on our estimates see Appendix A4.

Figure 1: Linked datasets feeding into our analysis of trade and productivity



3. The trade-productivity premium

Firms in Great Britain that traded by exporting or importing goods and/or services were on average 41.6%[3] more productive than firms that did not trade between 2011 and 2022, in terms of approximate gross value added (aGVA) per worker, according to our Annual Business Survey (ABS). This "productivity premium" was equivalent to £18,730 per worker in 2022.

[3] Labour productivity in our models enters as the natural logarithm of GVA per worker. We interpret the impact of the independent variable on labour productivity as the exponent of the estimated coefficient minus one. In Table C2.1 the coefficient of participating in any trade on the natural logarithm of labour productivity is 0.348. The impact on labour productivity is therefore $(e^{0.348} - 1) * 100 = 0.416 * 100 = 41.6\%$

As set out in the data section, we can only conduct analysis using ABS data covering both goods and services trade from 2011. This is when questions on goods exports and imports were introduced to the ABS. As questions on services were introduced before this, combining ABS data with administrative data from HM Revenue and Customs (HMRC) on trade in goods (TiG) allows us to obtain data on both goods and services trade going back to 2005.

The difference in productivity between firms doing any international trade and non-trading firms was 58.4% between 2005 and 2022. This estimate uses HMRC TiG data to identify whether a firm is trading goods. HMRC TiG data is affected by upward bias, compared with ABS estimates. This is because of the thresholds for reporting trade in goods with the EU to HMRC up until 2021. Please see appendix A.1.4 for more information.

Part of the productivity gap between firms that trade internationally and firms that do not, when estimated as averages, can be explained by differences in industry, size, age and ownership between traders and non-traders. When controlling for firm characteristics (Table 1), firms that export or import goods or services are 35.4 to 47.0% more productive than firms that do not participate in international markets at all (equivalent to £15,926 to £20,663 GVA per worker in 2022) in the ABS and ABS/HMRC-TiG data respectively. [4]

Table 1: Productivity premium of international traders in the ABS and ABS /HMRC-TiG data, controlling for observable firm characteristics

VARIABLES	(1)	(2)
	Log of labour productivity	
	ABS (2011-2022)	ABS/HMRC-TiG (2005-2022)
Participating in any trade	0.303***	0.385***
	(0.0360)	(0.0411)
Observations	385,593	662,863
R-squared	0.138	0.129
Region FE	Yes	Yes
Ind x Year FE	Yes	Yes
Firm FE	No	No

Note(s): The table presents the coefficient of a dummy equal to one if a firm participates in any form of trade (goods and/or services) regressed against GVA per worker (labour productivity) in a regression controlling for employment, foreign ownership, age and region and industry by year differences in productivity. Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

[4] Across this work we exclude the top and bottom 1% of firms in terms of labour productivity drawn at the industry division-year level. We also drop the top 1% of traders in terms of trade value drawn at the industry division-year level. More information can be found in appendix section D3.

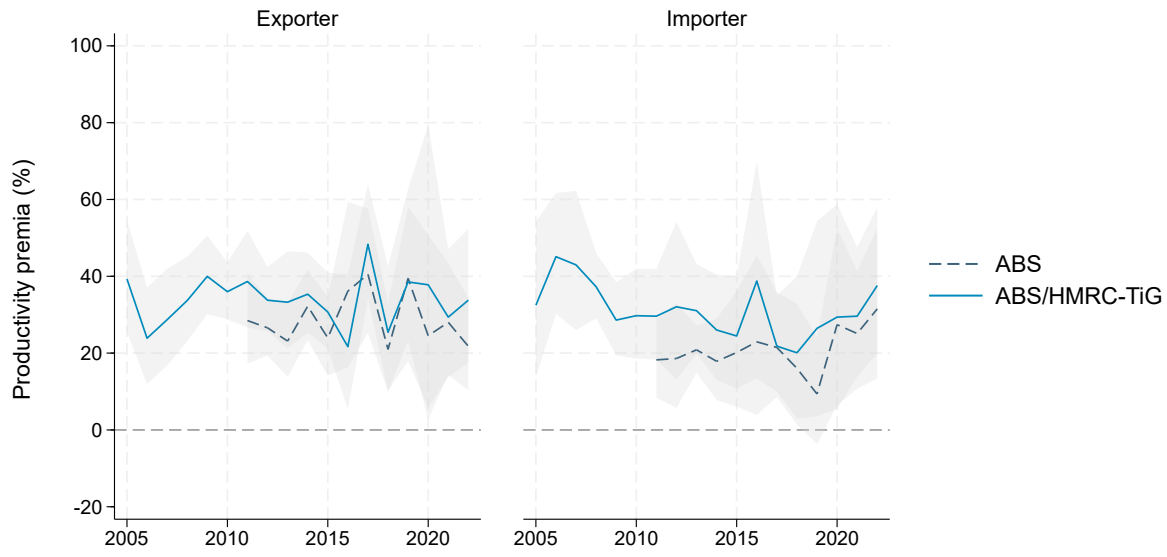
Throughout sections 3 and 4, we explore both goods and services trade and we report premia from both ABS and ABS/HMRC TiG data. This is because both datasets have complementary advantages and disadvantages in their coverage. In HMRC TiG, thresholds that exist when reporting trade with the EU mean that trade by some smaller exporters and importers may be missed. Since firms above the threshold are likely to be larger, more productive firms, the estimated trade-premia that draw goods export and goods import status from the HMRC-TiG dataset are higher due to the threshold-induced upward bias.

On the other hand, the question asking firms whether they participate in goods trade was only introduced in 2011 in the ABS, limiting the period over which firms can be observed. As shown in Table D2.1 and D2.2 in the Appendix, the upward bias present in the ABS/HMRC TiG estimates is not due to the differences in time periods as it persists even in estimates from the shorter 2011 to 2022 window.

Figure 2 plots coefficients from the same model presented in Table 1, but with exporters and importers categories separated and estimated individually for each year. The coefficients reflect the productivity premium, in percentage terms, of being an exporter/importer relative to a non-exporter/importer, within a given year.

The stability of the premia in both ABS and ABS/HMRC-TIG data over this period shows that the trade-productivity premium is a characteristic of our business population, rather than an effect that is changing through time.

Figure 2: Exporter and importer productivity premium by year, Great Britain, 2005 to 2022



Note(s): Figure 2 plots on the left-hand-side the coefficient of a dummy equal to one when a firm is an exporter of goods or services and on the right-hand-side a dummy equal to one when a firm is an importer of goods or services. The coefficients reported are after controlling for 2-digit industry, employment, firm age and foreign ownership. In the series labelled “ABS/HMRC-TiG” the trade in goods export and import statuses come from HMRC-TiG data while the services export and import statuses come from the ABS. In the ABS series, both goods and services trade statuses come from the ABS. 95% confidence intervals are presented as shaded gray areas around the series. Standard errors are clustered at the industry division level (2-digit industry).

The productivity premium is higher for firms that both export and import (Table 2). Controlling for observable firm characteristics, firms that are both importers and exporters are 55.9% more productive according to the ABS (72.1% using the ABS and goods trade status from the HMRC TiG dataset between 2005 and 2022). The respective premium for firms that export only is 28.1% (36.2%) and 20.8% (34.4%) for firms that import only.

Table 2: Productivity premium by combined trade status in ABS and ABS /HMRC-TiG data, controlling for observable firm characteristics

VARIABLES	(1)	(2)
	Log of labour productivity	
	ABS (2011 -2022)	ABS/HMRC-TiG (2005-2022)
Importer Only	0.189***	0.296***
	(0.0356)	(0.0452)
Exporter Only	0.248***	0.309***
	(0.0359)	(0.0383)
Importer & Exporter	0.444***	0.543***
	(0.0528)	(0.0565)
Observations	385,593	662,863
R-squared	0.139	0.130
Region FE	Yes	Yes
Ind x Year FE	Yes	Yes
Firm FE	No	No

Note(s): The table presents the coefficient of each trade status regressed against GVA per worker in a regression controlling for employment size, foreign ownership, age and region and industry by year differences in productivity. Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

Being engaged in both goods and services trade is associated with a higher output per worker (Table 3). Controlling for observable firm characteristics, exporting both goods and services is associated with 24.6% greater GVA per worker in the ABS compared to a non-exporter. Importing both goods and services, on the other hand, corresponds to a premium of 35.4%. Being only a services exporter is related with a productivity premium of 31.9%, and only a services importer 13.5%. Being only a goods exporter or a goods importer is associated with a 24.5% and 23.9% premium respectively.

Table 3: Productivity premium by trade type in ABS and ABS /HMRC-TiG data, controlling for observable firm characteristics

VARIABLES	(1) Log of labour productivity ABS (2011-2022)	(2) Log of labour productivity ABS/HMRC-TiG (2005-2022)
Goods Exporter Only	0.219***	0.348***
	(0.0226)	(0.0361)
Service Exporter Only	0.277***	0.262***
	(0.0405)	(0.0343)
Both Goods & Services Exporter	0.220***	0.402***
	(0.0363)	(0.0294)
Goods Importer Only	0.214***	0.359***
	(0.0372)	(0.0239)
Service Importer Only	0.127*	0.133**
	(0.0703)	(0.0541)
Both Goods & Services Importer	0.303***	0.457***
	(0.0356)	(0.0293)
Observations	385,593	662,863
R-squared	0.139	0.132
Year FE	No	No
Industry FE	No	No
Region FE	Yes	Yes
Ind x Year FE	Yes	Yes
Firm FE	No	No

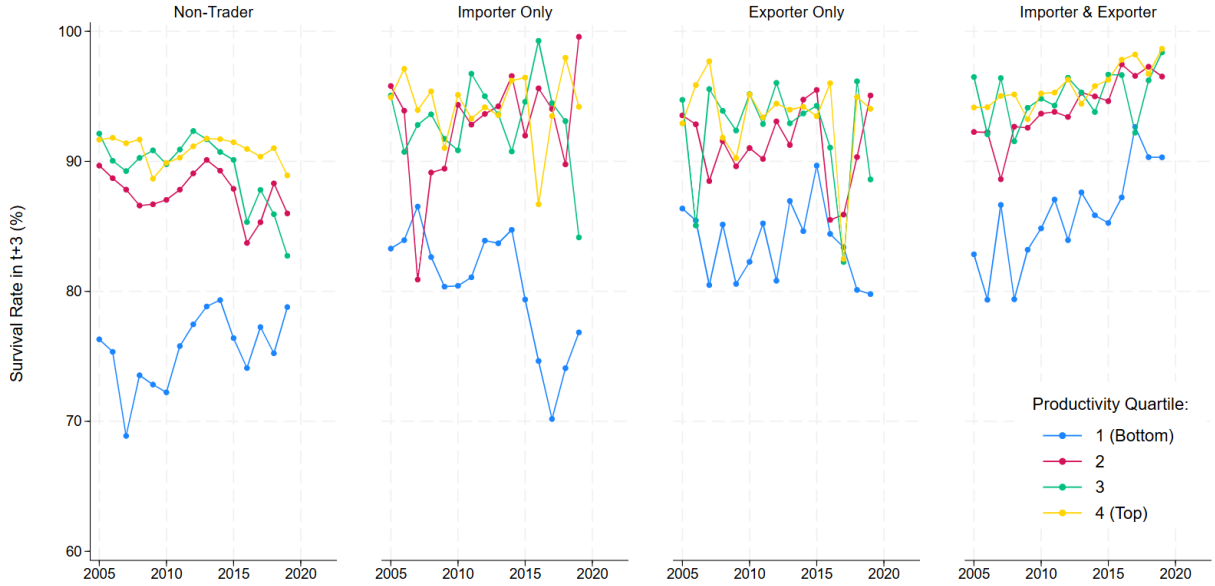
Note(s): This table reports the productivity premium attached to a trade status dummy classifying the different combinations of goods and services trade a firm can undertake, controlling for employment, age, foreign ownership and including region and industry by year fixed effects. Export and import types are separated and the baseline/comparison category in each categorical variable is non-exporters or non-importers respectively. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

While the premia estimated are larger when sourcing a firm's trade in goods status from the HMRC TiG data due to the reporting cutoff inherent in the customs dataset, using clustered standard errors the confidence intervals between the premia of different trade statuses are overlapping (Figure C2.1) suggesting that these differences may not be statistically significant. Since services trade status in both columns comes from the ABS, small differences in the premium of services only exporters and importers are due to the inclusion of additional years in column 2. Table D2.2 in the appendix reports estimates for consistent year windows.

Do these differences reflect true differences in productivity or are they driven by differential survival of low productivity firms when they engage in international markets? We use firm exit from the Longitudinal Business Database (LBD) to understand whether there is increased exit among low productivity exporters and importers. In Figure 4 we plot the three-year survival rate for firms of different trade

statuses by their productivity quartile three years prior. We do not find evidence of survival bias in our data. The three-year survival rate of low productivity firms (plotted in light blue in Figure 4) that engage in international markets is higher than their non-trader counterparts.

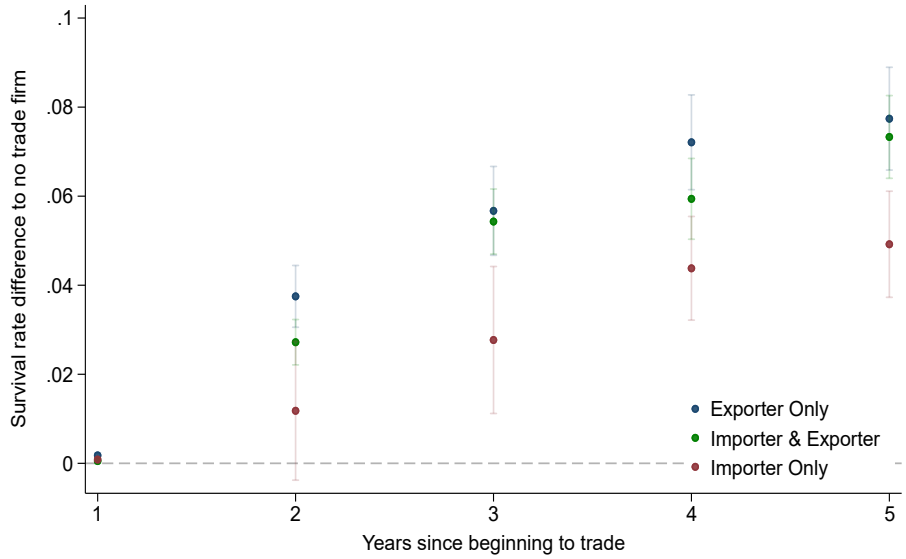
Figure 4: Three-year survival rates by trade status by ex-ante productivity quartile, Great Britain, 2005 to 2022



Note(s): The chart plots the share of firms each year that were still in the Longitudinal Business Database three years later for each trade status and by each productivity quartile. Estimates come from the linked ABS/HMRC TiG dataset. A firm is an exporter or an importer when it either declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC TiG dataset. Productivity quartiles are assigned in time t at the industry division level.

These differences are not driven by the characteristics of firms in different productivity quartiles. In Figure 5, we plot the coefficient of each trade status when regressed against a survival dummy that captures the presence or absence of a firm in the sample one to five years following. Other things being equal, firms that trade are roughly 7 percentage points more likely to be in the sample 5 years later compared to firms that don't participate in international markets.

Figure 5: Survival rate difference to firms that do not trade by trade status by number of years since beginning to trade, ABS/HMRC TiG, Great Britain, 2005 to 2022



Note(s): The chart plots the coefficient of each trade status regressed against presence in the Longitudinal Business Database one, two, three, four and five years later in a regression controlling for employment size, age, foreign ownership and region and industry division by year average differences in productivity. Error bars reflect 95% confidence intervals. Standard errors are clustered at the industry division (two-digit industry). Estimates come from the linked ABS/HMRC TiG dataset. A firm is an exporter or an importer when it either declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

4. The within-firm productivity premium

So far, we estimate the productivity premia reported as the coefficients ξ_{TS} in equation (1):

$$Y_{it} = a + \gamma_t + \xi_{TS} TradeStatus_{it} + \beta X_{it} + \alpha_i + \epsilon_{it} \qquad (1)$$

Where Y_{it} is the logarithm of labour productivity measured as GVA per worker and $TradeStatus_{it}$ is a set of dummies equal to one if the firm has the corresponding trade status ie. exporting, importing or both.

Given there are complementarities in overcoming the barriers to become a trader (Bas and Strauss-Kahn (2010)) we include all sets of trade statuses, ie. a dummy for exporting, importing and a dummy for being both an exporter and an importer, to avoid overstating the impact of exporting on productivity.

a_i is a group of firm observed or unobserved characteristics that vary between firms but are fixed over time and γ_t is a set of time varying shocks to productivity that are common to all firms. These can be set to be common to all firms of the same industry. X_{it} is a set of observable firm characteristics and ϵ_{it} is a set of idiosyncratic firm and time specific productivity shocks.

In the regressions estimated earlier, ξ , estimated at 0.44 in Table 2 (interpreted as 55.9%[5]) for firms that are both exporters and importers of goods or services, represents the productivity differences between firms of that trade status compared to firms that don't trade in the same (two-digit) industry, region, employment size, foreign ownership status and age that cannot be explained by year specific productivity shocks common to all firms of their industry.

ξ is biased if there are unobserved firm specific differences not captured by industry, region and size fixed effects, that affect both the probability to trade and productivity. Such differences could be a firm's culture or management practices or a firm's private information about its future productivity or investments.

To control for such unobserved firm specific differences that are stable over time we estimate the productivity premium from equation (1) using firm fixed effects, i.e. controlling for average firm differences in productivity. Firm fixed effects will absorb any time invariant characteristics such as industry, region or employment size band, but will also control for any other variation that is constant within firm. As a result, ξ estimated this way, captures the productivity "uplift" a given firm experiences when it switches from not trading to trading: the "within-firm productivity premium". We present the within-firm productivity premia estimated when including firm fixed effects in equation (1) in Table 4.

Switching from not participating in trade to becoming an importer is associated with a 6.2% greater GVA per worker in the ABS (7.5% in the ABS/HMRC TiG data between 2005 and 2022), becoming an exporter with a 4.6% premium (8.2%) and importing and exporting is associated with a 9.3% premium (16.3%).

Table 4: Within-firm productivity premia for different trade statuses in the ABS and ABS/ HMRC TiG data, Great Britain

VARIABLES	(1)	(2)
	Log of labour productivity	
	ABS (2011-2022)	ABS/HMRC-TiG (2005-2022)
Importer Only	0.0598***	0.0727***
	(0.0170)	(0.0180)
Exporter Only	0.0446**	0.0788***
	(0.0186)	(0.0260)
Importer & Exporter	0.0889***	0.151***
	(0.0182)	(0.0271)
Observations	216,868	369,911
R-squared	0.856	0.836
Region FE	Yes	Yes
Firm FE	Yes	Yes
Ind x Year FE	Yes	Yes

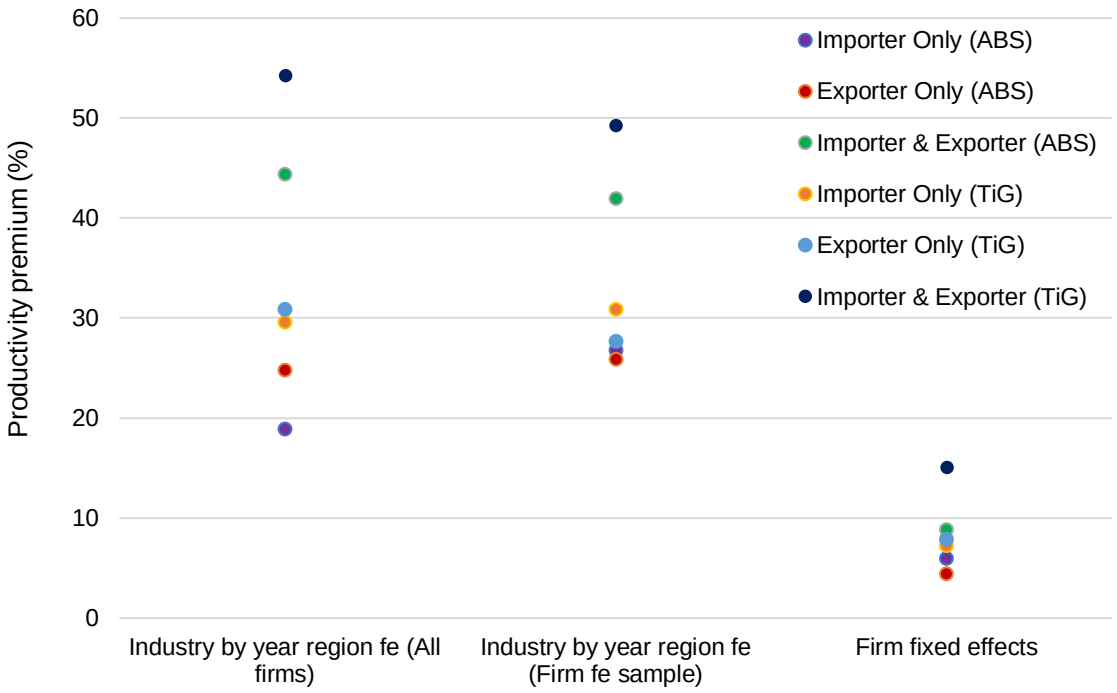
[5] Labour productivity in our models enters as the natural logarithm of GVA per worker. We interpret the impact of the independent variable on labour productivity as the exponent of the estimated coefficient minus one. In Table C2.1 the coefficient of participating in any trade on the natural logarithm of labour productivity is 0.348. The impact on labour productivity is therefore $(e^{0.444} - 1) * 100 = 0.444 * 100 = 55.9\%$

Note(s): This table presents the coefficient of each trade status regressed against GVA per worker in a regression controlling for employment size, age, foreign ownership and region as well as average industry by year differences in productivity. Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

In the first column of Figure 6 we plot the “between-firm” productivity premium for different trade statuses from Section 3 presented in Table 2 and compare it to the “within firm” premium from Table 4 plotted in the third column of Figure 6.

The ABS samples large firms every year but rotates the sampling of smaller firms to reduce respondent burden (ONS, 2024). Even in the absence of such design features of the survey, smaller firms are less likely to respond to surveys, resulting in systematic differences in the firms we have longitudinal information for, to estimate a within-firm productivity premium. In the second column of Figure 5, we re-estimate our less demanding fixed effects model of Section 3, Table 2, but only for firms that we have longitudinal information and can estimate firm fixed effects for (these are reported in Appendix D5). The difference between the within and between firm productivity premia is similar, meaning that the drop in the premium when estimated within-firm is not an artefact of selection of different types of firms in the sample we can estimate firm fixed effects for.

Figure 6: Within and between firm differences in productivity from engaging in trade, ABS and TiG, Great Britain



The closing of the productivity premium to 7% when estimating the differences within firm could suggest that productivity differences between traders and non-traders are mostly due to pre-existing differences in productivity. However, estimating the productivity impacts of trade contemporaneously could be missing productivity benefits that occur on the run-up or accumulate for years following engaging in international markets.

Even more, trade participation can be irregular. Some firms may export or import for the first time, continue for a few years or stop and then rejoin international markets only intermittently. If the productivity benefits of participating in international markets vary between the first export or import and any subsequent "re-entry" or if the productivity benefits from trade occur dynamically, then to identify the causal impact of trade we need to separate "reactivation" from first entry in international markets and estimate the productivity differences between traders and non-traders for several periods before and after the time of first trade.

In Sections 5 and 6, we embark in such an exercise, estimating the premium separately for the time of first trade and for each period before and after engaging in international markets. Unfortunately, as it is only with administrative data that we can follow a firm's trade behaviour over time, and it is only for firms born after the start of our administrative dataset that we can identify the year of first trade, the analysis that follows is done only for trade in goods and only for firms born after 2005. We discuss the implications of this data limitation further in our results in Section 6.

5. Empirical strategy: Differences in Differences

To get closer to the causal impact of engaging in international markets we adopt a differences-in-differences approach.

We estimate the equation:

$$Y_{it} = \alpha_i + \beta_1 Trade_i + \beta_2 Post_t + \boldsymbol{\xi}_{(\boldsymbol{s(i)})} Post_t \times Trade_i + \beta X_{it} + \epsilon_{it} \qquad (2)$$

Where Y_{it} is log GVA per worker. $Trade_i$ captures whether a firm is in the treated or control group (defined below). $Post_t$ is a dummy equal to zero before and one after the time of first export of the treated group. a_i is a group of observed and unobserved firm characteristics that vary between firms but are fixed over time. X_{it} is a set of observable firm characteristics and ϵ_{it} is a set of idiosyncratic firm year specific productivity shocks.

We estimate equation (2) for exports, where the greatest productivity benefits are concentrated. To separate the productivity benefits driven by trade from the impact of selection of more productive firms into becoming exporters, we estimate (2) with two different sets of control groups. First, with the control group being firms that never trade, and then, with both the control and treatment group being future exporters, but with the treatment group exporting within the estimated window, while the control group exporting at some later date but not within the window used for estimation.

Estimating equation (2) when both the treated and the control group are future exporters is a challenge. As Goodman-Bacon (2021) points out, when firms in both the control and treatment group are future exporters and therefore both experience treatment, just at different times, one cannot estimate (2) in this exact setup, because the period dummy is not defined for control observations.

In response, we estimate ξ cross-sectionally for each distance from treatment, i.e. each year before and after the exporters' time of first export, where:

$$Y_{it} = \alpha + \xi Treated_{it} + \epsilon_{it} \quad for \ \ t \, \epsilon \, [-5,7] \quad (3)$$

Where t is distance, i.e number of years since treatment.

When $t < 0$, before the time of the treated group's first export:

$Treated_{it}$ is equal to 1 for all firms that are t years pre-treatment and 0 for firms that are $k \neq t$ years pre-treatment

When $t \geq 0$, after the treated group's first export:

$Treated_{it}$ is equal to 1 for firms that are t years post-treatment and 0 for firms that are pre-treatment.[6]

To estimate equation (2) and (4) we need to be able to identify the timing of first export for a given firm as well as its trade behaviour every year before and after. As a result, we can only estimate equations (2) and (4) for firms born after 2005, and only for goods exports. We can only estimate (2) and (4) for goods exports because it is only with administrative data that survey sampling and survey response is not a cause for missing trade status information for a firm in any given year. We can only estimate (2) for firms born after the beginning of our dataset as it is only for these firms that we can credibly identify the first time they engaged in international markets. This raises the question of external validity and generalisability of these results for the wider business population, as well as for trade in services.

To address transparently the question of representativeness we re-estimate our baseline regressions from Section 3 for the post-2005 sample for trade in goods only and present these in Appendix D5. Even more, in Appendix Table A3.1, we provide some descriptive statistics on the characteristics of firms born after 2005 against the

[6] Work that exploits variation in treatment timing often uses a two-way fixed effects (TWFE) model:

$$Y_{it} = a_i + a_t + \xi Post_{it} + \epsilon_{it} \quad (3b)$$

Part of the average treatment effect in these models comes from comparing firms that have exported already to firms that become exporters at a later date. We compare our results to those of a TWFE model in Appendix C. For robustness we also estimate equation (2) repeatedly for different years excluding from the sample exporters-to-be that become exporters within the post-treatment window. We also repeat the same exercise, estimating equation (2) repeatedly for different year but include in the control exporters-to-be prior to the time of first export irrespective of the year these control observations come from in the data, controlling for year and cohort fixed effects. Results from these alternative ways to estimate ξ are presented in Appendix C.

characteristics of the average firm in the linked ABS/HMRC TiG sample as of 2022. We present these unweighted, weighted by ABS weights and finally compared to the post 2005 sample, weighted with our own weights created to adjust for the representatives of firms born after 2005 in each year's total business population in each 2-digit industry and employment size band. Table A3.1 shows that, as expected, when restricting to firms born after 2005, we lose about 57% or 24,000 firms from the sample. There are fewer exporters in the post 2005 data although this difference is more pronounced when we weight rather than in the underlying sample of firms. Firms born after 2005 seem to have similar labour productivity but more high productivity firms skewing the average in relation to the median.

With respect to the applicability to trade in services, our earlier results using both trade in services and goods, estimated on the ABS weighted business population, suggest the productivity premium may be slightly larger for services but that these differences may not be statistically significant. In this light, the results below could be relevant for the trade premium in services as well. Further analysis is needed, leveraging the power of administrative data to measure comprehensively trade in services, in the same way we have done for trade in goods, to strengthen and validate these ABS-based comparisons. Using information recorded by HMRC in corporate tax forms may allow identifying as precisely service traders in the business population and carrying out such analysis for services trade as well.

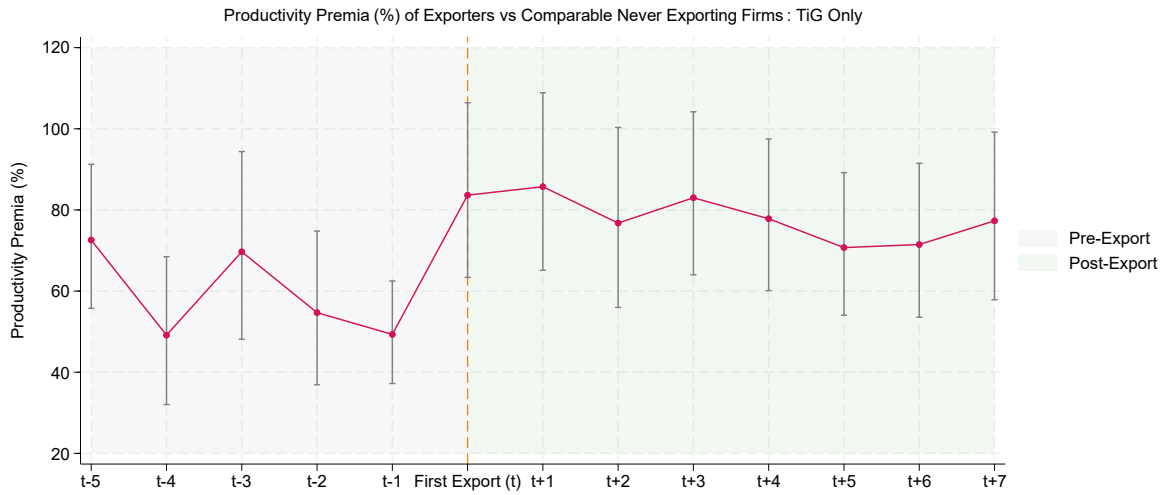
Finally, while our post treatment period is 7 years, we can only estimate productivity differences between the two groups for 5 years prior to the time of first export. As Figure B2.1 shows, 58% of firms that will ever export (of the firms born after 2005) will do so within their first three years of age. This means that, with most firms switching into exporting within the first 3 years of their lives, there is a limited number of firms that we observe more than five years before they export for the first time to be able to estimate longer pre-treatment productivity differences. This pattern is not only important for the variation available in our data to estimate the causal component of the productivity premium but for policy as well. It means that export support interventions may be more likely to be successful if targeted at younger firms, although targeting firms older than 3 years old may ensure greater additionality. We come back to this issue in our conclusion.

6. Results – The causal impact of engaging in international markets

Estimating equation (2) for firms born after 2005, with never-exporters as the control group, we find that productivity differences pre-date the decision to trade. Exporters-to-be are 59% more productive than never-exporters before they export for the first time comparing firms in the same industry, born in the same year, with the same foreign ownership and employment and after controlling for year specific shocks common to all firms. We drop firms that start exporting at birth and inactive firms in each year. The gap opens to 80% after the time of first export but remains stable over time. This is consistent with the literature that finds no differences in the growth rates between the two groups after entry in international markets. Gaps between never-exporters and exporters-to-be pre-date the time of first export providing

evidence that, as suggested by our within-firm premium estimates in Section 4, an important part of the productivity premium is due to selection.

Figure 7: Differences in productivity between never-exporters and exporters-to-be, ABS/HMRC TiG (post 2005 sample), Great Britain



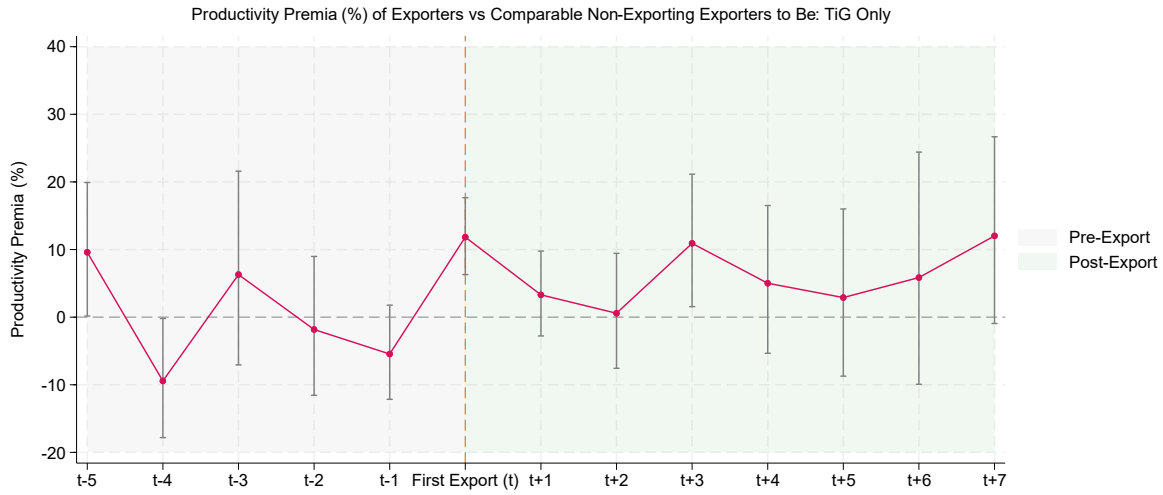
Note: This output shows the estimated productivity premium of a firm who will never trade compared to a firm who will trade by the exporting firm's distance to their first trade. The area shaded pre-export shows the productivity differences in each pre-treatment distance between the two groups to be prior to the treated group engaging in trade. This analysis only covers firms born after 2005 and only for trade in goods, as only for these firms can we accurately determine the year of first goods export and follow their export status longitudinally. Standard errors reported are clustered at 2 digit industry.

We next estimate equation (4) only for exporters-to-be, where the control group is exporters-to-be that will not export within the estimated window. The identifying assumption for this estimate to be interpreted as the causal impact of trade is that, after controlling for industry, employment, foreign ownership, year and cohort fixed effects, the timing of trade is random and there are therefore no unobserved systematic differences between exporters-to-be that could be driving the productivity wedge between the two groups. Put in other words; after controlling for a firm's characteristics, exporters-to-be in the control and treatment group are equally likely to have exported in a given year and it is for reasons exogenous to the productivity realisations of the firm that a given firm in the treatment group began exporting and its control counterpart didn't.

We find that prior to exporting there are no significant differences in the productivity of the two groups when controlling for firm characteristics. This suggests that while there are important unobservable differences between firms that never export and those that do, that even when controlling for observable characteristics we were not able to explain away, productivity differences before the time of first trade when restricting to firms that will all export at some disappear. Every cross-sectional estimate in the area shaded "post-export" shows the difference in productivity between exporters-to-be that haven't exported yet and firms that began exporting at time t and subsequently are n years post-export. Post export firms experience a 11.9% productivity premium compared to exporters-to-be in the year of entering international markets. The effect remains broadly stable over time, although we lose

power as we move further away from the time of first export as there are fewer firms in the sample that we observe exporting 7 years later. In Appendix C4 you can also find estimates for equation (2) estimated year by year, as well as estimated as a two-way fixed effects model. The results across the four ways to estimate ξ deliver comparable estimates.

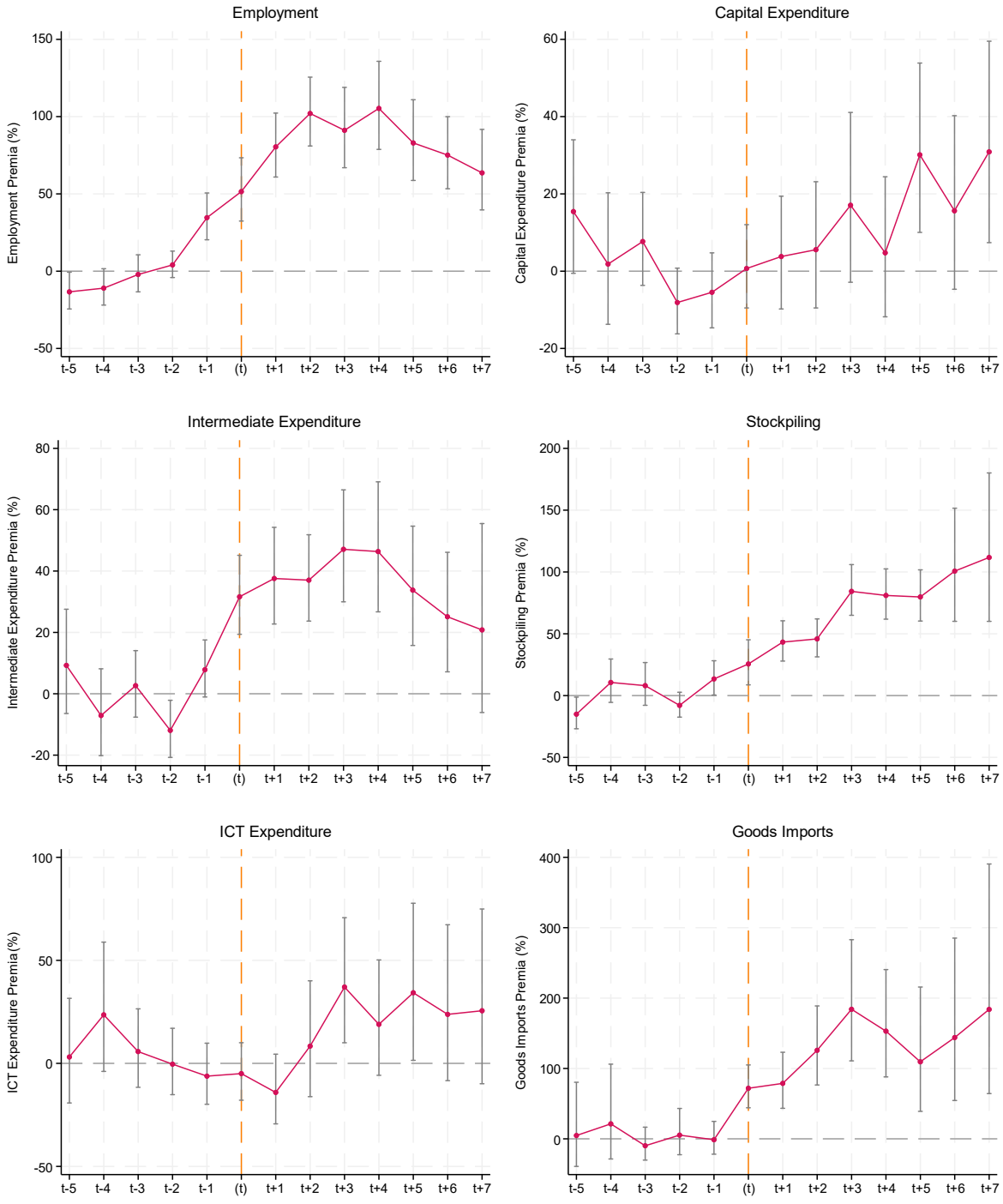
Figure 8: Productivity premium between exporters-to-be by distance to the time of first trade, ABS/HMRC TiG (post 2005 sample), Great Britain



Note(s): This output shows the estimated productivity premium of a firm who will at some point trade compared to a firm who will at some point trade but not in the exporting firm's post-trade period or in the exporting firm's exact distance to their first trade in the pre-treatment period. The area shaded pre-export shows the productivity differences in each pre-treatment period between the two exporters-to-be prior to one of them engaging in trade. This analysis only covers firms born after 2005 and only for trade in goods, as only for these firms can we accurately determine the year of first goods export and follow their export status longitudinally. Standard errors reported are clustered at 2-digit industry.

The estimated impact is causal for so long as entering international markets is exogenous to firms' productivity realisations. While we control for firm characteristics to make sure this is a sensible assumption within firms of the same industry, region and cohort, this may not be the case if firms have private information about future investments that may affect both their productivity and their returns from trade or have private information about productivity realisations themselves. In fact, in Melitz (2003) there is heterogeneity in firm efficiency even within firms of the same observable characteristics. To make sure to a certain reasonable extent the time of first trade is not related to prior changes in the treatments group's fundamentals in relation to those of the control group, we use detailed financial information from the ABS on the treatment group's capital expenditure, employment and intermediate consumption to test whether there are differences in these, every year on the run-up and following the time of first export.

Figure 9: Differences in employment, capital expenditure, intermediate consumption, ICT expenditure and inventory of the treatment and control group, by time from first goods export, ABS/HMRC TiG (post 2005 sample), Great Britain



Note(s): This output shows the estimated difference in employment, capital expenditure, intermediate consumption and stockpiling between a firm who will at some point trade compared to a firm who will at some point trade but not in the exporting firm's post-trade period or in the exporting firm's exact distance to their first trade in the pre-treatment period. The area shaded pre-export shows the productivity differences in each pre-treatment period between the two exporters-to-be prior to one of them engaging in trade. This analysis only covers firms born after 2005 and only for trade in goods, as only for these firms can we accurately determine the year of first goods export and follow their export status longitudinally. Standard errors reported are clustered at 2-digit industry.

Estimating specification (4) for each pre and post treatment window, we find that there is evidence of some anticipation effects in employment, although we do control for employment in our productivity comparisons, and some weak evidence of anticipation in intermediate consumption and stockpiling. We find no statistically significant differences in capital expenditure and ICT between the two groups, but investment does seem to pick up among exporters 3 to 5 years after the time of first export.

If these increases in employment, intermediate consumption and stockpiling are evidence of firms' private information about future productivity realisations and trade opportunities, our estimate of 11.9% may be an over-estimate of the causal impact of trade.

In future work, we want to strengthen the robustness of this exercise by using instruments to capture variation in trade status that is due to factors exogenous to the firm. Some avenues for this would be to explore exposure of firms to export support programs with specific eligibility criteria, or a firm's product and country specific trade mix interacted with exchange rate shocks or unexpected disruptions in the country of origin such as in Lafrogne-Joussier et al. (2022).

Taking the magnitude of the estimate at face value, it suggests that most of the productivity premium is driven by self-selection of higher productivity firms into exporting, but that trade does drive productivity increases post-export. But what is the economic intuition for this effect? In Figure 8 firms become 11.9% more productive on the first year of participating in international markets. This is quite quick to reflect learning-by-exporting and it is possible it's capturing demand effects. By exporting, firms access a greater number of customers for their products increasing their turnover at a greater rate than the increase to their intermediate inputs. Our findings however aren't incompatible with theories of technological upgrading through exposure to a greater variety of client relationships. The increases in capital and ICT seen some years post-export could suggest such "learning-by-exporting" dynamics.

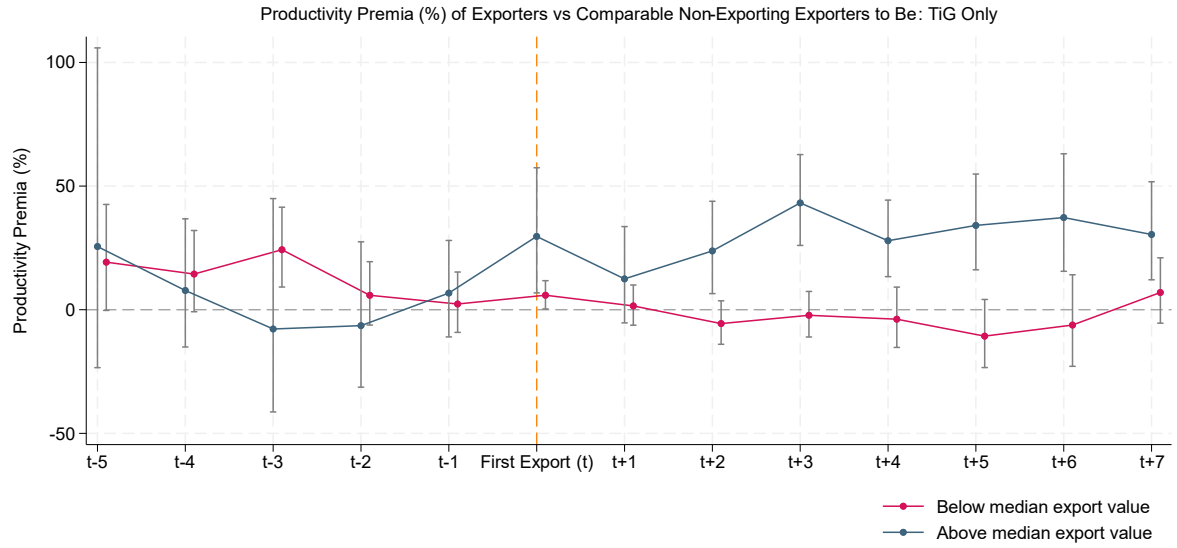
The impact of engaging in international markets by trade value and intensity

We have showed that firms that trade, other things being equal, are 35.4% more productive but that much of this difference pre-dates the time of first export. Comparing to an adequate control group, beginning to export drives a 11.9% productivity wedge between exporters and exporters-to-be in the first year of exporting.

Do these productivity benefits occur for all firms engaging in international markets for the first time or are they driven by large exporters? In other words, are these productivity benefits a true average treatment effect or is there heterogeneity in the premium driven by the intensive margin. Do these productivity benefits amplify as firms trade more? We investigate the impact of trade on productivity at the intensive margin by looking at the impact of trade value and trade intensity on productivity.

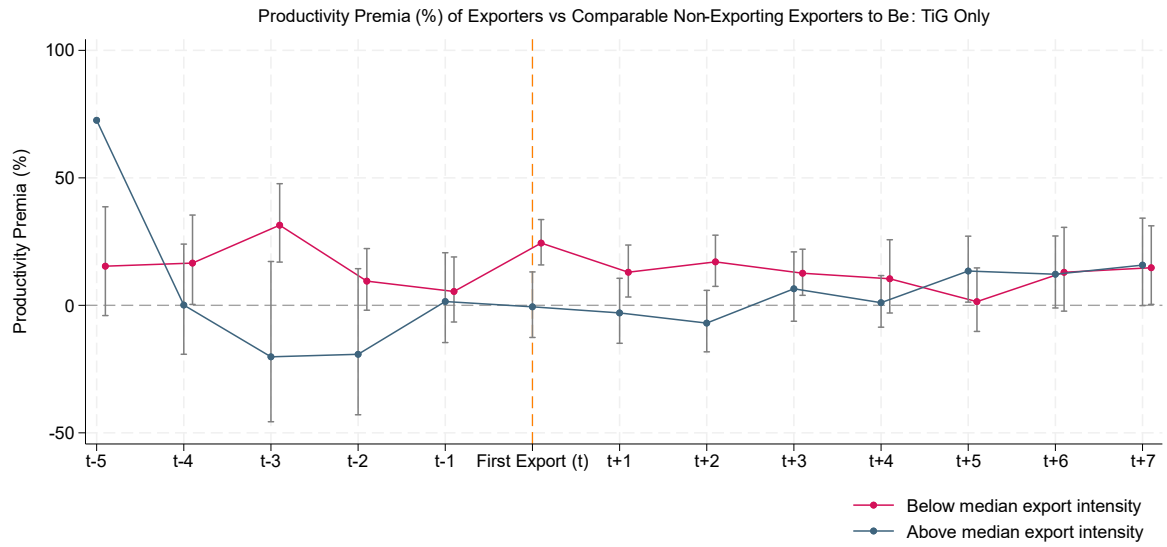
We start by re-estimating specification (4) separately for exporters-to-be with export value above the median export value in their respective two-digit industry and for exporters with export value below the median. In Figure 11, we do the same but for export intensity (export value as a share of turnover) at the time of first export.

Figure 10: Productivity premia for exporters above and below median export value at time of first export compared to exporters-to-be by distance from the time of first trade, ABS/HMRC TiG (post 2005 sample), Great Britain



Note(s): This output shows the estimated difference in labour productivity between a firm who will at some point trade compared to a firm who will at some point trade but not in the exporting firm's post-trade period or in the exporting firm's exact distance to their first trade in the pre-treatment period. The blue line shows point estimates for firms with above median export value compared to other firms in their two-digit industry. Firms are classified above or below the median if their modal status over the years exporting is above or below respectively. This analysis only covers firms born after 2005 and only for trade in goods, as only for these firms can we accurately determine the year of first goods export and follow their export status longitudinally. Standard errors reported are clustered at 2-digit industry.

Figure 11: Productivity premia for exporters above and below median export intensity at time of first export compared to exporters-to-be by distance from the time of first trade, ABS/HMRC TiG (post 2005 sample), Great Britain



Note(s): This output shows the estimated difference in labour productivity between a firm who will at some point trade compared to a firm who will at some point trade but not in the exporting firm's post-trade period or in the exporting firm's exact distance to their first trade in the pre-treatment period. The blue line shows point estimates for firms with above median export intensity compared to other firms in their two-digit industry. Firms are classified above or below the median if their modal status over the years exporting is above or below the median respectively. This analysis only covers firms born after 2005 and only for trade in goods, as only for these firms can we accurately determine the year of first goods export and follow their export status longitudinally. Standard errors reported are clustered at 2-digit industry.

We find significant heterogeneity in treatment by large and small export value traders. Figure 10 shows that the average treatment effect we find is driven by firms with above median export value for their industry at the time of first trade, whereas small value exporters see virtually no productivity benefits from exporting. On the other hand, the opposite is true for export intensity. The average British firm sources 37% of its turnover from exports by 2022 (Figure B1.11). The distribution is quite dispersed with firms in the 90th percentile sourcing all of their turnover from exporting. Figure 11 shows that firms with export intensity above the median within their two-digit industry not only experience none of the productivity benefits from trade, but the impact of trade on productivity for these firms may be negative for the first two years following entry in international markets. The role of intensity in productivity is interesting and merits more investigation. It is possible that firms that have little to no domestic sales and are fully reliant on international markets for their revenue may be over-exposed to uncertainty and unexpected shocks to global value chains caused by Brexit, the pandemic, the war in Ukraine, the war in the Middle East, or most recently (although not in our data) changes in US trade policy – a close UK trading partner. Roughly 30% of Manufacturing GVA, the largest goods trading sector, comes from firms whose export income is more than 50% from the US (Figure B3.4). Given the significant heterogeneity in average treatment effects, we investigate further the role of value and intensity for productivity.

Trade value

We estimate:

$$Y_{it} = \alpha_i + \gamma_t + \xi_{1,E,M} TradeStatus_{E,M,it} + \xi_{2,E,M} TradeValue_{E,Mit} + \beta X_{it} + \epsilon_{it} \quad (5)$$

Where $TradeStatus_{E,M,it}$ is equal to 1 when firm i is an exporter or respectively an importer at time t and $TradeValue_{E,Mit}$ captures the log real export (E) or respectively import (M) value of firm i at time t.

We find that every additional 10% increase in export value is associated with a 0.2% increase in labour productivity. When estimating the impact on the productivity premium within firm, becoming an exporter is insignificant and the impact on productivity is solely driven by the intensive margin.

Table 5: The productivity impact of goods export value, ABS/HMRC-TiG, Great Britain

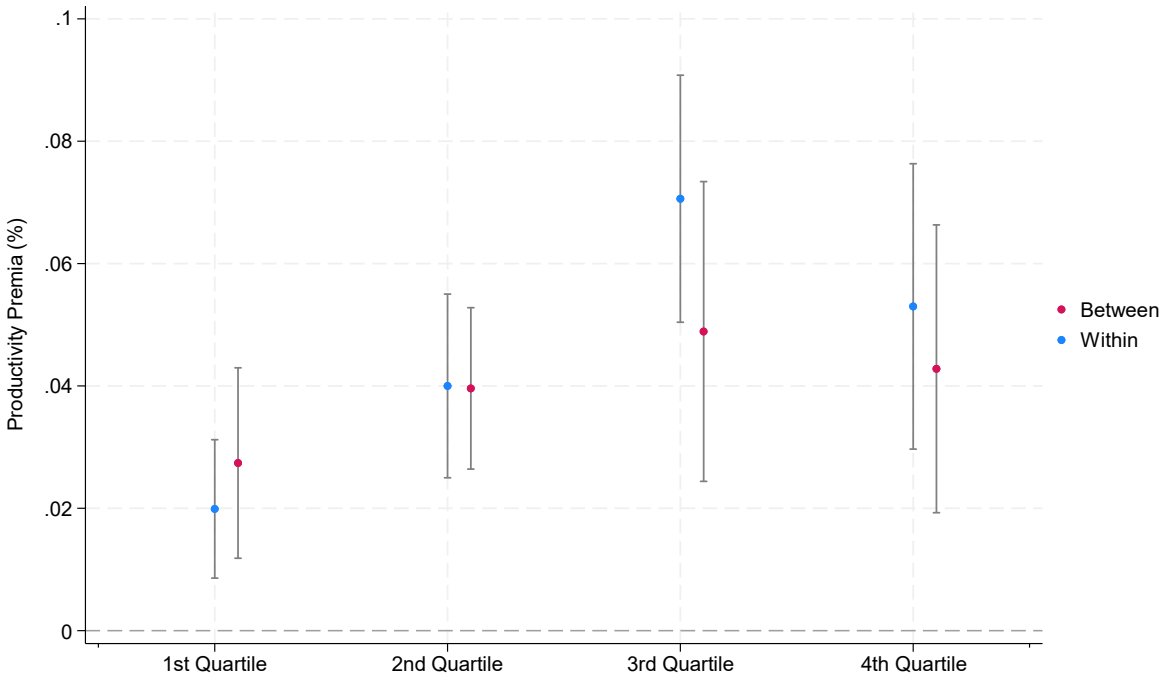
	(1)	(2)
VARIABLES	Log of labour productivity	
Goods Exporter	0.215***	-0.00222
	(0.0389)	(0.0228)
Goods Exporter # ln(Real Goods export value)	0.0257***	0.0229***
	(0.00762)	(0.00451)
Goods Importer	0.110**	-0.0273
	(0.0542)	(0.0213)
Goods Importer # ln(Real Goods import value)	0.0653***	0.0258***
	(0.0102)	(0.00615)
Observations	666,357	370,125
R-squared	0.086	0.811
Year FE	Yes	Yes
Industry FE	Yes	Yes
Region FE	Yes	Yes
Firm FE	No	Yes

Note(s): This output shows the coefficient of a regression of export status and log value on log labour productivity. In these regressions we control for log of employment and foreign ownership status. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Estimates in this table use the linked ABS/HMRC TiG dataset between 2005 and 2022.

To explore the heterogeneity in productivity gains for exporters of different sizes, we re-estimate specifications (1) and (2) from Table 1 but by each quartile of export value separately. The regression results are reported in Appendix C, Table C3.7. In Figure 12 below we plot the coefficient of goods export value from specification (1) in red and that of specification (2) in blue.

Consistent with our results earlier, larger exporters, at the third and fourth quartile of export value within their industry division seem to be driving the average productivity premium estimated. For the largest exporters, at the fourth quartile within their industry, a 10% increase in export value is associated with a 1% increase in labour productivity. In Appendix C3, we present these results for services trade as well.

Figure 13: The elasticity of productivity to value of goods exports by quartiles of export value, ABS/HMRC-TiG, Great Britain



Note(s): Quartiles drawn based on goods export value at the 2-digit industry and year level. These results use the linked ABS/HMRC TiG dataset between 2005 and 2022. Estimates marked as “Within” indicate that the regression used to estimate the elasticity uses firm fixed effects. Full regression table and controls are given in appendix table C3.7.

Trade intensity

We next turn to the impact of trade intensity. We estimate:

$$Y_{it} = \alpha_i + \gamma_t + \xi_{1,E,M} TradeStatus_{E,M,it} + \xi_{2,E,M} TradeInt_{E,Mit} + \beta X_{it} + \epsilon_{it} \qquad (6)$$

Where Y_{it} is the value of exports (E) as a share of turnover (export intensity) or the value of imports (M) as a share of intermediate consumption (import intensity).

Consistent with our earlier results using a differences-in-differences approach for firms above and below median export intensity, when estimating the impact of export intensity continuously, we find that controlling for firm fixed effects, a 0.1 unit (equivalent to 10 percentage points) increase in export intensity decreases productivity by 2%. In Appendix C, we report results when estimating equation (6) including a quadratic term as well.

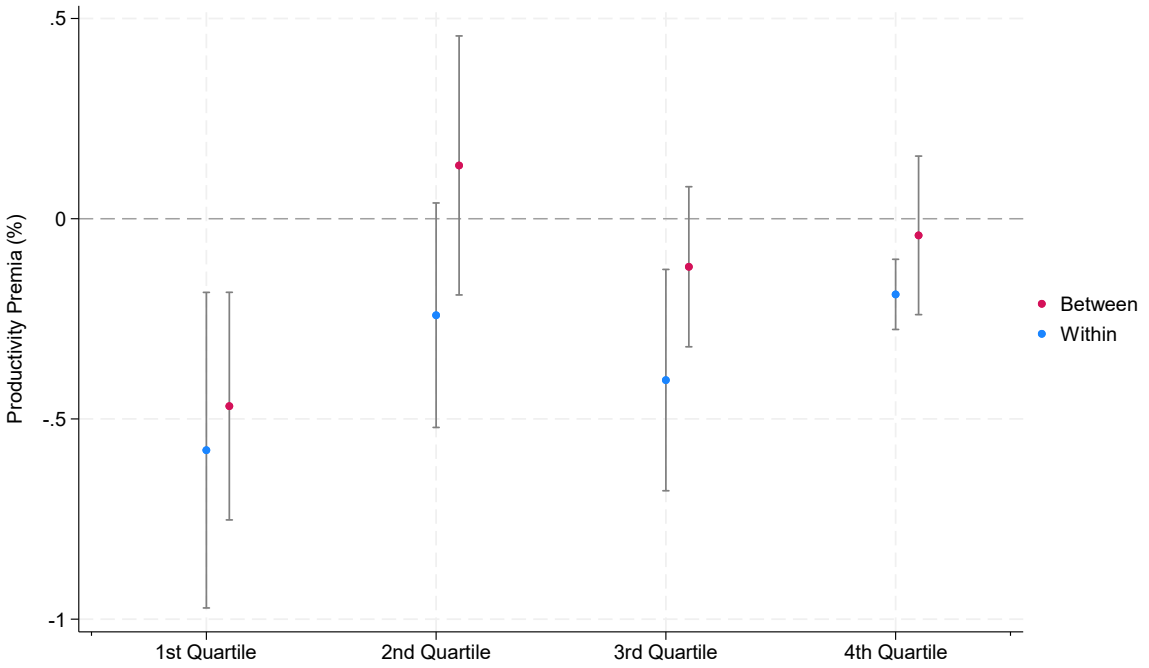
Table 6: The productivity impact of goods export intensity, ABS/HMRC-TiG, Great Britain

	(1)	(2)
VARIABLES	Log of labour productivity	
Goods Exporter	0.375***	0.0617***
	(0.0286)	(0.0181)
Goods Exporter # Export intensity	-0.156**	-0.226***
	(0.0668)	(0.0387)
Goods Importer	0.302***	0.0101
	(0.0251)	(0.0154)
Goods Importer # Import intensity	0.190***	0.508***
	(0.0395)	(0.0479)
Observations	624,546	358,756
R-squared	0.117	0.827
Year FE	Yes	Yes
Industry FE	Yes	Yes
Region FE	Yes	Yes
Firm FE	No	Yes

Note(s)**:** This output shows the coefficient of a regression of export status and export intensity (value of exports as a share of turnover) as well as import status and import intensity (imports as a share of intermediate consumption) on log labour productivity. In these regressions we control for log of employment and foreign ownership status. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Estimates in this table use the linked ABS/HMRC TiG dataset between 2005 and 2022.

Following the same framework as for value, we explore the heterogeneity in productivity gains for different degrees of “exposure” to international markets. We re-estimate specifications (1) and (2) for each quartile of export intensity separately. The regression results are reported in Appendix C, Table C3.6. In Figure 14 below, we plot the impact of a 1 percentage point increase in export intensity on productivity. We plot the estimated impact controlling for time-invariant firm-specific differences in productivity in blue (reported in specification (2) above) and the impact excluding firm-specific fixed effects in red (reported in specification (1) above). Unlike the quartile estimates for value, more intensive importers seem to be consistently underperformed by their less intensive counterparts across all quartiles.

Figure 14: The impact of goods export intensity on productivity by quartiles of export intensity, ABS/HMRC-TiG, Great Britain



Note(s): Quartiles drawn based on goods export intensity at the 2-digit industry and year level. These results use the linked ABS/HMRC TiG dataset between 2005 and 2022. Estimates marked as “Within” indicate that the regression used to estimate the elasticity uses firm fixed effects. Full regression table and controls are given in appendix table C3.6.

Conclusion

In this work we utilised an innovative dataset, bringing together administrative data on trade in goods and survey data on firm productivity and trade in services, to shed light on the link between participating in international markets and productivity.

We find that international trade matters for productivity, although selection is an important driver of the observed premia. British firms that participate in international markets by exporting or importing goods or services are 35.4% more productive than their domestically operating counterparts. Much like Brienlich and Criscuolo (2011) among others (Andersson et al 2008 for Sweden, Muuls and Pisu 2009 for Belgium, Vogel and Wagner, 2011) we also find that firms that engage in both exports and imports, so called “two-way traders”, are more productive than firms that only export or import.

But the direction of causality is complex. Using a differences-in-differences design we find that, consistent with the literature, selection explains most of the productivity premium as future goods exporters are already 59% more productive than their non-exporting counterparts, even before the time of first export.

However, comparing goods exporters-to-be among themselves, our results show that trade also drives productivity. Exporting goods drives a 11.9% productivity wedge between exporters-to-be that export compared to future goods exporters that haven’t entered international markets yet in the first year of exporting. This productivity wedge is not present before the time of first trade and cannot explained by a divergence in the fundamentals between the two groups. This wedge is driven by larger exporters.

What is the economic intuition for this trade-driven productivity gap? The estimated productivity differences between goods exporters-to-be are present already within the first year of engaging in international markets. We conjecture that this impact comes probably too quickly to be attributable to technological updating from new buyer relationships, a common mechanism that the literature attributes causal impacts of trade on productivity to. The estimated effect is more likely to reflect an expansion in the demand for a firm’s product. We do find an uptick in investment and ICT 3 to 5 years after the time of first trade that is likely to reflect learning-by-exporting trade dynamics.

These dynamics and the mechanisms that drive the trade-productivity relationships uncovered in this paper have important implications for the targeting and intended objectives of business and export support programs intended to not only raise the productivity of firms falling behind the British frontier but do so by building on international competitiveness. If productivity differences are predominantly driven by more-productive firms engaging in international markets, then policy aimed at improving firm level productivity may be the most effective way to support growth, including export-led growth, such as management academies or skills policy to upgrade the human capital available in local labour markets. On the other hand, barriers to trade do exacerbate the importance of selection. As per Melitz (2003), underlying heterogeneity in firm efficiency drives export participation because there

are fixed costs in entering international markets that mean only productive firms will find exporting profitable. A removal of tariff and non-tariff barriers to trade will lower entry costs allowing more British firms to benefit from the gains from trade.

In our analysis we find that the relationship between trade and the lifecycle of the firm is intricate. At least as far as we can tell from goods trade data, where we have robust longitudinal information, firms are more likely to become traders within the first 3 years of their life, and as they trade become more specialised across products in their exports and more diversified in their imports. On the other end, firms export to and import from more countries as they become more mature traders but the spatial concentration of their export and import value decreases. These stylised facts mean that, first of all, export support interventions may be more likely to be successful if targeted at younger firms, although targeting firms older than 3 years may ensure greater additionality by aiming to change the trade behaviour of firms that seem to otherwise have had a low probability of doing so.

On the other hand, the complexity we see in the product and country composition of trade over time suggests that our analysis is just the beginning. Further investigation is needed that takes into account how product and country dynamics affect productivity benefits from trade. Do firms sell the same products domestically as they do internationally? Do they expand their product mix when selling abroad? Is there a pattern between the spatial distribution of first export and that of more mature exporters? As per Dhingra and Morrow (2019) and Boehm et al (2022) these are not just follow-up questions of interest but contain rich stories of how productivity improvements manifest as a result of the multidimensional decisions through which businesses build their comparative advantage.

For instance, Arnold and Hussinger (2005) point out that while technological upgrading is a plausible driver of trade-induced productivity improvements in theory, it may be less plausible empirically in already technologically advanced sectors such as German manufacturing. Further analysis exploiting the partner country and product richness of the data could provide more meaningful stories of trade and productivity in British firms. As Fetzer et al. (2023) show, such explicit attention to the multitude of narratives that co-exist in the data is at the heart of better economic policy.

Future extensions

In this work we have focused on the role of trade in driving firm level productivity. While this is an important starting point, key to understanding the direct impacts of engaging in international markets, it may miss important indirect effects such as externalities to other firms and general equilibrium effects that could be as important for policy as the direct impacts. As an example, if firms that trade attract higher skilled workers to the areas they locate, firms in the same travel to work areas may see an uplift in their productivity through access to better labour markets. At the other end, firms competing with businesses that engage in international markets may struggle to survive, not having access to the same variety of intermediate inputs or

the same exposure to technological upgrading. If that's the case, the increase in productivity of exporters may be counter-balanced by higher exit of domestically operating firms. In fact, Eaton et al. (2011) find that lower trade barriers, while increasing total output of French firms, result in substantially more inequality in the distribution of firm size. Future extensions to this work should investigate further the role of externalities to get closer to an aggregate productivity impact estimate.

Finally, in this work, the scope of what we could investigate was often significantly constrained by the capabilities of the data currently available. An expansion of the data infrastructure available for the UK, harnessing further administrative information on businesses could significantly expand the possibilities for research. The use of corporation tax as opposed to the ABS would have allowed us to estimate Total Factor Productivity (TFP) for the entire population in the IDBR, rather than limit ourselves to labour productivity estimates or limit the analysis to only the sub-sample of predominantly large firms that we can estimate TFP for using the ABS. Even more, the use of corporation tax data in the future could allow us to measure trade in services longitudinally and comprehensively for the population of businesses. In this paper, we couldn't attempt estimates of the causal impact of services trade because measuring trade in services solely from survey data means we cannot credibly observe the time of first export and service trade behaviour over the lifecycle of the firm.

Probably the most important absence and most vital and urgent area for microdata development for the UK is the development of Linked Employer Employee Data (LEED). At the very minimum this would link income tax records to business data; more ambitiously it would link income tax records and surveys like the Annual Survey of Hours and Earnings or the Longitudinal Education Outcomes survey to business data; and at its most ambitious would augment these linked datasets with a revival of a Worker Employment Relations Survey, to capture aspects of the complex relationship between firm and worker that only surveying both sides of the relationship can uncover.

Why is this the most urgent and important data gap? Growth, the foundational quest of any policy economist in the UK in the last twenty years is, after all, only a means to an end. We care about productivity growth because we believe it to be ultimately the only means to raise material living standards in the long run. For all its promise, we are yet to fully understand how the potential of export-led growth affects workers. The question ultimately is not what the impact of trade is on the average British firm but what is the promise of trade for the average household's standard of living? And for that, a link between worker and firm needs to be welded at the core of the UK's microdata infrastructure.

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Appendix

A: Data

A1: Linking HMRC's Trade in Goods dataset with the Inter-Departmental Business Register

A.1.1 Inter-Departmental Business Register (IDBR)

The IDBR is a comprehensive register of UK businesses, maintained by the Office for National Statistics (ONS) for the purposes of producing sampling frames for UK business surveys. It includes all businesses registered with HMRC either for Value Added Tax (VAT) or for the operation of the UK's payroll tax system, Pay as You Earn (PAYE). Further information is derived from Companies House and ONS business surveys. Consequently, it excludes those who do not have employees and those whose turnover is below the VAT registration threshold (which was £85,000 until the 1st of April 2024, when it was increased to £90,000).

Within the IDBR, the ONS links together identifiers (PAYE, VAT, Companies House, etc.) for the same business around a core "enterprise". An "enterprise" is a unit which enjoys a high degree of autonomy. For each "enterprise" there exists a set of "local units" which map the geographical locations of the business' premises. The ONS then proceeds to create "reporting units", which are units representing a group of local units and designed to gather information at the lowest level of granularity for which the company can provide consistent information.

Most UK businesses have a simple administrative structure, with only one VAT and PAYE number, and one reporting unit. However, they account for a considerably smaller proportion of activity than businesses with a more complex structure. Figure A.1 and A.2 show and example structure of an administratively simple business and a complex structured business.

Figure A.1 Simple structured business

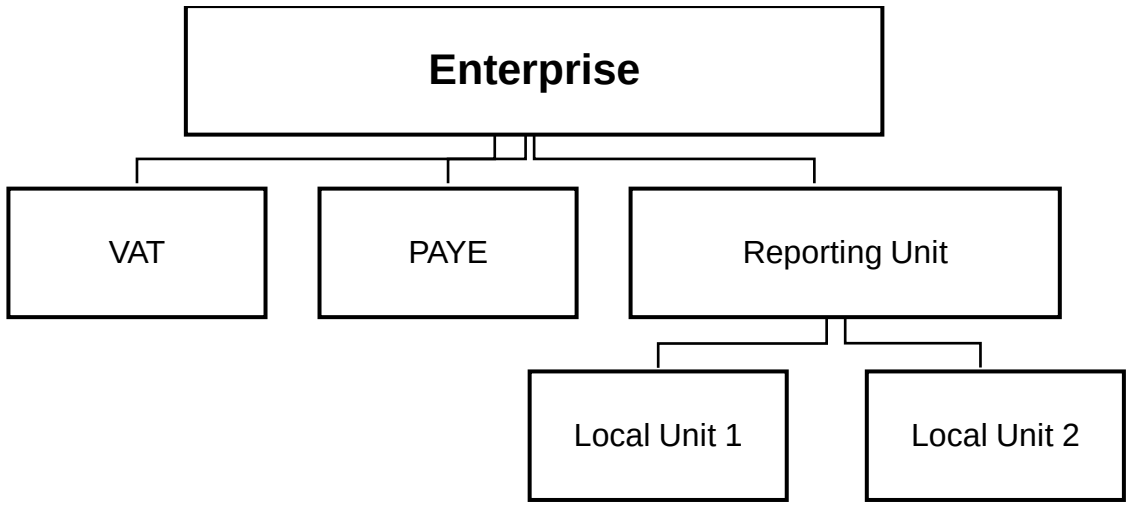
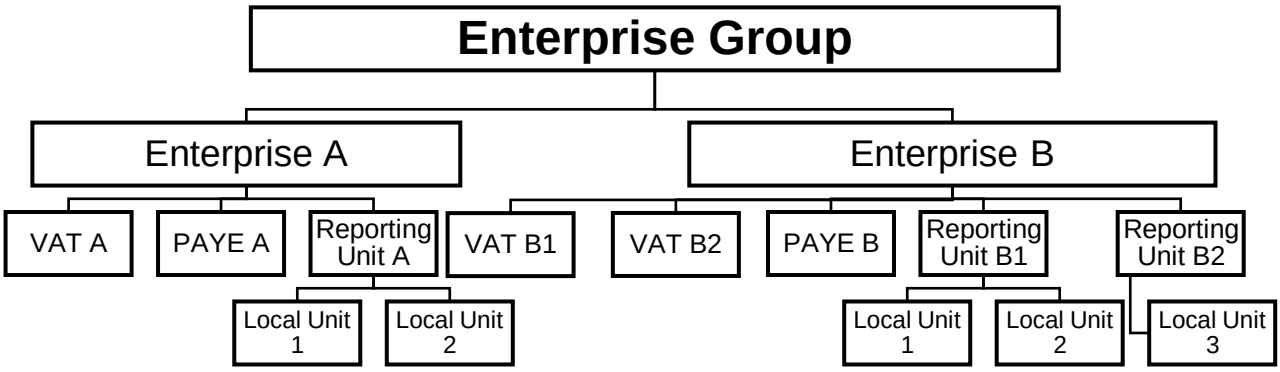


Figure A.2 Complex structured business



Part of the purpose of the IDBR hierarchy is created to accommodate the existence of VAT groups. Note that IDBR enterprises do not have to be exclusive to one VAT group. It is possible for one IDBR enterprise to be a composite of units that are members of different VAT groups. However, VAT groups should not cross enterprise groups. The common ownership and control conditions that qualify companies to form a VAT group also imply that the business register should treat the companies as part of the same enterprise group.

In the 2020s, it is expected that the IDBR will be replaced by the Statistical Business Register (SBR), which will incorporate additional data from HMRC and data on companies that are below the VAT and PAYE thresholds. While the SBR will be an expanded database, it will still provide the data currently available in the IDBR.

A.1.2 HMRC Trade in Goods (TiG) dataset

HMRC collects information on the trade in goods conducted by companies in the UK. These data are used by the ONS to produce estimates of trade in National Accounts. HMRC's data covers two distinct types of transactions:

A. Trade between businesses based in the UK and EU countries.

Up until 2021, information on the total value of trade in goods transactions of UK businesses with the EU was collected via the Intrastat survey. Businesses were included in the survey if the annual value of trade they reported in their VAT returns crossed an administrative threshold. These administrative thresholds could change on a calendar year basis. Businesses had to complete this survey on a monthly basis until the end of the calendar year. The use of the Intrastat survey for recording trade with the EU meant that HMRC data cannot capture trade from small traders who do not exceed the threshold.

Following the UK's withdrawal from the EU, since the 1st of January 2021, businesses based in Great Britain that export goods to EU nations must complete full customs declarations. In the case of imports, businesses based in Great Britain which import goods from EU nations must submit full customs declarations from the 1st of January 2022. Businesses based in Northern Ireland can continue to export and imports goods from the EU without having to complete full customs declarations. Hence, since the 1st of January 2022, only trade between Northern Ireland and the EU remains on Intrastat.

Table A.1 shows HMRC's thresholds for inclusion on the Intrastat survey from 2007 to 2022. Since the threshold for submissions has changed substantially over time, users of this data should be aware that this will affect some uses of firm-level trade in goods data. For instance, an observed drop in a particular category of the number of businesses importing from the EU may not reflect a genuine change in the trade pattern, but rather an artificial change: the threshold may have risen, resulting in data not being collected for companies that no longer exceed the threshold.

Table A.1 Threshold for inclusion of VAT unit in Intrastat survey

Year	Imports from EU	Exports to EU
2007	£260,000	£260,000
2008	£260,000	£260,000
2009	£270,000	£270,000
2010	£600,000	£250,000
2011	£600,000	£250,000
2012	£600,000	£250,000
2013	£600,000	£250,000
2014	£1,200,000	£250,000
2015	£1,500,000	£250,000
2016	£1,500,000	£250,000
2017	£1,500,000	£250,000
2018	£1,500,000	£250,000
2019	£1,500,000	£250,000
2020	£1,500,000	£250,000
2021	£1,500,000	£250,000
2022	£500,000	£250,000

B. Trade between businesses based in the UK and non-EU countries.

Businesses conducting trade with non-EU countries must complete customs declarations on their exports and imports (in particular, those whose trade value exceeds £873 and 1,000kg in weight). This dataset is administrative and covers a large proportion of UK trade with non-EU nations.

Companies (“company” here meaning a legal entity with a distinct Company Registration Number) may register for VAT as a group. Almost all companies do not do this. However, large and complex enterprise groups can be made up of many company registrations, and as such they may choose to make a single consolidated submission, at the VAT group level, on their trade in goods data to HMRC. Further information on VAT groups is available from HMRC: Group and divisional VAT registration.

A VAT reference comprises the 9-digit reference for the VAT group, followed by a 3-digit supplementary number, to make up the 12-digit full length VAT reference. For those VAT registrations that are not part of a group (i.e., almost all registrations), the 3-digit supplementary number is 000. However, for VAT groups, different supplementary numbers will identify the individual companies inside the group. One group company is the “representative member” that makes submissions to HMRC.

Companies supply trade in goods data to HMRC at the VAT group level. For many research purposes, this level of detail is sufficient. Other purposes include cases where additional geography or industry detail underneath the VAT group is important, or where the trade data is intended to be matched to business survey data.

A.1.3 Linking and apportioning the Trade in Goods dataset to the IDBR

After preparing both the HMRC trade in goods dataset and the IDBR, the datasets are linked and our apportioning methods are applied i.e. estimating proportions of trade for reporting units inside large enterprise groups, since the original trade data is only supplied to HMRC at the more aggregated VAT group level.

We undertake a three-stage apportionment process. The first stage involves apportioning each trade transaction to the reporting units inside a given VAT group. We apportion using the quarterly IDBR employment that corresponds to the month of the trade. When apportioning by IDBR employment, if one reporting unit has 0.5% or less of total VAT group employment, then it is considered to be marginal to the VAT group and is not given trade; trade is then apportioned among the remaining reporting units by their share of employment. If all reporting units inside a VAT group have zero IDBR employment, then each reporting unit is given a token single worker and trade is divided equally within the VAT group. Following this approach, we obtain the employment-weighted trade value.

Please note that we apportion directly from the VAT group. This represents a methodological difference compared to Wales et al. (2018), where trade was aggregated all the way up to the enterprise group level, and then apportioned down to all reporting units inside an enterprise group on an equal basis. The reason for this is that there exist enterprise groups where trade data belongs to VAT groups with zero or little employment, while other parts of the enterprise group had larger employment. We have decided to opt for a more conservative approach. Researchers using the linked IDBR-Trade in Goods dataset in the SRS can address

the zero employment VAT group problem in their own way, if they believe it is a significant problem to their research – but ultimately it is small.

The second stage of the apportionment process involves calculating industry-commodity weights: these are weights calculated by dividing total trade for each industry and commodity combination by total industry employment, where total industry employment is derived from the monthly WER dataset. All firms are used, both administratively simple firms, and the employment-weighted trade values for administratively complex firms (firms with multiple VAT groups and reporting units). Weights are calculated for each month using a rolling year-long window approach: we sum the total industry-commodity trade for the current month, five months ahead and six months behind, and divide by total industry employment for the current month, five months ahead and six months behind. The weights are calculated at the 2-digit commodity level, 2-digit SIC code level (or 3-digit for some cases where more granularity is required), and for EU and non-EU trade separately. Note that as the employment comes from a quarterly-frequency data source, the quarters are used in proportion to the months in the window.

Note that again the exists a method change with respect to Wales et al. (2018), where only administratively simple firms were used to calibrate the weights employed for administratively complex firms. Further investigations found that weights calculated using all firms, with the simpler solely-employment-weighted trade value method for administratively complex firms, yielded consistent results. However, ultimately the differences from using different weighting methods are small. This is because most of the variation across reporting units comes from employment size, and enterprise groups and VAT groups most often have a main industry that dominates.

The third stage of the apportionment process involves apportioning each VAT group's trade value across its reporting units, but this time we apportion using the quarterly IDBR employment, multiplied by the relevant industry-commodity weight. Again, VAT groups with zero employment in their reporting units are given a token worker to be multiplied by the relevant weight. This creates the industry-commodity-employment weighted trade values.

A.1.4 Changes to Intrastat

In an attempt information on trade with the EU more comparable across our panel following recent changes to the collection method, we make an adjustment within the linked IDBR/Trade in Goods dataset.

For exports, where a firm first declares trade with the EU in or after 2021 with an export value of less that £500,000, we set their EU export value to zero. For imports, where a firm first reports imports from the EU in or after 2022 with an import value less that £1,500,000, we set their EU import value to zero. The impact on the number of goods exporters and importers is shown in figure A1.1 and A1.2

Figure A1.1: Number of goods exporters in linked IDBR-HMRC TiG data, with and without Instrastat adjustment, Great Britain, 2005 to 2022

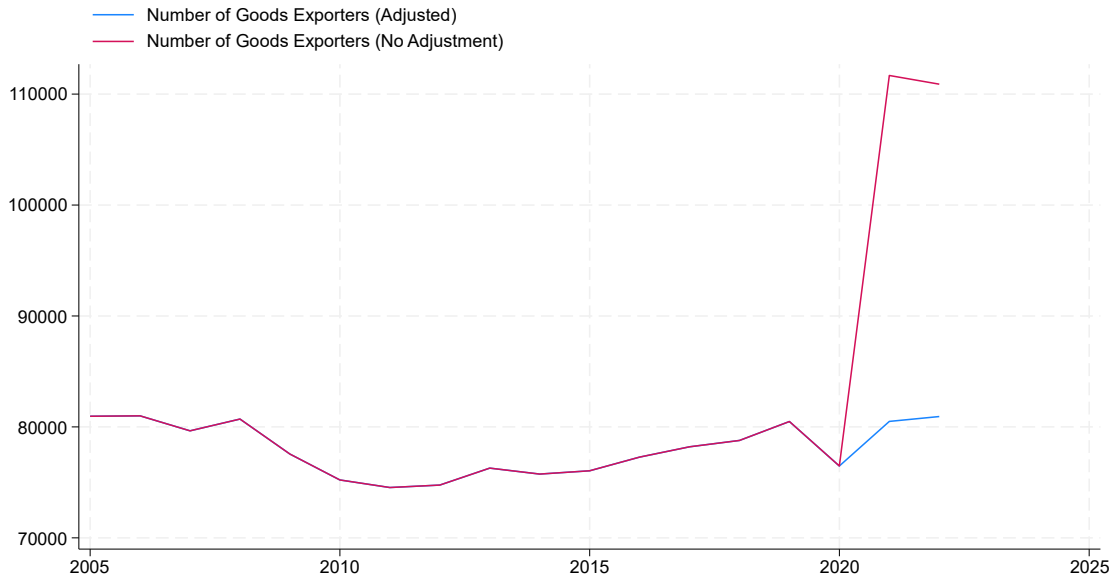
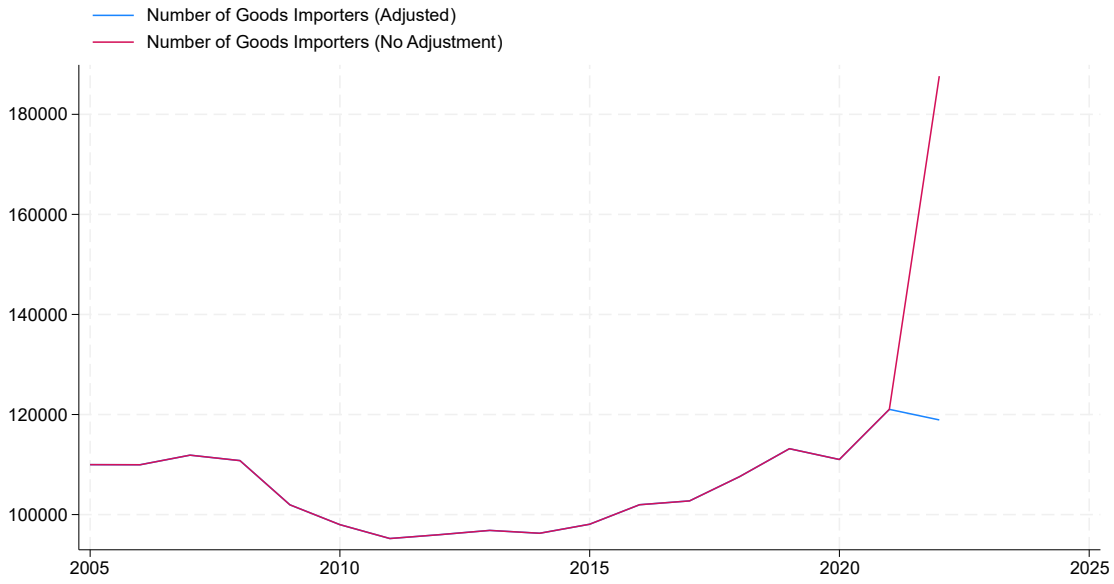


Figure A1.2: Number of goods importers in linked IDBR-HMRC TiG data, with and without Instrastat adjustment, Great Britain, 2005 to 2022



A2: Comparability between linked IDBR/TiG dataset and the ABS

A firm's goods export or import status can be derived both from HMRC TiG data as well as the Annual Business Survey (ABS). The linked IDBR/HMRC TiG dataset relies on administrative data related to customs declarations whereas the ABS relies on firms responding to a binary marker about their goods export and import status.

For the linked sample, we are able to compare the accuracy of the survey reporting for simple firm structures and the performance of the apportionment process for multi-VAT structures outlined in appendix A.1.3.

In 2022, 10% of firms classified as goods exporters in the HMRC TiG dataset are both from a complex enterprise and report no trade goods exporting in the ABS signalling potentially incorrect apportionment. 18% of those classified as goods traders in the TiG data do not belong in a complex enterprise (reporting unit is one to one with VAT unit) and yet have reported no trade in the ABS (contradiction across administrative and survey responses). 63% of exporters and 88% of non-exporters agree across the two datasets.

Figure A2.1 Agreement between ABS and TiG goods export status, Great Britain, 2022

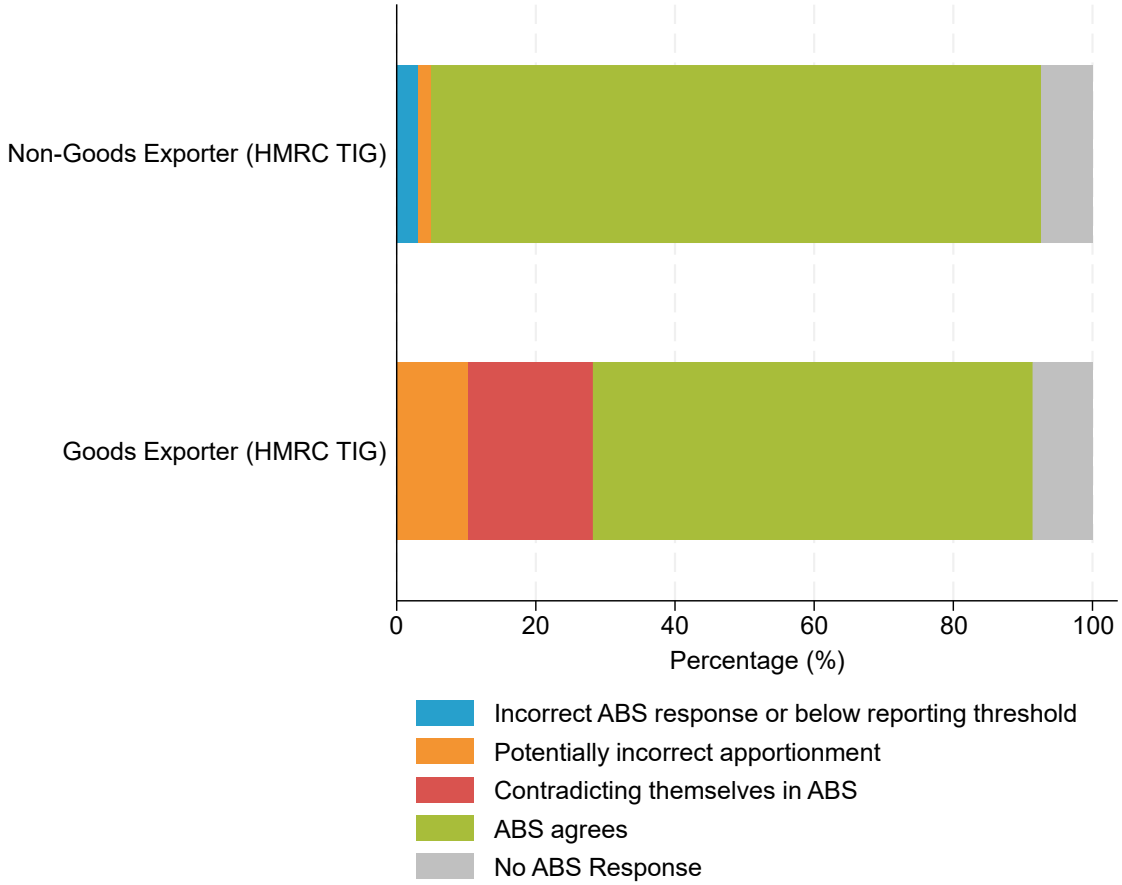


Figure A2.2 Share of goods exporters and non-goods exporters where ABS response agrees with HMRC TiG return, Great Britain, 2011 to 2022

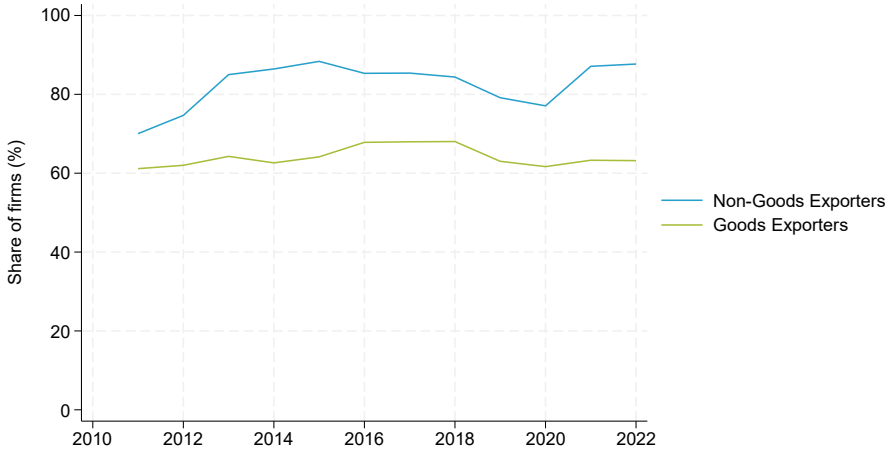


Figure A2.3 Share of goods exporters and non-goods exporters in HMRC TiG data that did not respond to the ABS questions, Great Britain, 2011 to 2022

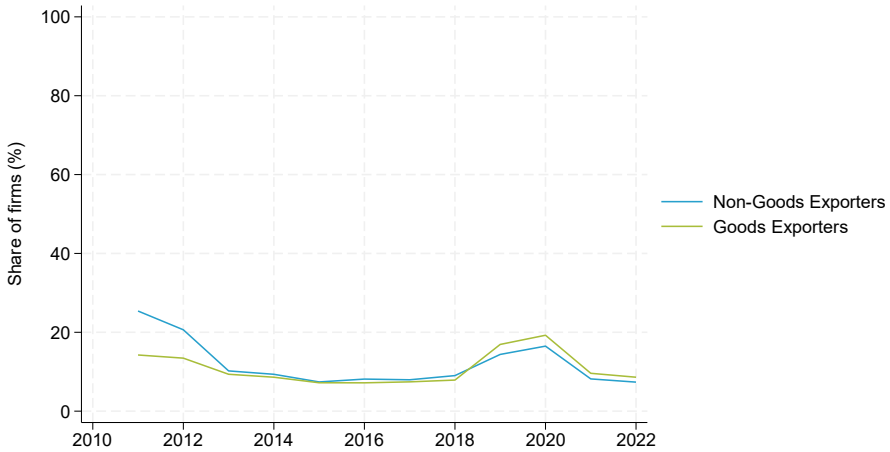
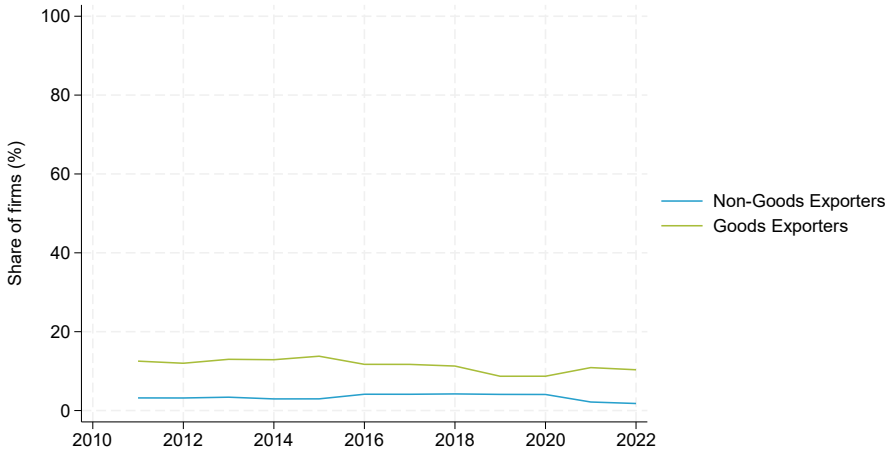


Figure A2.4 Share of goods exporters and non-goods exporters in HMRC TiG data where an incorrect apportionment has potentially taken place, Great Britain, 2011 to 2022



A3: Linked sample comparability

A3.1 Whole sample compared to post 2005 sample

Table A3.1: Comparison of entire ABS-TiG linked sample and the subsample of firms born after 2005, weighted and unweighted, Great Britain, 2022

	Whole ABS sample - Weighted	*Post 2005 ABS sample - Weighted*	*Whole ABS sample - Unweighted*	*Post 2005 ABS sample - Unweighted*
Average Employment	*7.7*	*8.1*	*173.1*	*130.4*
Average Labour Productivity (£,000)	*51.3*	*204.1*	*99.6*	*148.8*
Median Labour Productivity (£,000)	*29.3*	*31.0*	*50.6*	*42.9*
Number of Firms	*2,294,041*	*2,278,321*	*42,209*	*18,598*
Share of Exporters	*8.0%*	*1.7%*	*32.6%*	*20.5%*
Average Export Value (£,000)	*1,769*	*2,953*	*9,531*	*8,683*
Median Export Value (£,000)	*28*	*86*	*697*	*446*

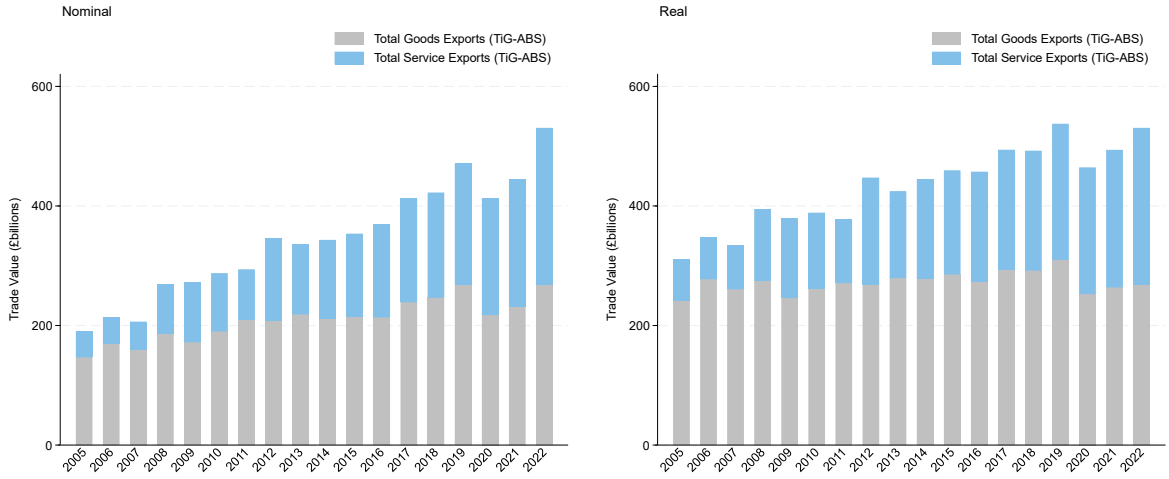
A4: Deflators

The UK National accounts include fully balanced estimates of GVA[7], domestic output, intermediate consumption by industry and supply and demand of products in current (or "nominal") prices as well as in "Chained volume measure" (CVM). CVM is a series in which changes year by year reflect only changes in production.

We calculate deflators for GVA, trade in goods exports for EU/RoW, trade in goods imports for EU/RoW, as well as services export and imports. We calculate deflators by dividing the series of interest at nominal prices to its chained volume measure at 2-digit industry level. For information about prices at product level we use supply and use tables to obtain weights of each product in each industry by year. Then we merge these industry level deflators to firm level data by industry.

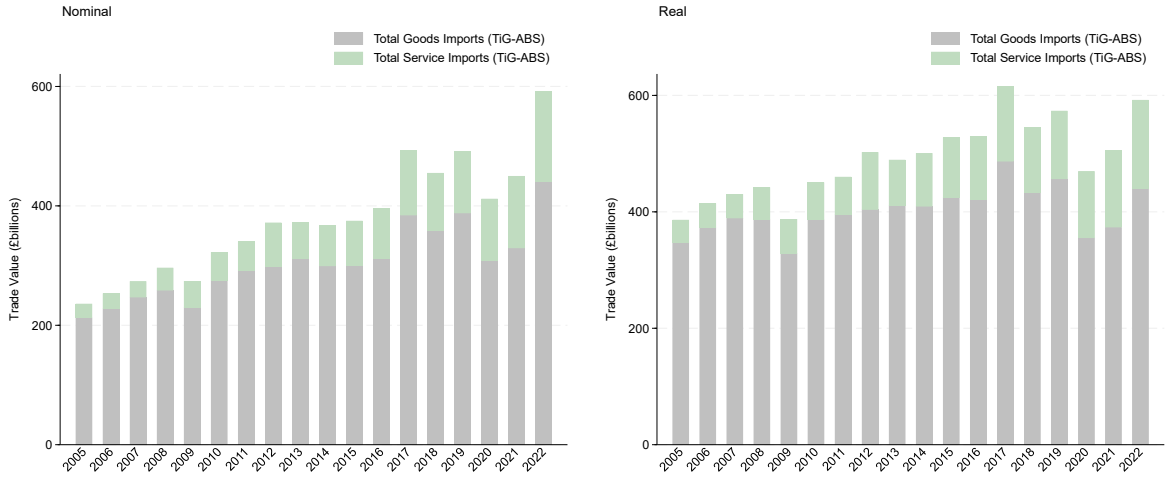
7 https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/supplyanduseofproductsandindustrygvaukexperimental

Figure A4.1 Total value of goods and services exports in nominal and real terms, Great Britain, 2005 to 2022



Note(s): Derived from the linked ABS/HMRC TiG dataset covering. Goods export values are derived from HMRC TiG data. Data on service export values come from the ABS. Estimates are weighted using ABS firm weights.

Figure A2.2 Total value of goods and services imports in nominal and real terms, Great Britain, 2005 to 2022



Note(s): Derived from the linked ABS/HMRC TiG dataset covering. Goods import values are derived from HMRC TiG data. Data on service import values come from the ABS. Estimates are weighted using ABS firm weights.

Figure A4.3 Total value of goods exports in nominal and real terms by broad industry sector, Great Britain, 2005 to 2022

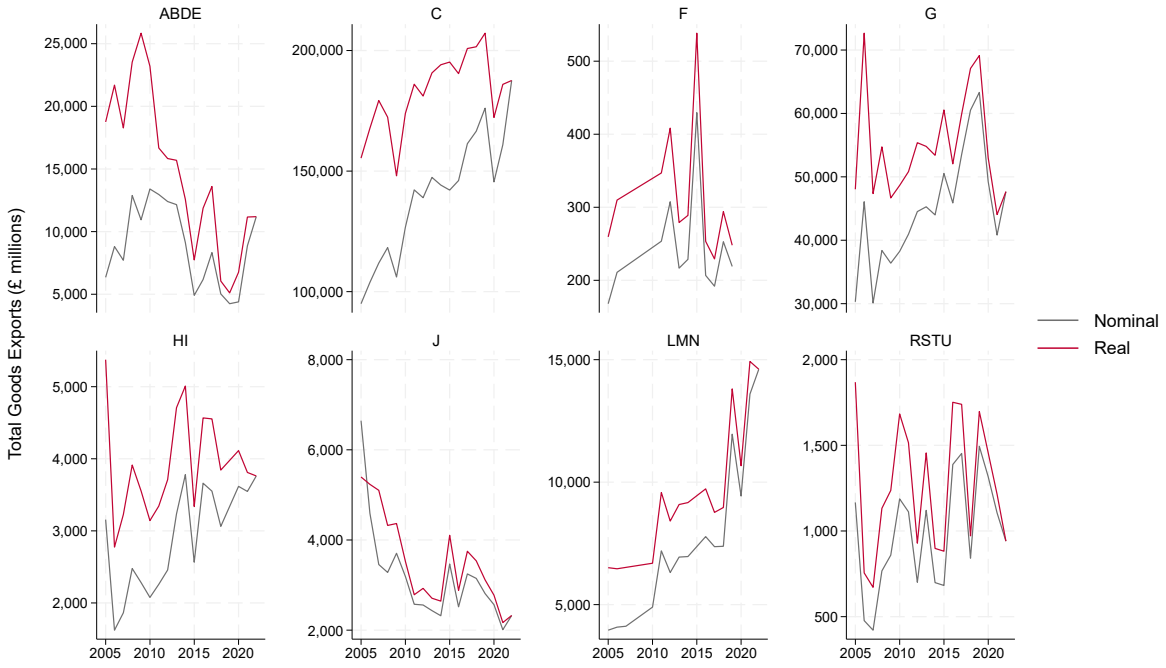


Figure A4.4 Total value of goods imports in nominal and real terms by broad industry sector, Great Britain, 2005 to 2022

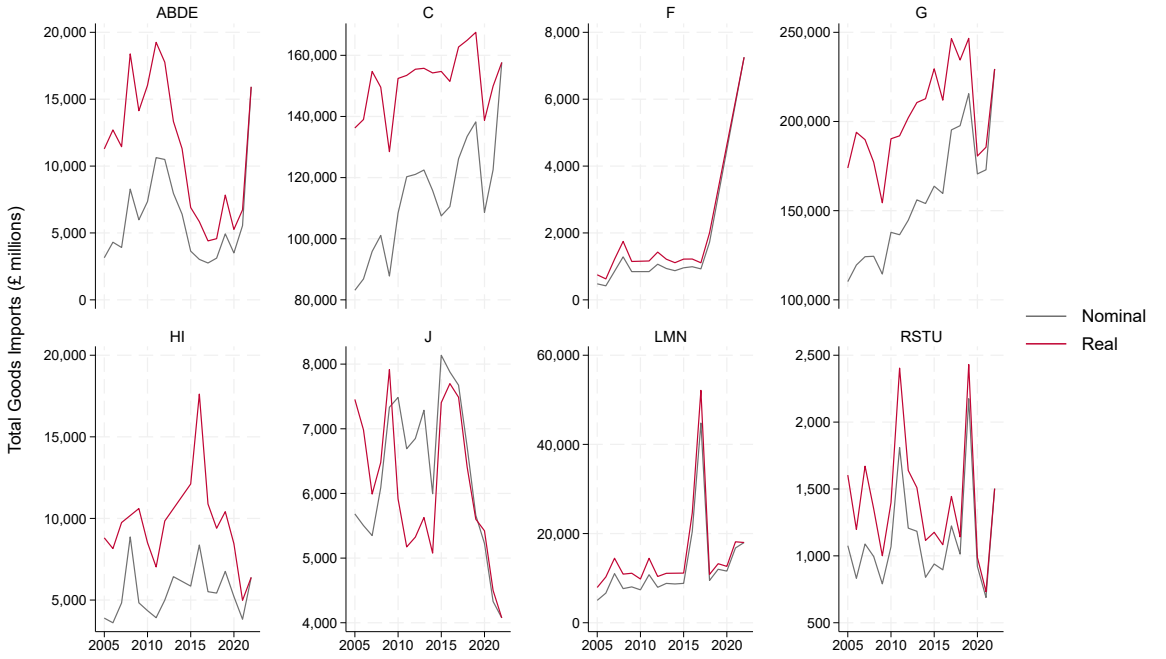


Figure A4.5 Total value of service exports in nominal and real terms by broad industry sector, Great Britain, 2005 to 2022

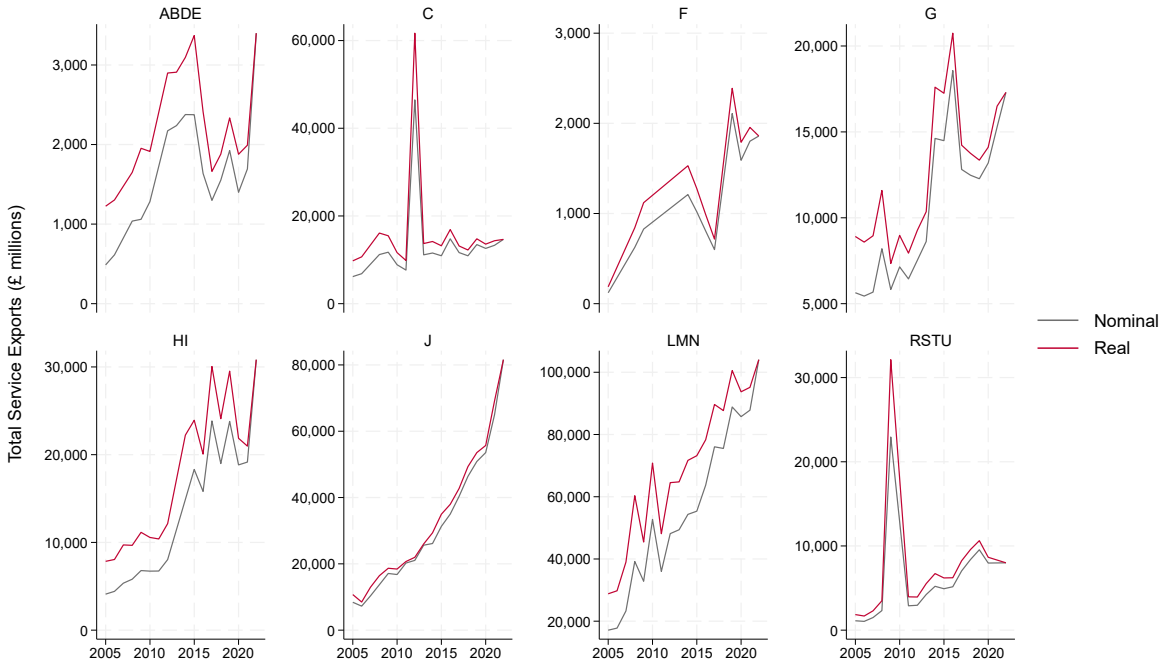


Figure A4.6 Total value of goods imports in nominal and real terms by broad industry sector, Great Britain, 2005 to 2022

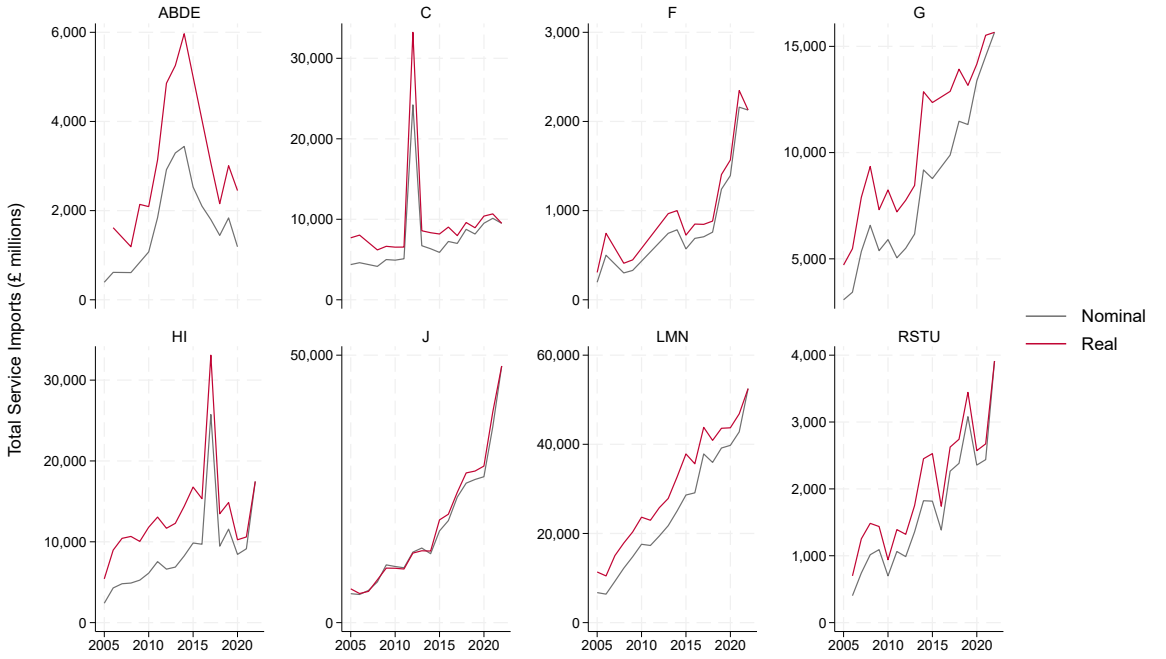


Figure A4.7 Labour productivity by combined exporter and importer status in nominal and real terms, Great Britain, 2005 to 2022

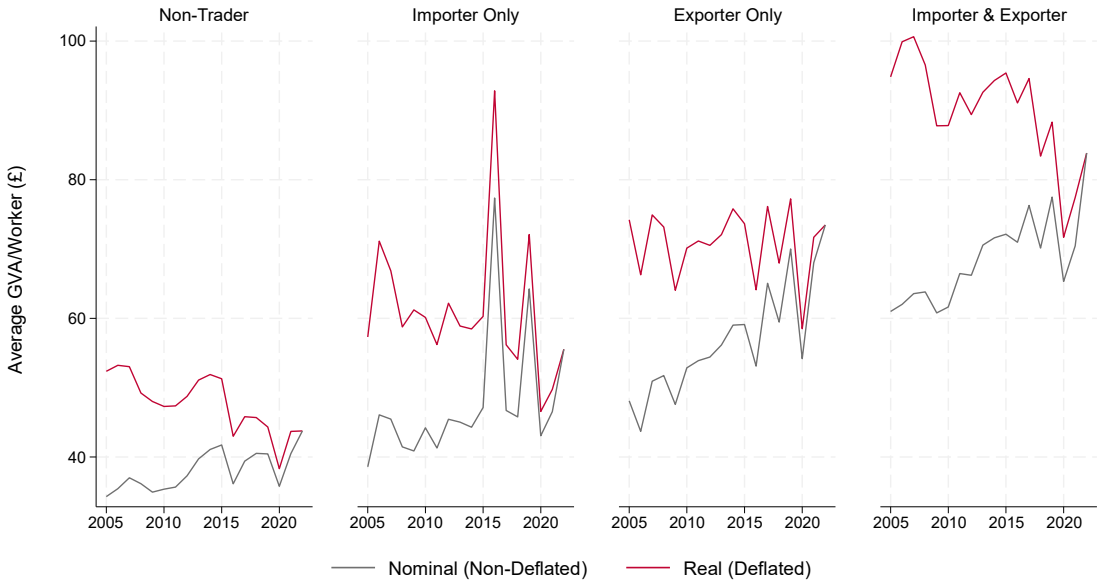


Table A4.1: Impact of gross value-added deflators on baseline productivity premium regressions, ABS and ABS/HMRC-TIG, Great Britain, 2011 to 2022

	(1)	(2)	(3)	(4)
	Log of labour productivity			
VARIABLES	ABS (Nominal)	ABS (Real)	ABS/HMRC-TIG (Nominal)	ABS/HMRC-TIG (Real)
Importer Only	0.189***	0.189***	0.300***	0.300***
	(0.0356)	(0.0356)	(0.0539)	(0.0539)
Exporter Only	0.247***	0.248***	0.322***	0.322***
	(0.0357)	(0.0359)	(0.0450)	(0.0451)
Importer & Exporter	0.444***	0.444***	0.518***	0.518***
	(0.0528)	(0.0528)	(0.0625)	(0.0625)
Log of Employment	-0.0165	-0.0163	-0.0276*	-0.0274*
	(0.0164)	(0.0165)	(0.0157)	(0.0157)
Foreign-Owned	0.532***	0.532***	0.478***	0.478***
	(0.0506)	(0.0507)	(0.0470)	(0.0470)
Log of Age	0.0315**	0.0316**	0.0307**	0.0308**
	(0.0144)	(0.0145)	(0.0142)	(0.0143)
Constant	3.181***	3.324***	3.181***	3.327***
	(0.0318)	(0.0319)	(0.0312)	(0.0314)
Observations	385,593	385,593	430,782	430,782
R-squared	0.132	0.139	0.133	0.140
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

Table A4.2: Impact of gross value-added deflators on within-firm productivity premium regressions, ABS and ABS/HMRC-TIG, Great Britain, 2011 to 2022

VARIABLES	(1)	(2)	(3)	(4)
	Log of labour productivity			
	ABS (Nominal)	ABS (Real)	ABS/HMRC-TIG (Nominal)	ABS/HMRC-TIG (Real)
Importer Only	0.0597***	0.0598***	0.0725***	0.0727***
	(0.0170)	(0.0170)	(0.0181)	(0.0180)
Exporter Only	0.0446**	0.0446**	0.0788***	0.0788***
	(0.0185)	(0.0186)	(0.0261)	(0.0260)
Importer & Exporter	0.0895***	0.0889***	0.151***	0.151***
	(0.0181)	(0.0182)	(0.0271)	(0.0271)
Log of Employment	-0.391***	-0.391***	-0.377***	-0.377***
	(0.0230)	(0.0230)	(0.0194)	(0.0195)
Constant	4.654***	4.812***	4.472***	4.689***
	(0.0702)	(0.0703)	(0.0573)	(0.0576)
Observations	216,868	216,868	369,911	369,911
R-squared	0.853	0.856	0.832	0.836
Year FE	No	No	No	No
Industry FE	No	No	No	No
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

Notes the same as Table A4.1

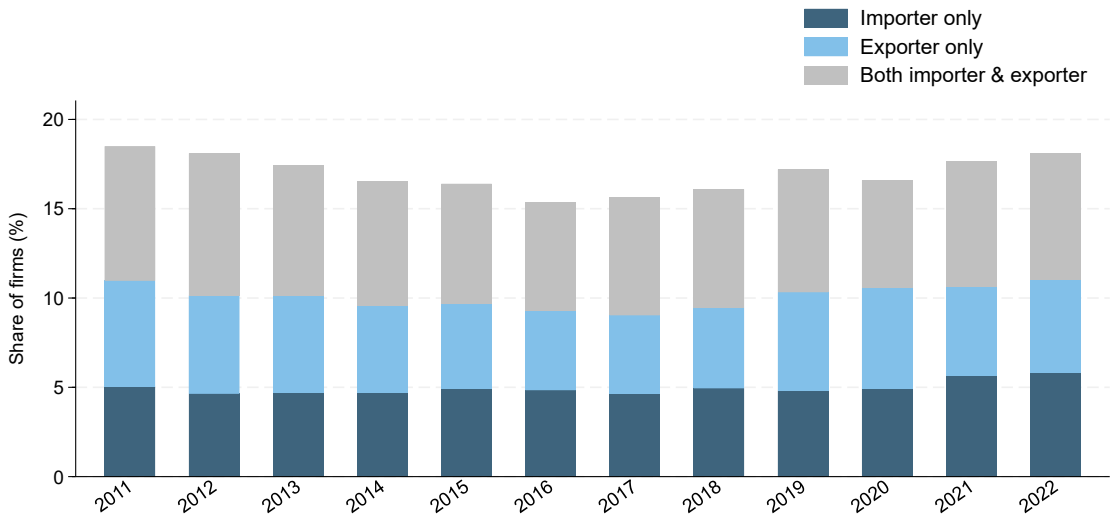
B: Trade descriptives

B1: A portrait of British trade from firm microdata

In this section we present an expansive set of descriptives on British traders.

Trade participation: In 2022, 18% of the non-financial business economy (388,000 firms) participated in international trade according to the ABS. Of these firms, 38% engaged in both imports and exports (151,000 firms).

Figure B1.1: Share of firms by combined trade status, non-financial business economy, ABS, Great Britain, 2011 to 2022



Larger firms are more likely to trade but smaller firms form the majority of British traders. In 2022, 59% of all large firms participated in trade, compared to only 16% of firms with less than 9 employees, but such micro-firms represented 80% of all traders.

Figure B1.2 Share of firms by exporter trade type by employment size-band, ABS, Great Britain, 2022

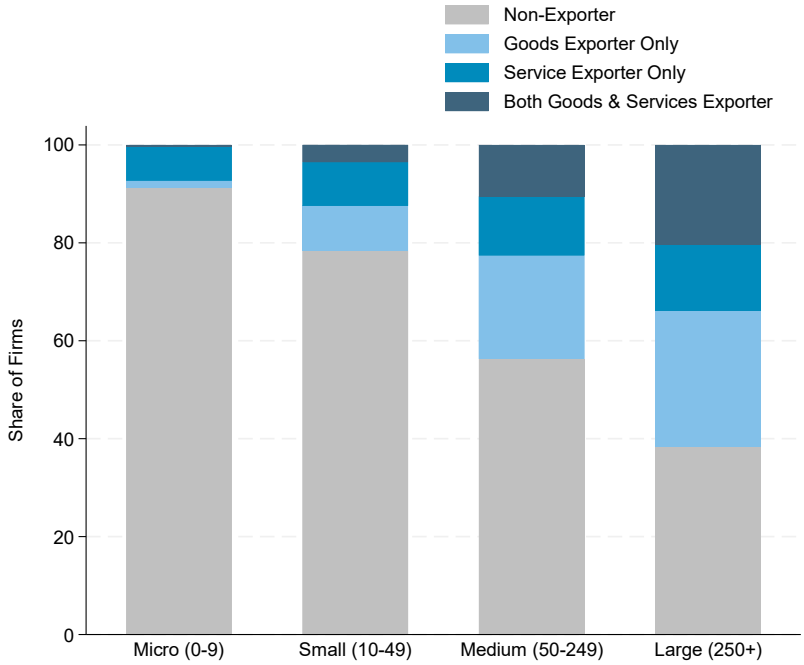
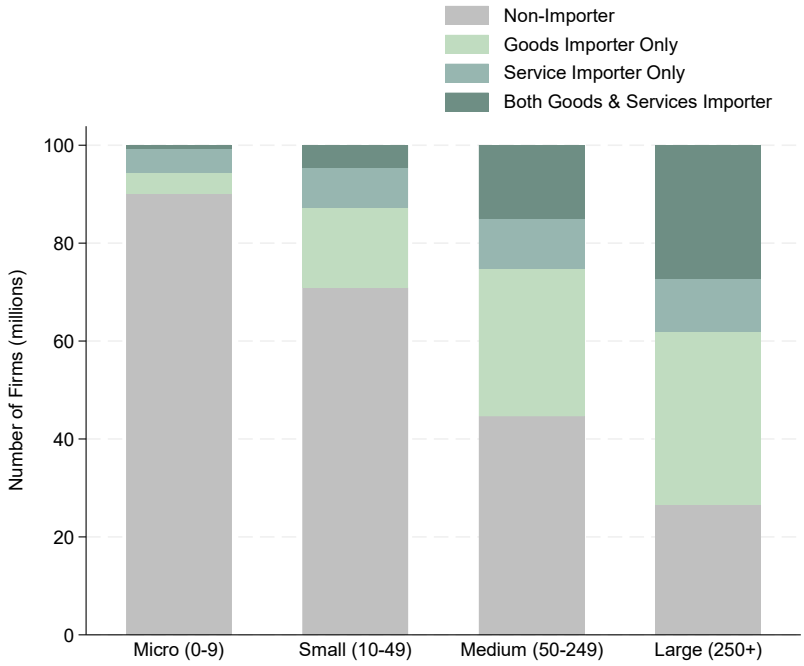
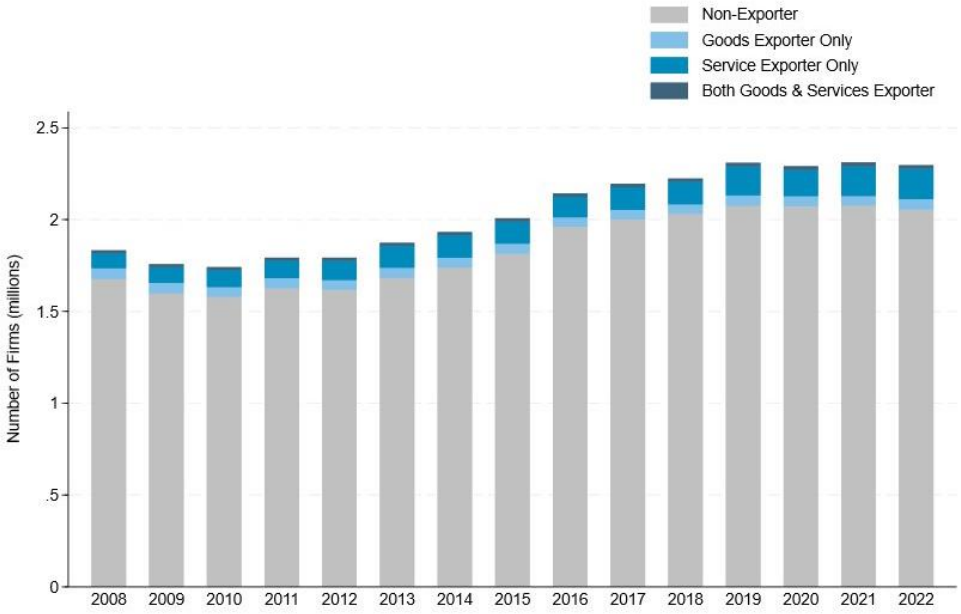


Figure B1.3 Share of firms by importer trade type by employment size-band, ABS, Great Britain, 2022



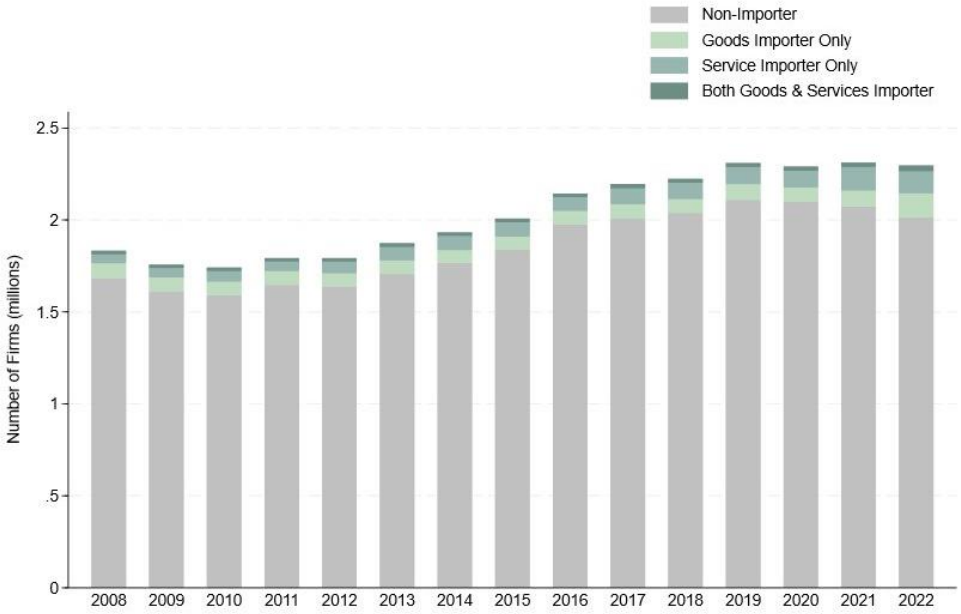
More firms export services than goods. 68.4% of exporters (165,000 firms) export only services, 23.8% (57,000 firms) export only goods and 7.8% (18,880 firms) export both. The picture is more balanced for imports. In 2022, 283,000 firms reported purchases from abroad. Of these 46.7% imported only goods, 42.5% only services and 11% both.

Figure B1.4: Number of exporters by exporter type, ABS/HMRC TiG, Great Britain, 2008 to 2022



Note(s): Services export status is taken from the ABS and goods export status is derived from HMRC TiG data.

Figure B1.5: Number of importers by importer type, ABS/HMRC TiG, Great Britain, 2008 to 2022



Note(s): Services trade import is taken from the ABS and goods trade import is derived from HMRC TiG data.

Trade value vs trade participation:

Trade is concentrated in a few industries. Figure B1.6 illustrates how many firms export goods and services across sectors of the economy. Professional services and ICT have the highest number of exporting firms, driven by service exporters, that is 46,000 firms in ICT and 88,000 firms in professional services. But the picture is different for trade value by sector. Figure B1.7 shows that while manufacturing firms are only the third largest group of exporters, they comprise the largest share of export value, driven by goods exports. In 2022 manufacturing firms exported £187 million in goods (Figure B1.7) and imported £158 million (Figure B1.8, a £29 million trade surplus (Figure X). Professional services and ICT are the second and third largest overall exporters exporting £119 and £84 million respectively.

Figure B1.6: Number of firms that export by industry sector, trade status, non-financial business economy, ABS, Great Britain, 2022

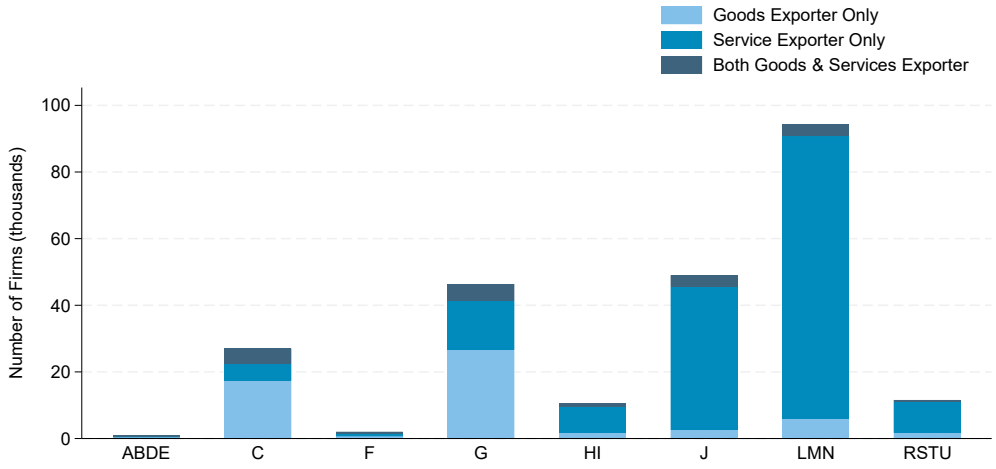
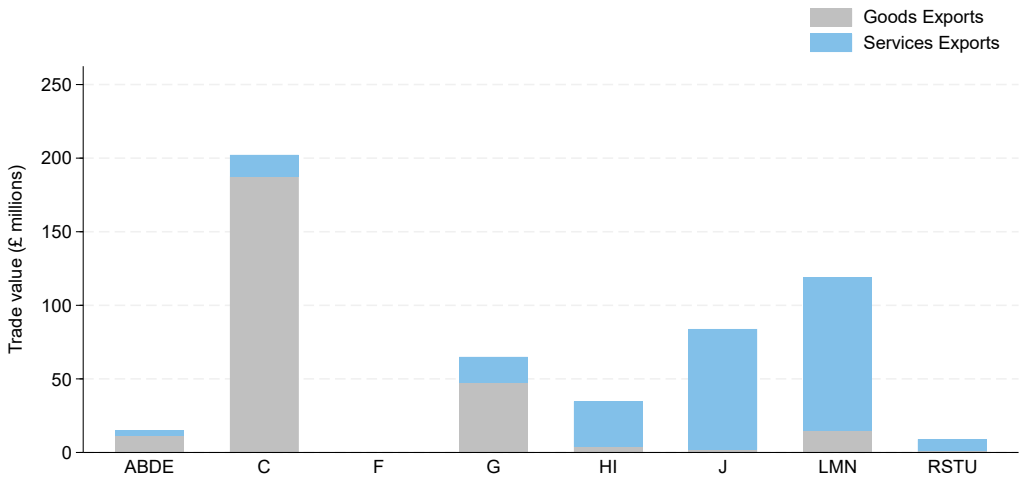


Figure B1.7: Value of exports by industry sector, non-financial business economy, ABS/HMRC-TIG, Great Britain, 2022



The picture is similar for imports. Figure B1.6,8 and 9 show that while Wholesale and Retail trade is the second largest goods exporter, it is the largest importer of goods. In 2022, it exported £47.6 million and imported £229.5 million, corresponding to a trade deficit of £181.9 million (Figure B1.10).

Figure B1.9 Number of importers by broad industry sector, ABS, Great Britain, 2022

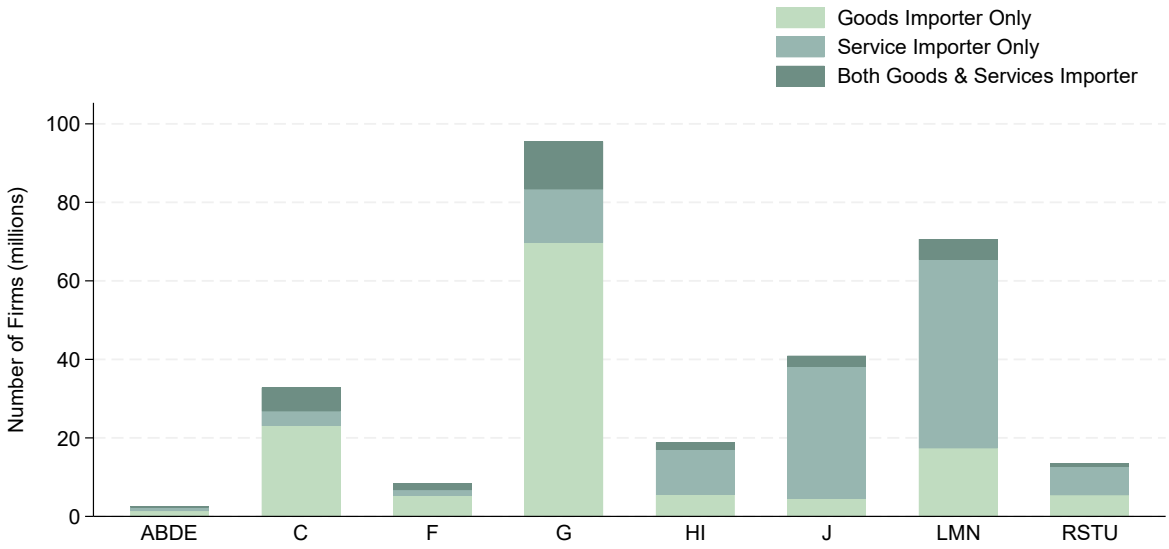


Figure B1.9 Value of goods and services imports by broad industry sector, ABS/HMRC-TIG, Great Britain, 2022

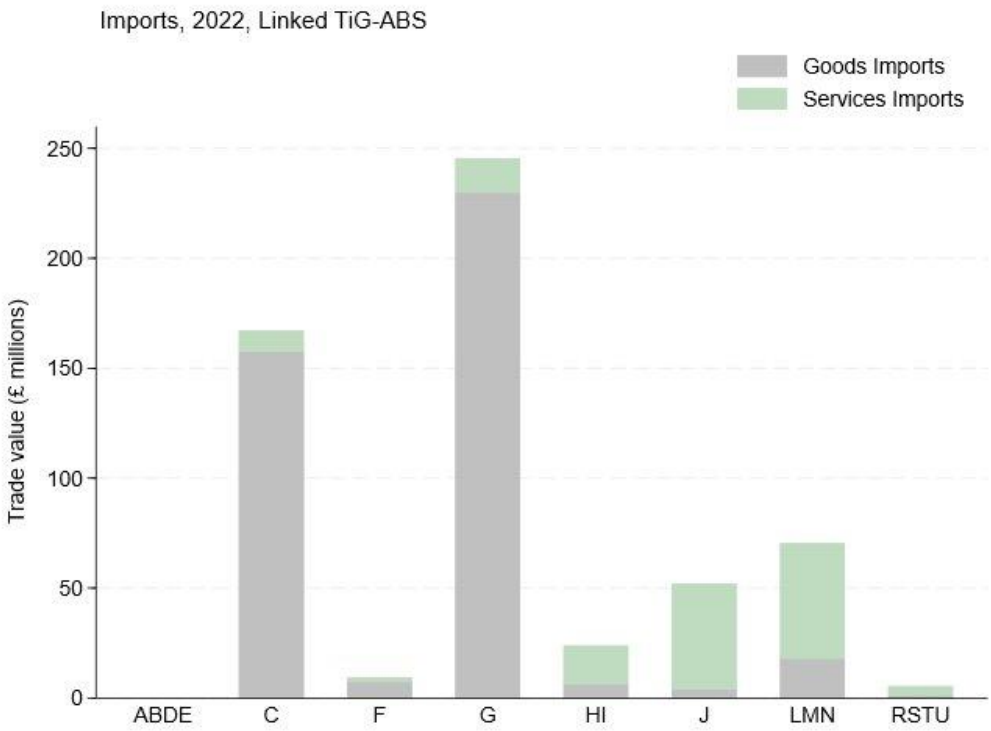
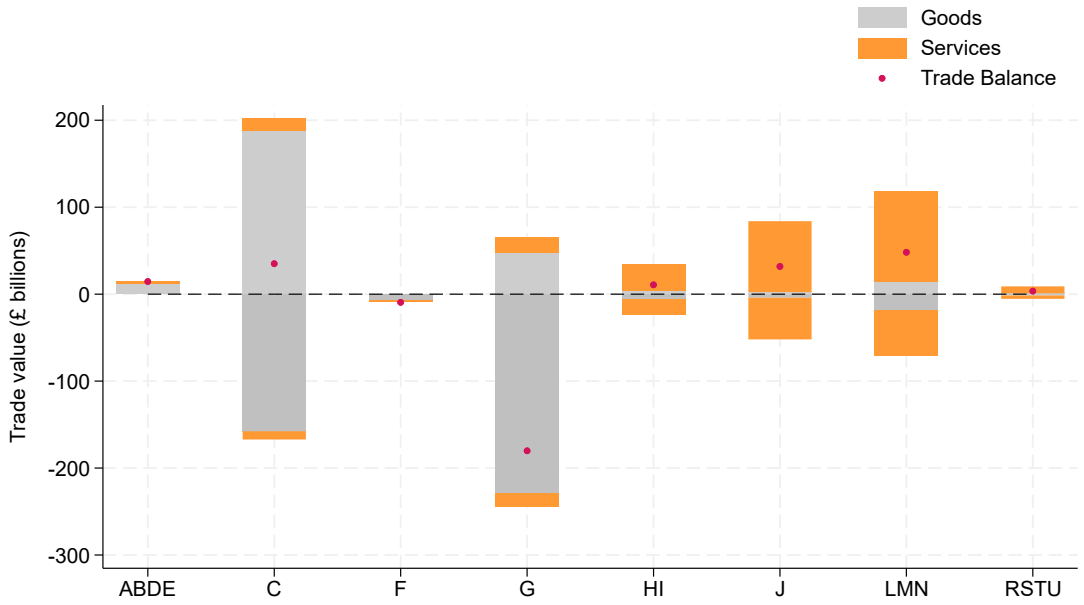


Figure B1.10: Trade balance in goods and services by broad industry sector, ABS/HMRC-TIG linked dataset, 2022



Trade intensity:

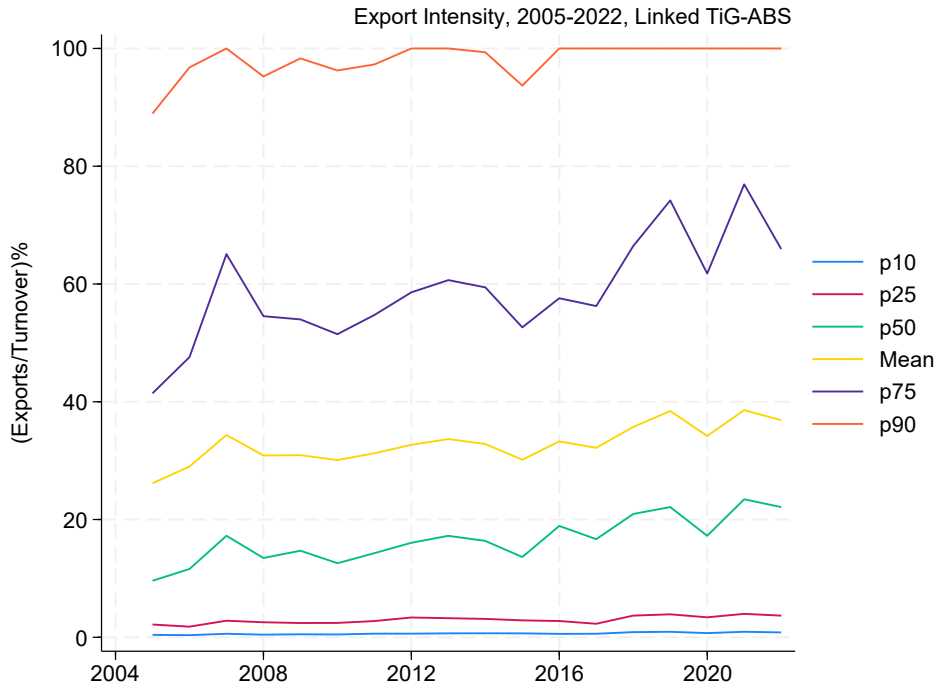
Trade is an important component of the average firm's turnover and intermediate consumption. Figure B1.11 shows indicators of trade intensity at the firm level, where it captures the size of trade relative to how much output it produces and how much inputs it consumes as part of its production process.

In 2022, the average British exporter made 36.9% of its turnover from exports (the median is 22.1%), an increase of 10.7 percentage points since 2005. On the other hand, the average importer sourced 28.5% of its intermediate consumption from abroad. But exposure to international markets is quite dispersed among British traders. The most export intensive firms in the sample, at the 90th percentile of export intensity, earned all their turnover from exports while the most import intensive sourced 80.4% of their intermediate consumption from abroad.

At the other end, the least export and import intensive firms, at the bottom 10th percentile of export and import intensity, sourced less than 1% of their purchases and turnover from abroad, a share that has remained relatively flat over time.

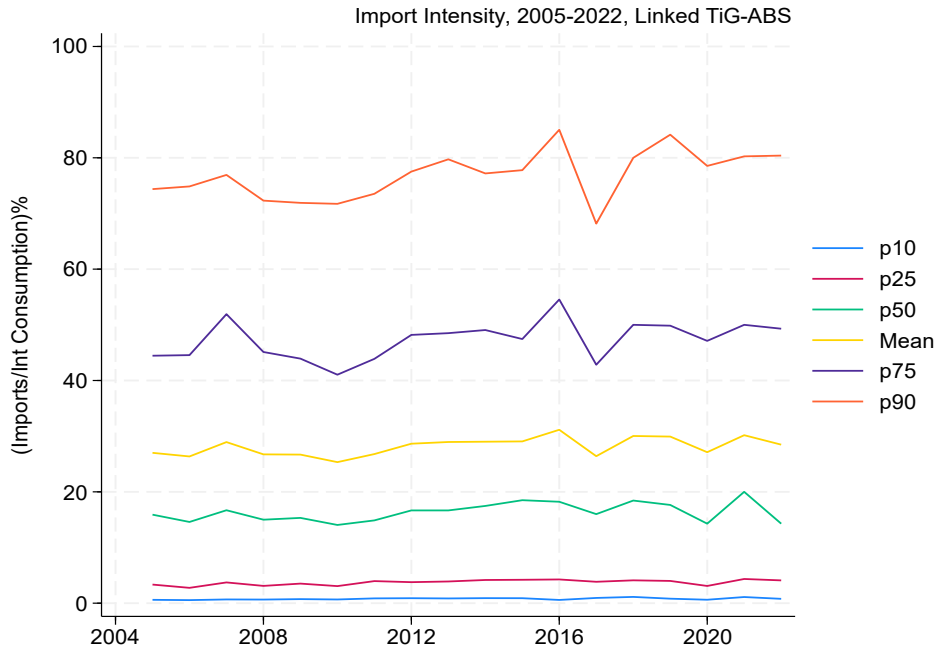
The greatest rise in trade openness has been by firms at the 75th percentile of export intensity. Exports made up 65.9% of these firms' turnover in 2022 a rise of 24.5pp since 2005.

Figure B1.11: Export and import intensity, non-financial business economy, ABS/HMRC-TIG, Great Britain, 2005 to 2022



Note(s): Export intensity is calculated as ((export value/turnover) * 100). Firms with export intensity greater than 110% are excluded from these outputs. Estimates are weighted using firm weights ABS.

Figure B1.12: Export and import intensity, non-financial business economy, ABS/HMRC-TIG, Great Britain, 2005 to 2022

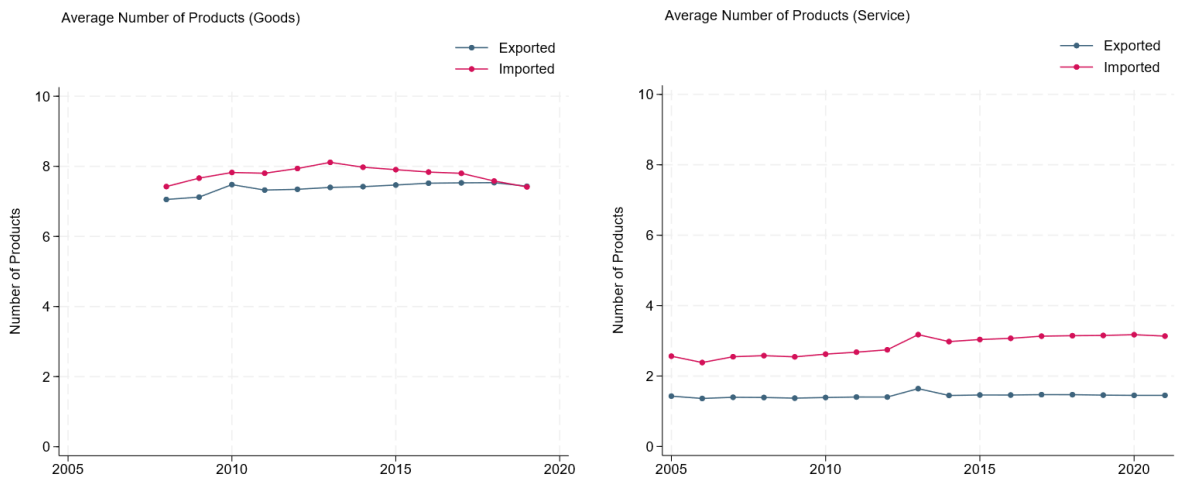


Note(s): Import intensity is calculated as ((import value/intermediate consumption) * 100). Firms with import intensity greater than 110% are excluded from these outputs. Estimates are weighted using firm weights ABS.

Product and Services traded:

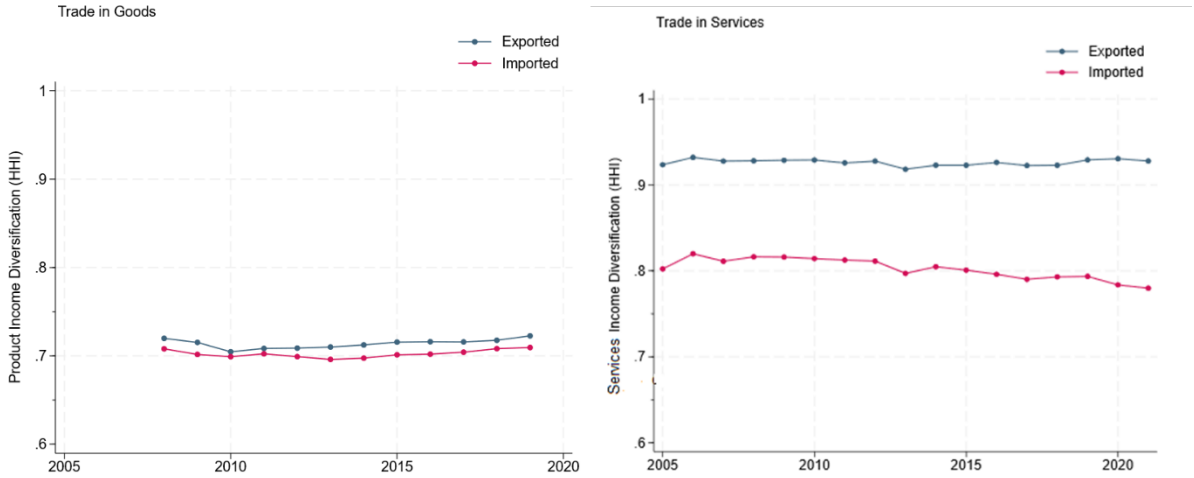
While trade openness (which we define here as the exposure of a firm's turnover to international markets) of intensive exporters (exporters at the 75th percentile of export intensity) has risen in the past 15 years, the average number of product and services traded has been relatively stable. Figure B1.13 shows that firms exported on average 7 goods and close to 3 services between 2005-2022.

Figure B1.13: Average number of products for goods and services exported and imported, HMRC TiG and ITIS, Great Britain, 2005 to 2022



Note(s): In estimates related to services, a product refers to a distinct service type as defined in the International Trade in Services Survey. In estimates related to goods, we define a product as a distinct 4-digit commodity code. Information on TIG is near population and does not require weights. Outputs using the International Trade in Services Survey are unweighted.

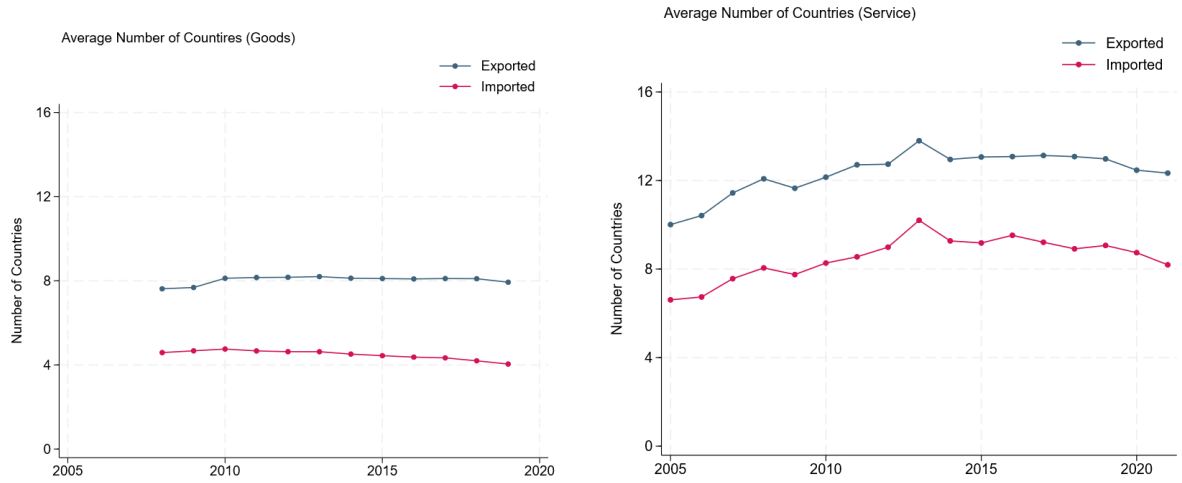
Figure B1.14: Product diversification of export and import trade for both goods and services, HHI, HMRC TiG and ITIS, Great Britain, 2005 to 2022



Notes(s): Notes in Figure B1.13 apply to this figure also. HHI refers to a Herfindahl–Hirschman index used to measure concentration. This measure shows how concentrated a firm's export income/import purchases are across products.

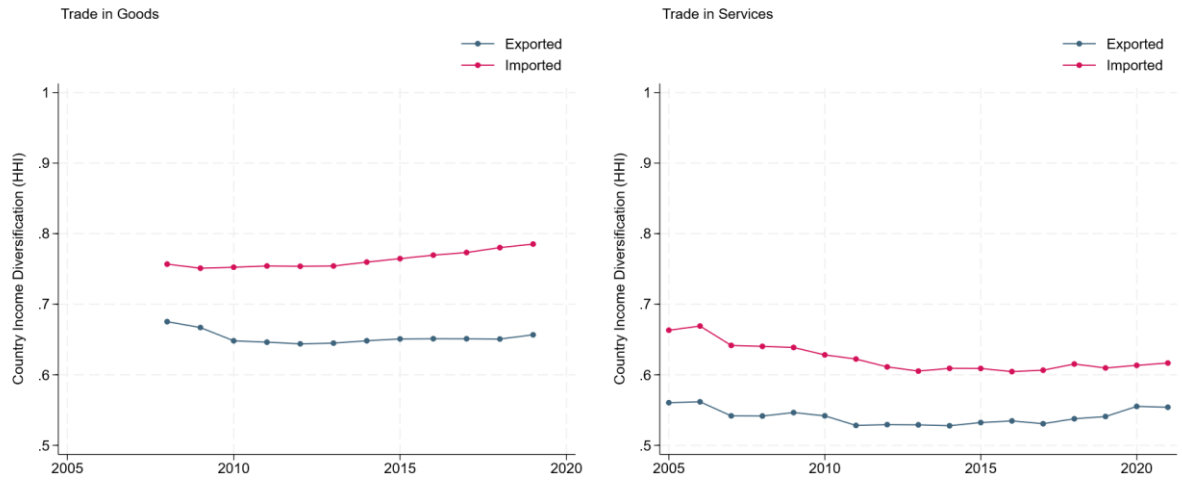
Figure B1.15 shows a similar pattern for the geographic composition of trade. The number of countries British firms export to and import goods and services from, as well as the trade value concentration among these countries has also remained relatively stable since 2005. Goods traders export to 8 countries on average and source inputs from 4. On the other hand, the average service trader will export to 12 countries and import services from 8.

Figure B1.15: Average number of country firms export or import goods and services to, TiG and ITIS, Great Britain, 2005 to 2022



Note(s): Information on TIG is near population and does not require weights. Outputs using the International Trade in Services Survey are unweighted.

Figure B1.16: Country diversification of export and import trade for both goods and services, HHI, TiG and ITIS, Great Britain, 2005 to 2022



Notes(s): Notes in Figure B1.15 apply to this figure also. HHI refers to a Herfindahl–Hirschman index used to measure concentration. This measure shows how concentrated a firm's export income/import purchases are across products.

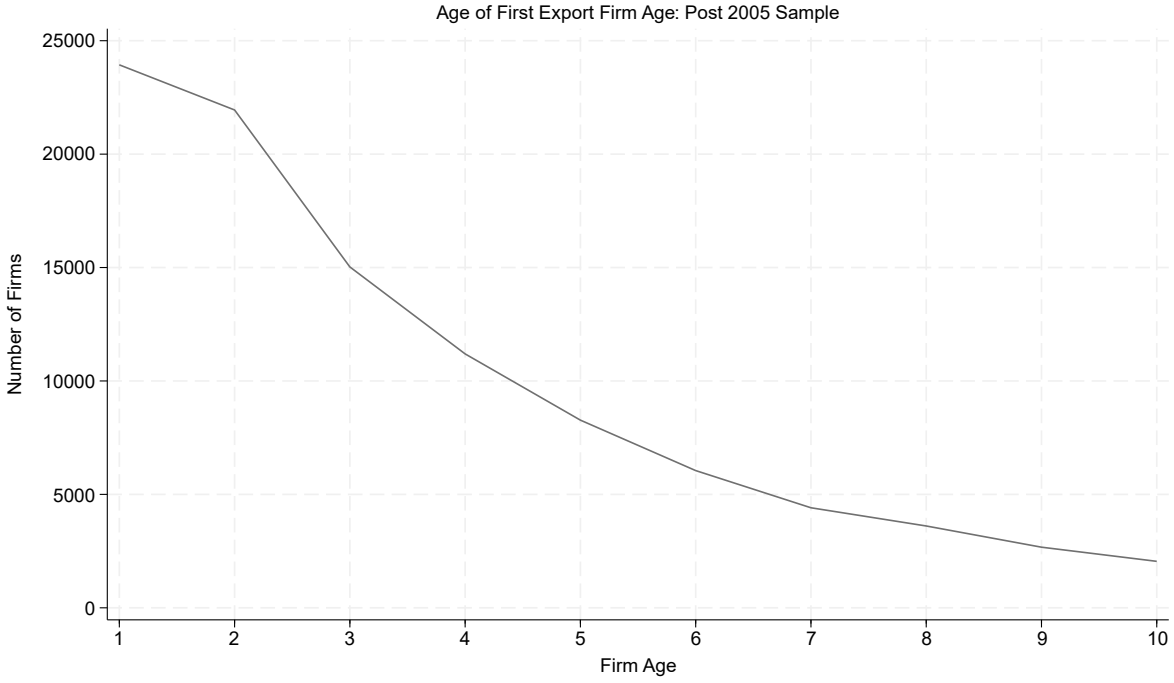
B2. Goods trade participation, value and product, service variety across the lifecycle of the firm

Aggregate patterns for the average firm, mask important dynamics in trade behaviour along a firm's lifecycle. Due to data limitations, explored in Section 5, we can only investigate patterns in the trade behaviour of firms for trade in goods and only for firms born after 2005 as for these firms we observe their entire lifecycle.

We find that trade participation is quite dynamic. Among firms participating in exporting or importing goods every year, roughly 11% are new exporters and 18% new importers. Trade participation is also quite patchy. Among goods traders born after 2005, the average firm trades on average 6 years and only 60% of the years active since its entry in international markets.

Not only that but age matters. A firm is more likely to become an exporter within its first three years of life. Figure B2.1 shows that 58% of firms that will ever export (of the firms born after 2005) will do so by the time they are three years old. This is important both for policy and for the variation available in our data to estimate the causal component of the productivity premium. It means that export support interventions may be more likely to be successful if targeted at younger firms, although targeting firms older than 3 years old may ensure greater additionality. But also, that with most firms switching into exporting within the first 3 years of their lives, there is a limited pre-treatment period for the majority of our sample to estimate productivity differences that predate the time of first trade.

Figure B2.1: Age of First export by firm age, Post 2005 sample, Great Britain

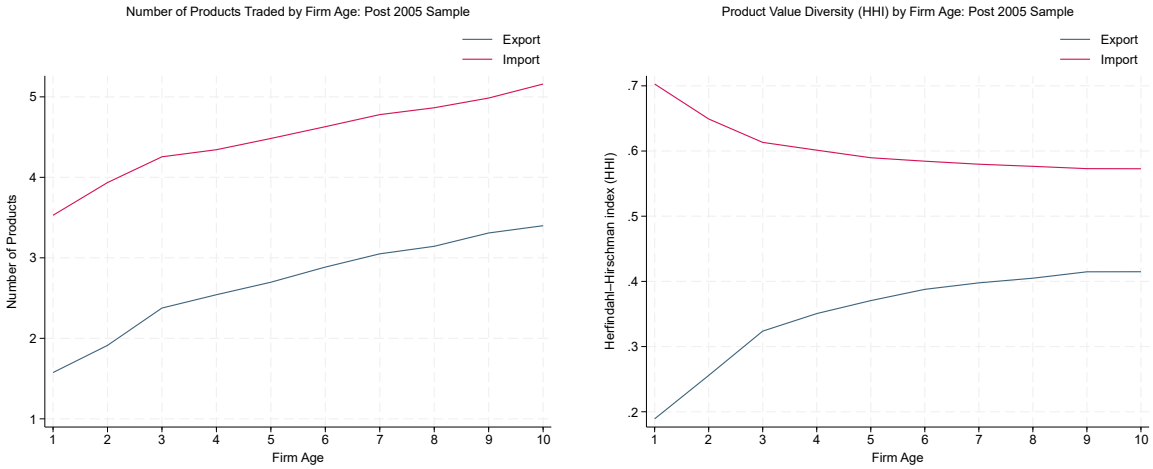


Age matters for the product and country composition of trade as well. In Figure B2.2, we see that firms increase their imports faster than their exports as they become more trade mature. The number of partner countries (B2.3) also increases over time. Firms export to more countries than they import but the opposite is true for product diversity.

To understand how trade value is distributed across products and partner countries over the lifecycle of the firm we calculate a trade value Herfindahl-Hirschman index (HHI). The HHI is a common measure of market concentration and is calculated as the sum of squared market shares of the firm. In this instance the HHI is calculated as the sum of the squared shares of each product's export or import value over a firm's total exports or imports.

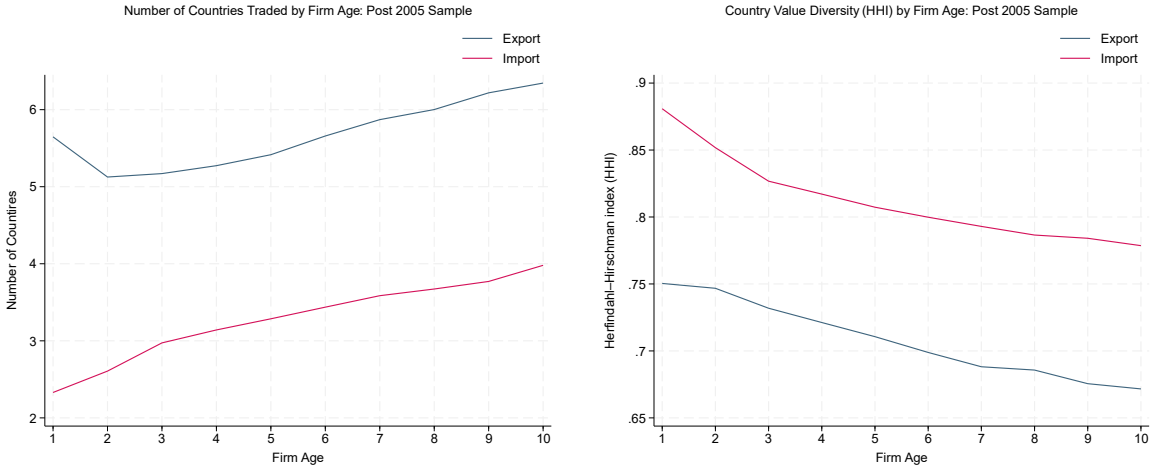
A higher HHI suggests value is less equally shared, more concentrated in fewer products. We find that firms become more specialised in their export product mix and more diversified in their imports, figure B2.2 (right hand panel). On the other end, firms diversify across both destination and source countries, figure B2.3 (right hand panel). As firms become more mature traders the spatial concentration of their export and import value decreases.

Figure B2.2: Product diversity in exports and imports over the lifecycle of a firm, firms born after 2005



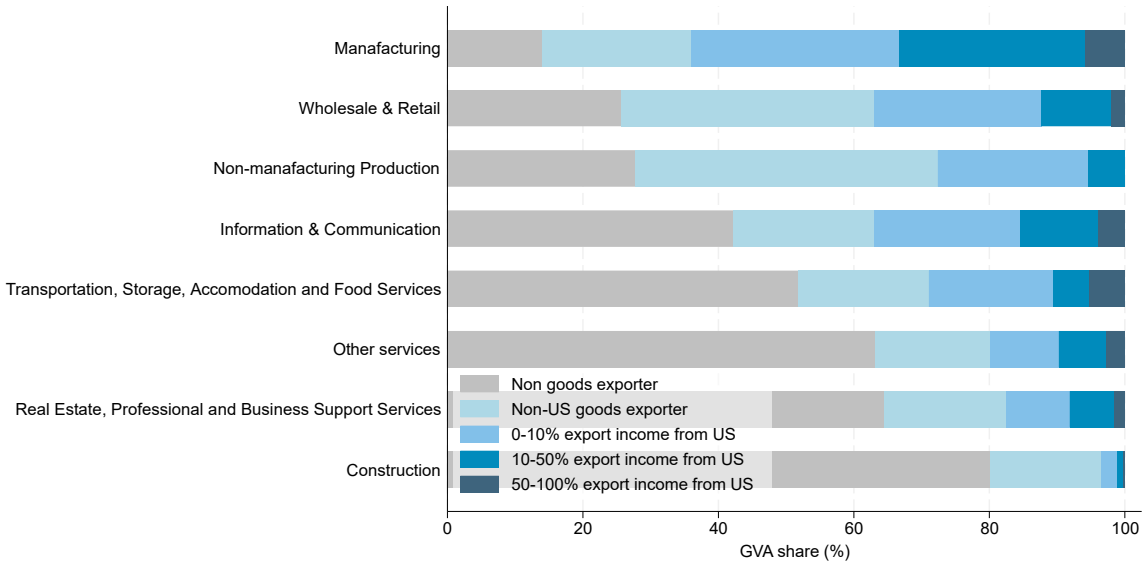
Note(s): Estimates use only firms born after 2005. Information relates only to trade in goods. We define a product as a distinct 4-digit commodity code. HHI refers to a Herfindahl–Hirschman index used to measure concentration.

Figure B3.3: Country diversity in exports and imports over the lifecycle of a firm, firms born after 2005



Note(s): Estimates use only firms born after 2005. Information relates only to trade in goods. HHI refers to a Herfindahl–Hirschman index used to measure concentration.

Figure B3.4: Share of GVA by share of US export income by macro-sector, 2022, Linked TiG-ABS, Great Britain



Note(s): Estimates are weighted using firm weights ABS. US export status and level of exposure is derived from HMRC TiG data.

C: Productivity and Trade

C1 Descriptive Results

Figure C1.1: Difference in labour productivity between exporters and non-exporters, source comparison, Great Britain, 2005 to 2022

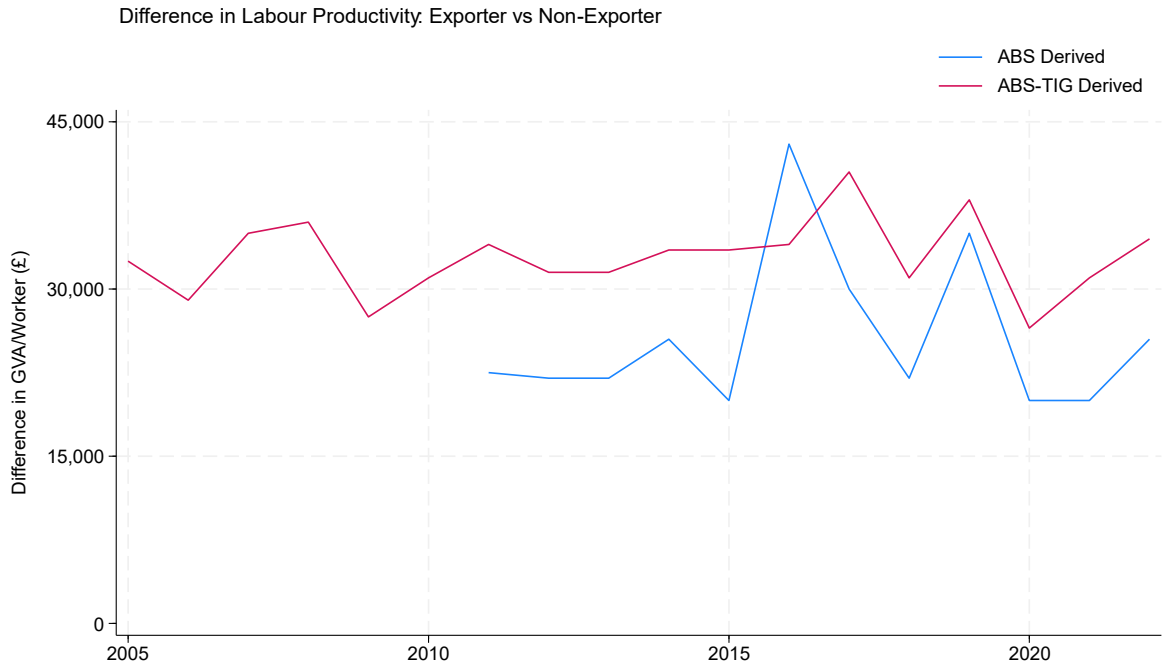


Figure C1.2: Difference in labour productivity between importers and non-importers, source comparison, Great Britain, 2005 to 2022

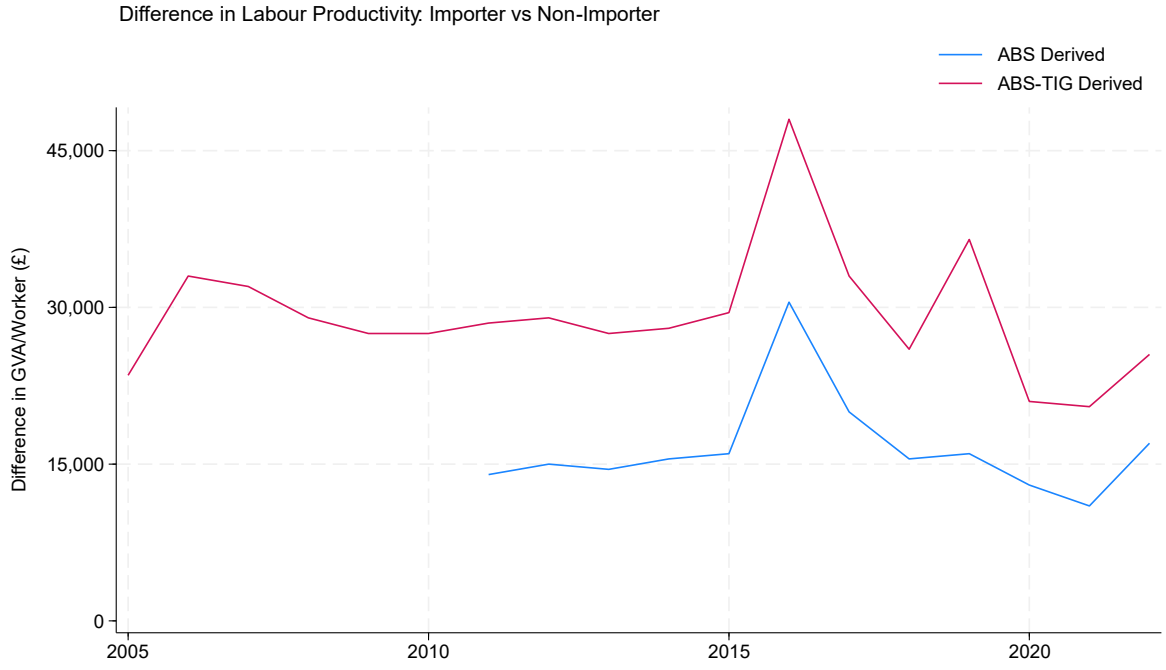
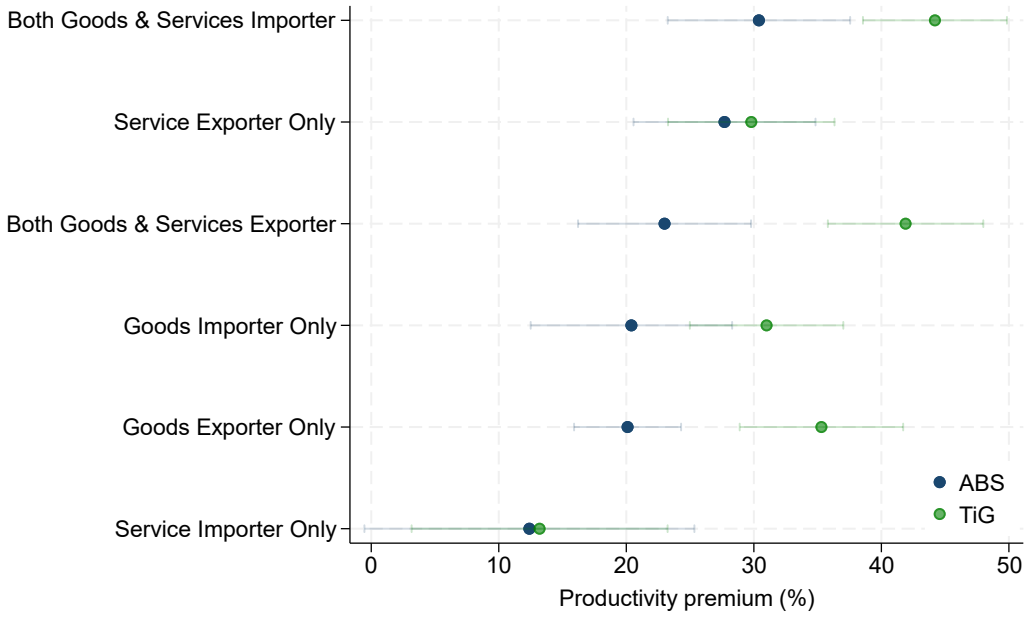


Table C1.1: Categorical trade status variables and baseline category

Note: baseline/comparison category shaded in light blue.

Status Name	Status
Any International Trade	Non-Trader (International Trade)
	International Trader (Exporter and/or Importer of Goods and/or Services)
Exporter Status	Non-Exporter
	Exporter (Goods and/or Services)
Importer Status	Non-Importer
	Importer (Goods and/or Services)
Exporter Type	Non-Exporter
	Goods Exporter Only
	Service Exporter Only
	Both Goods and Services Exporter
Importer Type	Non-Importer
	Goods Importer Only
	Service Importer Only
	Both Goods and Services Importer
Combined Exporter-Importer Status	Non-Trader (International Trade)
	Importer Only (Goods and/or Services)
	Exporter Only (Goods and/or Services)
	Both Exporter and Importer (Goods and/or Services)

Figure C1.3: Other things being equal, trade-productivity premium from the ABS and TiG data by trade type, Great Britain



Note(s): The chart plots the coefficient of each trade status regressed against GVA per worker in a regression controlling for employment size, age, foreign ownership and region as well as industry by year differences in productivity. Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as " TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

C2 Extensive margin regressions

Table C2.1 Productivity premium by any trade status, ABS, Great Britain, 2011 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ln(Labour productivity)								
Participating in any trade	0.348***	0.349***	0.328***	0.304***	0.303***	0.303***	0.0497***	0.0667***	0.0645***
	(0.00500)	(0.00499)	(0.0410)	(0.0361)	(0.0362)	(0.0360)	(0.0141)	(0.0140)	(0.0138)
Log of Employment				-0.00155	-0.0145	-0.0122		-0.396***	-0.390***
				(0.0172)	(0.0176)	(0.0174)		(0.0247)	(0.0230)
Foreign Owned				0.575***	0.575***	0.563***			
				(0.0534)	(0.0533)	(0.0516)			
Log of Age					0.0365**	0.0320**			
					(0.0148)	(0.0145)			
Constant	3.372***	3.372***	3.375***	3.373***	3.313***	3.320***	3.618***	4.832***	4.814***
	(0.00204)	(0.00203)	(0.00682)	(0.0175)	(0.0327)	(0.0323)	(0.00531)	(0.0757)	(0.0706)
Observations	385,615	385,615	385,614	385,614	385,599	385,593	216,874	216,874	216,868
R-squared	0.012	0.017	0.120	0.122	0.123	0.138	0.845	0.850	0.856
Year FE	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	No	No	No	No	Yes	No	No	Yes
Firm FE	No	No	No	No	No	No	Yes	Yes	Yes

Note(s): The row “Participating in any trade” presents the coefficient of a dummy equal to one if a firm participates in any form of trade regressed against the natural logarithm of GVA per worker. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade

Table C2.2 Productivity premium by any trade status, ABS/HMRC-TIG, Great Britain, 2005 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Ln(Labour productivity)								
Participating in any trade	0.460***	0.463***	0.403***	0.390***	0.389***	0.385***	0.0606***	0.0980***	0.0938***
	(0.00426)	(0.00425)	(0.0462)	(0.0413)	(0.0414)	(0.0411)	(0.0201)	(0.0212)	(0.0209)
Log of Employment				-0.0211	-0.0307*	-0.0270		-0.377***	-0.375***
				(0.0173)	(0.0177)	(0.0168)		(0.0206)	(0.0198)
Foreign Owned				0.494***	0.494***	0.480***			
				(0.0393)	(0.0390)	(0.0382)			
Log of Age					0.0288**	0.0244*			
					(0.0144)	(0.0137)			
Constant	3.387***	3.386***	3.394***	3.409***	3.361***	3.367***	3.625***	4.695***	4.691***
	(0.00154)	(0.00153)	(0.00601)	(0.0170)	(0.0329)	(0.0314)	(0.00661)	(0.0609)	(0.0584)
Observations	662,928	662,928	662,927	662,927	662,866	662,863	369,917	369,917	369,911
R-squared	0.017	0.023	0.110	0.112	0.112	0.129	0.820	0.829	0.836
Year FE	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	No	No	No	No	Yes	No	No	Yes
Firm FE	No	No	No	No	No	No	Yes	Yes	Yes

Note(s): The row “Participating in any trade” presents the coefficient of a dummy equal to one if a firm participates in any form of trade regressed against the natural logarithm of GVA per worker. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

Table C2.3: Productivity premium by exporter and importer status, ABS, Great Britain, 2011 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ln(Labour productivity)							
Exporter	0.377***	0.268***	0.254***	0.252***	0.251***	0.0244	0.0380**	0.0365**
	(0.00670)	(0.0300)	(0.0294)	(0.0281)	(0.0286)	(0.0159)	(0.0159)	(0.0151)
Importer	0.117***	0.208***	0.188***	0.190***	0.192***	0.0438***	0.0562***	0.0535***
	(0.00683)	(0.0449)	(0.0389)	(0.0394)	(0.0395)	(0.0137)	(0.0139)	(0.0133)
Log of Employment			-0.00568	-0.0185	-0.0163		-0.397***	-0.391***
			(0.0165)	(0.0168)	(0.0165)		(0.0247)	(0.0230)
Foreign Owned			0.544***	0.543***	0.532***			
			(0.0531)	(0.0530)	(0.0511)			
Log of Age				0.0361**	0.0316**			
				(0.0148)	(0.0144)			
Constant	3.371***	3.374***	3.376***	3.316***	3.323***	3.616***	4.831***	4.813***
	(0.00201)	(0.00685)	(0.0170)	(0.0325)	(0.0320)	(0.00544)	(0.0751)	(0.0701)
Observations	385,615	385,614	385,614	385,599	385,593	216,874	216,874	216,868
R-squared	0.021	0.121	0.124	0.125	0.139	0.845	0.850	0.856
Year FE	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	No	No	No	Yes	No	No	Yes
Firm FE	No	No	No	No	No	Yes	Yes	Yes

Note(s): Exporter and importer rows represent the coefficient attached to a dummy equal to one if a firm participates in the export/import of goods and services regressed against the natural logarithm of GVA per worker. Exporter and importer dummies are estimated separately but within the same model. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade

Table C2.4: Productivity premium by exporter and importer status, ABS/HMRC-TIG, Great Britain, 2005 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Ln(Labour productivity)							
Exporter	0.414***	0.297***	0.294***	0.291***	0.289***	0.0554***	0.0824***	0.0785***
	(0.00564)	(0.0311)	(0.0294)	(0.0282)	(0.0280)	(0.0169)	(0.0190)	(0.0194)
Importer	0.229***	0.280***	0.271***	0.274***	0.270***	0.0407***	0.0755***	0.0724***
	(0.00600)	(0.0446)	(0.0402)	(0.0413)	(0.0411)	(0.0134)	(0.0129)	(0.0126)
Log of Employment			-0.0271	-0.0368**	-0.0330**		-0.379***	-0.377***
			(0.0165)	(0.0168)	(0.0159)		(0.0203)	(0.0195)
Foreign Owned			0.445***	0.445***	0.431***			
			(0.0393)	(0.0389)	(0.0377)			
Log of Age				0.0288**	0.0244*			
				(0.0144)	(0.0137)			
Constant	3.388***	3.395***	3.415***	3.366***	3.372***	3.620***	4.693***	4.689***
	(0.00152)	(0.00575)	(0.0161)	(0.0323)	(0.0307)	(0.00652)	(0.0598)	(0.0574)
Observations	662,928	662,927	662,927	662,866	662,863	369,917	369,917	369,911
R-squared	0.025	0.111	0.113	0.114	0.130	0.820	0.829	0.836
Year FE	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	No	No	No	Yes	No	No	Yes
Firm FE	No	No	No	No	No	Yes	Yes	Yes

Note(s): Exporter and importer rows represent the coefficient attached to a dummy equal to one if a firm participates in the export/import of goods and services regressed against the natural logarithm of GVA per worker. Exporter and importer dummies are estimated separately but within the same model. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

Table C2.5: Productivity premium by exporter and importer type, ABS, Great Britain, 2011-2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				ln(Labour Productivity)				
Goods Exporter Only	0.205***	0.229***	0.218***	0.216***	0.219***	0.00608	0.0201	0.0202
	(0.0108)	(0.0256)	(0.0227)	(0.0233)	(0.0226)	(0.0173)	(0.0168)	(0.0169)
Service Exporter Only	0.470***	0.295***	0.283***	0.280***	0.277***	0.0347*	0.0475**	0.0442**
	(0.00861)	(0.0421)	(0.0418)	(0.0402)	(0.0405)	(0.0205)	(0.0213)	(0.0190)
Both Goods & Services Exporter	0.298***	0.238***	0.224***	0.221***	0.220***	0.0577**	0.0716**	0.0719**
	(0.0174)	(0.0402)	(0.0370)	(0.0363)	(0.0363)	(0.0283)	(0.0284)	(0.0274)
Goods Importer Only	0.105***	0.219***	0.210***	0.212***	0.214***	0.0480**	0.0602***	0.0574***
	(0.00903)	(0.0427)	(0.0370)	(0.0372)	(0.0372)	(0.0197)	(0.0184)	(0.0171)
Service Importer Only	0.178***	0.152**	0.127*	0.129*	0.127*	0.0438**	0.0539***	0.0516***
	(0.0112)	(0.0742)	(0.0695)	(0.0702)	(0.0703)	(0.0199)	(0.0192)	(0.0194)
Both Goods & Services Importer	0.265***	0.341***	0.294***	0.299***	0.303***	0.0195	0.0401	0.0367
	(0.0162)	(0.0488)	(0.0353)	(0.0358)	(0.0356)	(0.0239)	(0.0245)	(0.0232)
Log of Employment			-0.00615	-0.0190	-0.0168		-0.397***	-0.391***
			(0.0164)	(0.0166)	(0.0164)		(0.0246)	(0.0229)
Foreign Owned			0.539***	0.538***	0.527***			
			(0.0520)	(0.0519)	(0.0501)			
Log of Age				0.0362**	0.0317**			
				(0.0147)	(0.0144)			
Constant	3.370***	3.373***	3.376***	3.316***	3.323***	3.617***	4.831***	4.813***
	(0.00201)	(0.00678)	(0.0169)	(0.0324)	(0.0319)	(0.00529)	(0.0746)	(0.0695)
Observations	385,615	385,614	385,614	385,599	385,593	216,874	216,874	216,868
R-squared	0.022	0.122	0.124	0.125	0.139	0.845	0.850	0.856
Year FE	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	No	No	No	Yes	No	No	Yes
Firm FE	No	No	No	No	No	Yes	Yes	Yes

Note(s): This table reports the productivity premium attached to a trade status dummy classifying the different combinations of goods and services trade a firm can undertake regressed against the natural logarithm of GVA per worker. Exporter type and importer type dummies are estimated separately but within the same model. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Table C2.6: Productivity premium by exporter and importer type, ABS/HMRC-TIG, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				ln(Labour Productivity)				
Goods Exporter Only	0.341***	0.337***	0.350***	0.346***	0.348***	0.0626***	0.102***	0.0978***
	(0.0101)	(0.0430)	(0.0369)	(0.0366)	(0.0361)	(0.0229)	(0.0264)	(0.0269)
Service Exporter Only	0.427***	0.269***	0.267***	0.265***	0.262***	0.0436***	0.0595***	0.0564***
	(0.00670)	(0.0352)	(0.0352)	(0.0339)	(0.0343)	(0.0156)	(0.0149)	(0.0139)
Both Goods & Services Exporter	0.498***	0.411***	0.415***	0.409***	0.402***	0.0921***	0.128***	0.121***
	(0.0174)	(0.0307)	(0.0319)	(0.0311)	(0.0294)	(0.0238)	(0.0262)	(0.0259)
Goods Importer Only	0.275***	0.358***	0.360***	0.363***	0.359***	0.0459**	0.0905***	0.0877***
	(0.00867)	(0.0249)	(0.0238)	(0.0244)	(0.0239)	(0.0194)	(0.0197)	(0.0194)
Service Importer Only	0.143***	0.138**	0.136**	0.138**	0.133**	0.0299	0.0535***	0.0501***
	(0.00849)	(0.0554)	(0.0531)	(0.0537)	(0.0541)	(0.0186)	(0.0172)	(0.0156)
Both Goods & Services Importer	0.425***	0.487***	0.454***	0.459***	0.457***	0.0691***	0.123***	0.119***
	(0.0169)	(0.0378)	(0.0304)	(0.0308)	(0.0293)	(0.0203)	(0.0208)	(0.0197)
Log of Employment			-0.0334**	-0.0431***	-0.0394**		-0.381***	-0.379***
			(0.0162)	(0.0163)	(0.0154)		(0.0204)	(0.0195)
Foreign Owned			0.405***	0.405***	0.391***			
			(0.0418)	(0.0416)	(0.0403)			
Log of Age				0.0288**	0.0243*			
				(0.0144)	(0.0137)			
Constant	3.388***	3.394***	3.420***	3.371***	3.377***	3.616***	4.690***	4.687***
	(0.00152)	(0.00426)	(0.0146)	(0.0315)	(0.0299)	(0.00774)	(0.0593)	(0.0570)
Observations	662,928	662,927	662,927	662,866	662,863	369,917	369,917	369,911
R-squared	0.025	0.113	0.114	0.115	0.132	0.821	0.829	0.837
Year FE	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	No	No	Yes
Ind x Year FE	No	No	No	No	No	Yes	Yes	Yes

Note(s): This table reports the productivity premium attached to a trade status dummy classifying the different combinations of goods and services trade a firm can undertake regressed against the natural logarithm of GVA per worker. Exporter type and importer type dummies are estimated separately but within the same model. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

Table C2.7: Productivity premium by combined exporter and importer status, ABS, Great Britain, 2011 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Labour Productivity)							
Importer Only	0.108***	0.200***	0.186***	0.189***	0.189***	0.0489***	0.0617***	0.0598***
	(0.00881)	(0.0384)	(0.0353)	(0.0359)	(0.0356)	(0.0176)	(0.0173)	(0.0170)
Exporter Only	0.369***	0.261***	0.252***	0.250***	0.248***	0.0309	0.0451**	0.0446**
	(0.00837)	(0.0364)	(0.0367)	(0.0352)	(0.0359)	(0.0203)	(0.0200)	(0.0186)
Importer & Exporter	0.500***	0.480***	0.444***	0.443***	0.444***	0.0673***	0.0932***	0.0889***
	(0.00743)	(0.0620)	(0.0527)	(0.0532)	(0.0528)	(0.0182)	(0.0185)	(0.0182)
Log of Employment			-0.00570	-0.0185	-0.0163		-0.397***	-0.391***
			(0.0164)	(0.0167)	(0.0165)		(0.0247)	(0.0230)
Foreign Owned			0.543***	0.543***	0.532***			
			(0.0527)	(0.0526)	(0.0507)			
Log of Age				0.0361**	0.0316**			
				(0.0148)	(0.0145)			
Constant	3.372***	3.374***	3.376***	3.317***	3.324***	3.616***	4.830***	4.812***
	(0.00203)	(0.00664)	(0.0166)	(0.0324)	(0.0319)	(0.00564)	(0.0754)	(0.0703)
Observations	385,615	385,614	385,614	385,599	385,593	216,874	216,874	216,868
R-squared	0.021	0.121	0.124	0.125	0.139	0.845	0.850	0.856
Year FE	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	No	No	No	Yes	No	No	Yes
Firm FE	No	No	No	No	No	Yes	Yes	Yes

Note(s): The table presents the coefficient of each trade status regressed against the natural logarithm of GVA per worker. Each regression increasingly includes an additional number of controls and fixed effects. A firm is an exporter/importer in this table if they export/import goods and/or services. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Table C2.8: Productivity premium by combined exporter and importer status, ABS/HMRC-TIG, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Labour Productivity)							
Importer Only	0.263***	0.302***	0.298***	0.300***	0.296***	0.0423**	0.0754***	0.0727***
	(0.00791)	(0.0461)	(0.0442)	(0.0454)	(0.0452)	(0.0190)	(0.0191)	(0.0180)
Exporter Only	0.439***	0.313***	0.314***	0.311***	0.309***	0.0573**	0.0824***	0.0788***
	(0.00681)	(0.0397)	(0.0396)	(0.0381)	(0.0383)	(0.0249)	(0.0259)	(0.0260)
Importer & Exporter	0.622***	0.565***	0.549***	0.549***	0.543***	0.0957***	0.158***	0.151***
	(0.00656)	(0.0660)	(0.0565)	(0.0569)	(0.0565)	(0.0243)	(0.0268)	(0.0271)
Log of Employment			-0.0268	-0.0365**	-0.0327**		-0.379***	-0.377***
			(0.0165)	(0.0167)	(0.0158)		(0.0203)	(0.0195)
Foreign-Owned			0.449***	0.448***	0.435***			
			(0.0394)	(0.0391)	(0.0378)			
Log of Age				0.0288**	0.0244*			
				(0.0144)	(0.0137)			
Constant	3.386***	3.394***	3.414***	3.365***	3.371***	3.620***	4.693***	4.689***
	(0.00153)	(0.00589)	(0.0160)	(0.0326)	(0.0311)	(0.00715)	(0.0600)	(0.0576)
Observations	662,928	662,927	662,927	662,866	662,863	369,917	369,917	369,911
R-squared	0.025	0.111	0.113	0.114	0.130	0.820	0.829	0.836
Year FE	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Industry FE	No	Yes	Yes	Yes	No	Yes	Yes	No
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	No	No	Yes
Ind x Year FE	No	No	No	No	No	Yes	Yes	Yes

Note(s): The table presents the coefficient of each trade status regressed against the natural logarithm of GVA per worker. Each regression increasingly includes an additional number of controls and fixed effects. A firm is an exporter/importer in this table if they export/import goods and/or services. The industry by year fixed effects are at 2-digit SIC level (industry division). Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

C3 Intensive margin regressions

Table C3.1: The impact of goods trade intensity on productivity, ABS/HMRC-TIG, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Labour Productivity)							
Goods Exporter	0.370***	0.371***	0.0584***	0.0851***	0.400***	0.399***	0.0610***	0.0857***
	(0.0343)	(0.0294)	(0.0180)	(0.0211)	(0.0285)	(0.0269)	(0.0176)	(0.0203)
Goods Exporter # Good Export Intensity	-0.125*	-0.169**	-0.218***	-0.160***	-0.697**	-0.694**	-0.327**	-0.179
	(0.0714)	(0.0687)	(0.0418)	(0.0439)	(0.266)	(0.263)	(0.136)	(0.154)
Goods Exporter # Good Export Intensity Squared					0.802**	0.738**	0.140	0.0248
					(0.334)	(0.315)	(0.135)	(0.146)
Goods Importer	0.300***	0.293***	0.00453	0.0419***	0.361***	0.352***	0.0113	0.0449***
	(0.0187)	(0.0223)	(0.0144)	(0.0139)	(0.0250)	(0.0261)	(0.0154)	(0.0148)
Goods Importer # Good Import Intensity	0.292***	0.236***	0.607***	0.626***	-0.585***	-0.616***	0.397**	0.531***
	(0.0436)	(0.0487)	(0.0435)	(0.0453)	(0.162)	(0.164)	(0.155)	(0.161)
Goods Importer # Good Import Intensity Squared					1.097***	1.064***	0.255	0.115
					(0.232)	(0.244)	(0.205)	(0.209)
Log of Employment		-0.0193		-0.386***		-0.0198		-0.386***
		(0.0156)		(0.0212)		(0.0156)		(0.0212)
Foreign Owned		0.447***				0.443***		
		(0.0435)				(0.0435)		
Constant	3.404***	3.419***	3.609***	4.717***	3.404***	3.419***	3.612***	4.717***
	(0.00159)	(0.0144)	(0.00630)	(0.0607)	(0.00171)	(0.0145)	(0.00595)	(0.0606)
Observations	622,166	622,162	356,725	356,719	622,166	622,162	356,725	356,719
R-squared	0.115	0.135	0.828	0.845	0.115	0.135	0.828	0.845
Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Industry FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Note(s): Good export/import status and values are taken from HMRC-TiG data. Export intensity is calculated as ((goods export value/turnover) * 100). Import intensity is calculated as ((goods import value/intermediate consumption) * 100). Firms with export or import intensity greater than 110% are excluded from these outputs. Both turnover and intermediate consumption are taken from the ABS. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights).

Table C3.2: The impact of goods trade value on productivity, ABS/HMRC-TIG, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Labour Productivity)							
Goods Exporter	0.207***	0.223***	0.00900	0.000674	0.340***	0.338***	0.0602***	0.0906***
	(0.0324)	(0.0341)	(0.0190)	(0.0196)	(0.0367)	(0.0315)	(0.0202)	(0.0249)
Goods Exporter # ln(Goods Exports (£,000))	0.0226**	0.0206**	0.0174***	0.0313***				
	(0.00861)	(0.00855)	(0.00406)	(0.00461)				
Goods Exporter # Goods Exports (£,000)					5.26e-07	3.26e-07	3.57e-07**	3.96e-07
					(8.63e-07)	(7.29e-07)	(1.79e-07)	(2.78e-07)
Goods Importer	0.112*	0.120**	-0.0234	-0.0264	0.383***	0.367***	0.0447**	0.0837***
	(0.0569)	(0.0544)	(0.0187)	(0.0225)	(0.0230)	(0.0225)	(0.0191)	(0.0193)
Goods Importer # ln(Goods Imports (£,000))	0.0688***	0.0645***	0.0234***	0.0383***				
	(0.0108)	(0.0102)	(0.00606)	(0.00797)				
Goods Importer # Goods Imports (£,000)					7.71e-07	6.61e-07	1.37e-07	3.22e-07
					(1.07e-06)	(8.54e-07)	(2.94e-07)	(4.36e-07)
Log of Employment		-0.0292**		-0.390***		-0.0248*		-0.377***
		(0.0140)		(0.0198)		(0.0148)		(0.0199)
Foreign Owned		0.399***				0.454***		
		(0.0467)				(0.0406)		
Constant	3.416***	3.438***	3.606***	4.698***	3.416***	3.434***	3.624***	4.694***
	(0.00130)	(0.0115)	(0.00841)	(0.0549)	(0.00198)	(0.0131)	(0.00700)	(0.0571)
Observations	662,938	662,935	369,926	369,920	662,938	662,935	369,926	369,920
R-squared	0.110	0.129	0.821	0.837	0.108	0.127	0.820	0.836
Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Industry FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Note(s): Good export/import status and values are taken from HMRC-TiG data. Labour productivity refers to GVA per worker and is derived from the ABS. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights).

Table C3.4: The impact of services trade intensity on productivity, ABS/HMRC-TIG, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Labour Productivity)							
Service Exporter	0.370***	0.364***	0.0481***	0.0525***	0.389***	0.379***	0.0510***	0.0556***
	(0.0275)	(0.0297)	(0.0136)	(0.0122)	(0.0304)	(0.0323)	(0.0130)	(0.0110)
Service Exporter # Service Export Intensity	-0.216***	-0.241***	-0.119**	-0.112*	-0.429***	-0.418***	-0.195	-0.194
	(0.0625)	(0.0585)	(0.0575)	(0.0607)	(0.135)	(0.131)	(0.165)	(0.163)
Service Exporter # Service Export Intensity Squared					0.215*	0.180	0.0875	0.0943
					(0.125)	(0.124)	(0.213)	(0.213)
Service Importer	0.258***	0.222***	0.00898	0.0237*	0.219***	0.184***	0.00357	0.0167
	(0.0466)	(0.0360)	(0.0152)	(0.0136)	(0.0545)	(0.0386)	(0.0153)	(0.0140)
Service Importer # Service Import Intensity	-0.249***	-0.252***	0.128*	0.127*	0.247	0.224	0.254**	0.289**
	(0.0829)	(0.0788)	(0.0674)	(0.0754)	(0.275)	(0.224)	(0.1000)	(0.111)
Service Importer # Service Import Intensity Squared					-0.556**	-0.534**	-0.164	-0.211*
					(0.255)	(0.215)	(0.114)	(0.114)
Log of Employment		-0.00643		-0.374***		-0.00634		-0.374***
		(0.0189)		(0.0199)		(0.0189)		(0.0199)
Foreign Owned		0.542***				0.541***		
		(0.0417)				(0.0415)		
Constant	3.418***	3.420***	3.637***	4.709***	3.418***	3.420***	3.637***	4.709***
	(0.00269)	(0.0168)	(0.00167)	(0.0576)	(0.00270)	(0.0168)	(0.00166)	(0.0576)
Observations	661,569	661,566	368,959	368,953	661,569	661,566	368,959	368,953
R-squared	0.105	0.124	0.821	0.836	0.105	0.124	0.821	0.836
Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Industry FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Note(s): Service export/import status and values are taken from the ABS. Export intensity is calculated as ((service export value/turnover) * 100). Import intensity is calculated as ((service import value/intermediate consumption) * 100). Firms with export or import intensity greater than 110% are excluded from these outputs. Both turnover and intermediate consumption are taken from the ABS. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights).

Table C3.5: The impact of services trade value on productivity, ABS/HMRC-TIG, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln(Labour Productivity)							
Service Exporter	-0.298***	-0.282***	-0.0933***	-0.120***	0.275***	0.260***	0.0369***	0.0413***
	(0.0665)	(0.0730)	(0.0324)	(0.0320)	(0.0334)	(0.0342)	(0.0127)	(0.0115)
Service Exporter # ln(Service Exports (£,000))	0.153***	0.147***	0.0282***	0.0349***				
	(0.0139)	(0.0170)	(0.00618)	(0.00669)				
Service Exporter # Service Exports (£,000)					3.54e-06***	2.93e-06***	6.35e-07***	8.27e-07***
					(4.93e-07)	(5.03e-07)	(1.74e-07)	(2.22e-07)
Service Importer	-0.0559	-0.0411	-0.00992	-0.00728	0.201***	0.164***	0.0272**	0.0413***
	(0.0462)	(0.0483)	(0.0265)	(0.0228)	(0.0537)	(0.0484)	(0.0127)	(0.0108)
Service Importer # ln(Service Imports (£,000))	0.0584***	0.0477***	0.00689	0.00921**				
	(0.0134)	(0.0104)	(0.00478)	(0.00452)				
Service Importer # Service Imports (£,000)					-9.57e-07	-1.04e-06	-2.41e-07	-2.97e-07
					(7.59e-07)	(6.25e-07)	(1.55e-07)	(2.06e-07)
Log of Employment		-0.0173		-0.376***		-0.00392		-0.373***
		(0.0195)		(0.0196)		(0.0189)		(0.0199)
Foreign Owned		0.412***				0.533***		
		(0.0563)				(0.0434)		
Constant	3.420***	3.433***	3.635***	4.711***	3.419***	3.419***	3.637***	4.705***
	(0.00352)	(0.0180)	(0.00162)	(0.0565)	(0.00303)	(0.0170)	(0.00148)	(0.0577)
Observations	662,927	662,924	369,917	369,911	662,927	662,924	369,917	369,911
R-squared	0.111	0.129	0.821	0.837	0.104	0.124	0.820	0.836
Year FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Industry FE	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Note(s): Service export/import status and values are taken from the ABS. Labour productivity refers to GVA per worker and is derived from the ABS. Each regression increasingly includes an additional number of controls and fixed effects. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights).

Table C3.6: The impact of goods trade intensity on productivity by goods export intensity quartile, ABS/HMRC-TIG, 2005 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Ln (labour productivity)			
VARIABLES	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Goods exporter# Goods export intensity	-0.468***	0.133	-0.120	-0.0416	-0.578***	-0.241*	-0.403***	-0.189***
	(0.145)	(0.165)	(0.102)	(0.101)	(0.201)	(0.143)	(0.141)	(0.0447)
Goods Importer	0.0698***	0.147***	0.208***	0.280***	0.00509	0.0317	0.0496	0.0165
	(0.0242)	(0.0265)	(0.0375)	(0.0551)	(0.0190)	(0.0262)	(0.0364)	(0.0261)
Goods importer# Goods import intensity	0.236***	0.284***	0.307***	0.346***	0.518***	0.564***	0.670***	0.877***
	(0.0472)	(0.0876)	(0.0920)	(0.0468)	(0.120)	(0.0695)	(0.0605)	(0.0876)
Log of Employment	-0.0618***	-0.0146	-0.0115	0.0258**	-0.400***	-0.356***	-0.362***	-0.331***
	(0.0171)	(0.0126)	(0.00892)	(0.0119)	(0.0282)	(0.0257)	(0.0346)	(0.0239)
Foreign Owned	0.233***	0.151***	0.206***	0.203***				
	(0.0327)	(0.0569)	(0.0334)	(0.0629)				
Log of Age	-0.0387**	-0.00407	0.0242	-0.00798				
	(0.0167)	(0.0231)	(0.0368)	(0.0201)				
Constant	4.259***	3.873***	3.751***	3.662***	5.476***	5.302***	5.369***	5.189***
	(0.0626)	(0.0566)	(0.122)	(0.0563)	(0.0924)	(0.0958)	(0.136)	(0.0778)
Observations	44,525	39,252	36,472	34,457	37,586	33,466	31,627	29,019
R-squared	0.320	0.325	0.262	0.261	0.787	0.766	0.765	0.779
Year FE	No	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes	Yes	Yes

Note(s): Quartiles drawn based on goods export intensity at the 2-digit industry and year level. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are clustered at the industry division (2-digit industry) as well. Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1.

Table C3.7: The impact of goods trade value on productivity by goods export value quartile, ABS/HMRC-TIG, 2005 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Ln(labour productivity)			
VARIABLES	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Goods exporter# Goods export value	0.0274***	0.0396***	0.0489***	0.0428***	0.0199***	0.0400***	0.0706***	0.0530***
	(0.00794)	(0.00673)	(0.0125)	(0.0120)	(0.00577)	(0.00766)	(0.0103)	(0.0119)
Goods Importer	-0.0474	-0.0132	0.0797	0.0102	-0.0699***	-0.0536	-0.113**	-0.205***
	(0.0423)	(0.0450)	(0.0800)	(0.0754)	(0.0254)	(0.0432)	(0.0562)	(0.0534)
Goods importer # Goods import value	0.0609***	0.0568***	0.0264**	0.0398***	0.0393***	0.0426***	0.0374***	0.0552***
	(0.0117)	(0.0159)	(0.0113)	(0.0129)	(0.00881)	(0.0124)	(0.0130)	(0.00934)
Log of Employment	0.00813	-0.0700**	-0.0974***	-0.168***	-0.460***	-0.406***	-0.422***	-0.350***
	(0.0159)	(0.0290)	(0.0346)	(0.0279)	(0.0330)	(0.0345)	(0.0438)	(0.0208)
Foreign Owned	0.202***	0.164***	0.115***	0.0594**				
	(0.0393)	(0.0462)	(0.0205)	(0.0244)				
Log of Age	-0.00939	0.0193	0.0493	0.0414				
	(0.0189)	(0.0165)	(0.0385)	(0.0354)				
Constant	3.645***	3.743***	3.817***	4.305***	5.304***	5.156***	5.283***	5.324***
	(0.0562)	(0.0624)	(0.148)	(0.149)	(0.0972)	(0.117)	(0.105)	(0.0866)
Observations	46,536	42,815	41,302	30,908	34,263	36,373	37,802	29,338
R-squared	0.232	0.231	0.296	0.405	0.773	0.740	0.723	0.724
Year FE	No	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes	Yes	Yes

Note(s): Quartiles drawn based on goods export intensity at the 2-digit industry and year level. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are clustered at the industry division (2-digit industry) as well. Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1.

Table C3.8: The impact of services trade intensity on productivity by services export intensity quartile, ABS/HMRC-TIG, 2005 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Ln(labour productivity)			
VARIABLES	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Service exporter# Service export intensity	0.0840	0.168	-0.270*	-0.0366	-0.508***	-0.509***	-0.119	-0.218**
	(0.171)	(0.219)	(0.153)	(0.120)	(0.143)	(0.153)	(0.0979)	(0.0994)
Service Importer	-0.00422	0.0394	0.0905**	0.272***	-0.0299	0.0248	-0.0330	-0.0398
	(0.0444)	(0.0456)	(0.0394)	(0.0680)	(0.0192)	(0.0225)	(0.0621)	(0.0337)
Service importer # Service import intensity	0.0175	0.346***	0.304**	-0.519***	0.200	0.349***	0.266**	0.182**
	(0.134)	(0.110)	(0.120)	(0.0918)	(0.120)	(0.119)	(0.102)	(0.0847)
Log of Employment	-0.0347*	0.0239	0.0630***	0.0639***	-0.427***	-0.389***	-0.242***	-0.350***
	(0.0180)	(0.0214)	(0.0194)	(0.0108)	(0.0564)	(0.0579)	(0.0694)	(0.0649)
Foreign Owned	0.431***	0.149	0.268***	0.520***				
	(0.114)	(0.161)	(0.0782)	(0.0636)				
Log of Age	-0.0225	0.0155	-0.0392	0.00191				
	(0.0270)	(0.0429)	(0.0467)	(0.0243)				
Constant	4.211***	3.832***	3.883***	3.726***	5.719***	5.580***	5.094***	5.616***
	(0.0574)	(0.0893)	(0.0917)	(0.122)	(0.207)	(0.206)	(0.253)	(0.221)
Observations	24,937	22,392	21,988	21,066	17,959	14,988	14,258	10,907
R-squared	0.271	0.276	0.251	0.244	0.858	0.829	0.805	0.860
Year FE	No	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes	Yes	Yes

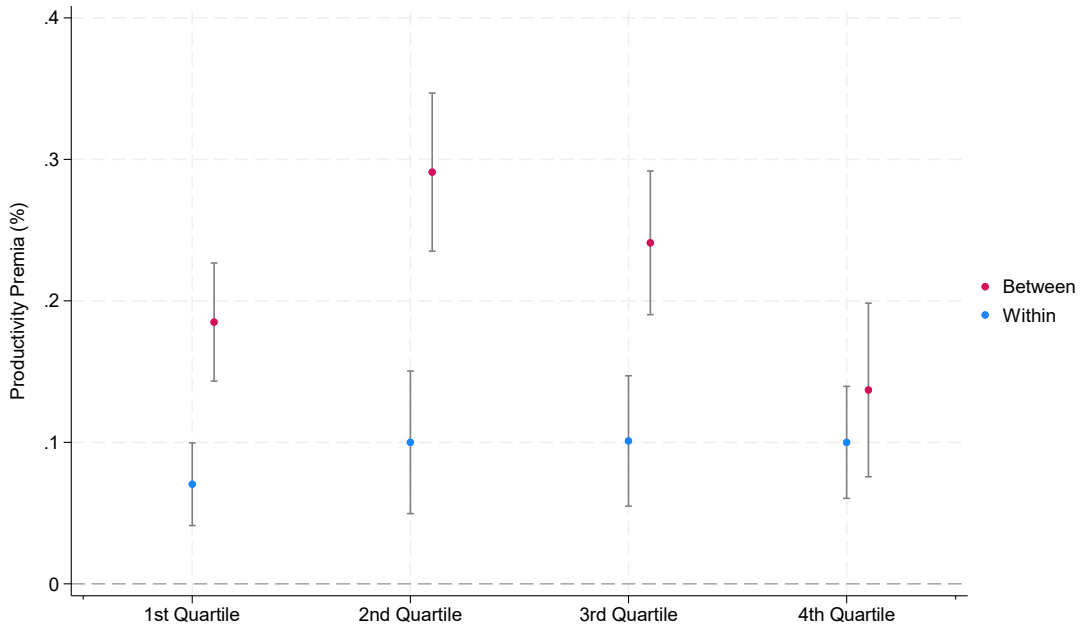
Note(s): Quartiles drawn based on goods export intensity at the 2-digit industry and year level. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are clustered at the industry division (2-digit industry) as well. Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1.

Table C3.9: The impact of services trade value on productivity by services export value quartile, ABS/HMRC-TIG, 2005 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					Ln(Labour productivity)			
VARIABLES	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Service exporter # Service export value	0.185***	0.291***	0.241***	0.137***	0.0704***	0.100***	0.101***	0.1000***
	(0.0213)	(0.0285)	(0.0259)	(0.0313)	(0.0149)	(0.0257)	(0.0235)	(0.0202)
Service Importer	-0.130	-0.150***	0.0179	-0.0653	-0.123	-0.0265	-0.0386	-0.118
	(0.0781)	(0.0401)	(0.0649)	(0.100)	(0.0843)	(0.0583)	(0.0579)	(0.0786)
Service importer #Service import value	0.0492***	0.0102	-0.0306*	0.00164	0.0266	0.0151	0.00982	0.0143
	(0.00937)	(0.0146)	(0.0162)	(0.0151)	(0.0197)	(0.0123)	(0.0119)	(0.00947)
Log of Employment	-0.0202	-0.142***	-0.202***	-0.169***	-0.441***	-0.400***	-0.366***	-0.399***
	(0.0163)	(0.0157)	(0.0280)	(0.0232)	(0.0789)	(0.0519)	(0.0716)	(0.0415)
Foreign Owned	0.0219	0.136**	0.171***	0.101***				
	(0.211)	(0.0545)	(0.0260)	(0.0244)				
Log of Age	0.0209	0.0337	0.0541***	0.0513				
	(0.0303)	(0.0227)	(0.0191)	(0.0313)				
Constant	3.143***	2.846***	3.263***	3.974***	5.023***	4.923***	5.008***	5.610***
	(0.0622)	(0.132)	(0.108)	(0.231)	(0.231)	(0.230)	(0.227)	(0.187)
Observations	25,834	24,718	21,913	19,080	11,801	14,586	16,012	16,528
R-squared	0.212	0.295	0.393	0.475	0.857	0.836	0.823	0.775
Year FE	No	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	Yes	Yes	Yes	Yes

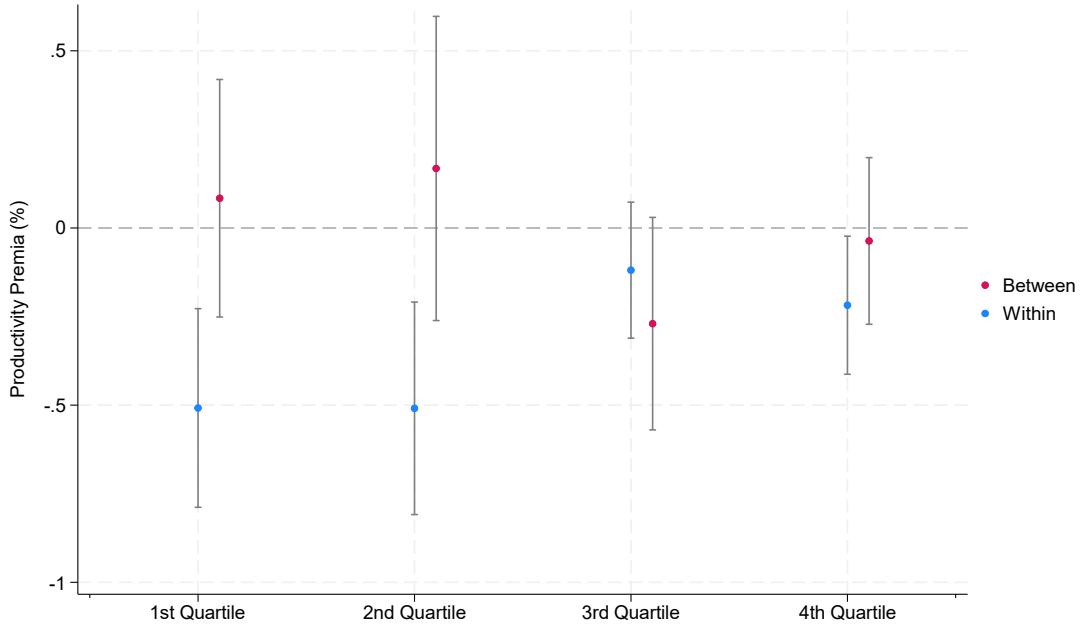
Note(s): Quartiles drawn based on goods export intensity at the 2-digit industry and year level. The industry by year fixed effects are at 2-digit SIC level (industry division). Standard errors are clustered at the industry division (2-digit industry) as well. Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1.

Figure C3.1: The elasticity of productivity to value of service exports by quartiles of export value.



Note(s): Quartiles drawn based on goods export intensity at the 2-digit industry and year level. These results use the linked ABS/HMRC TiG dataset between 2005 and 2022. Estimates marked as "Within" indicate that the regression used to estimate the elasticity uses firm fixed effects. Full regression table and controls are given above in appendix table C3.8.

Figure C3.2: The elasticity of productivity to service export intensity by quartiles of export intensity.



Note(s): Quartiles drawn based on goods export intensity at the 2-digit industry and year level. These results use the linked ABS/HMRC TiG dataset between 2005 and 2022. Estimates marked as "Within" indicate that the regression used to estimate the elasticity uses firm fixed effects. Full regression table and controls are given above in appendix table C3.9.

C.4 Difference-in-difference regressions

Figure C4.1 Number of Annual Business Survey responses by firm time from first goods export, post 2005 sample, Great Britain, 2005 to 2022

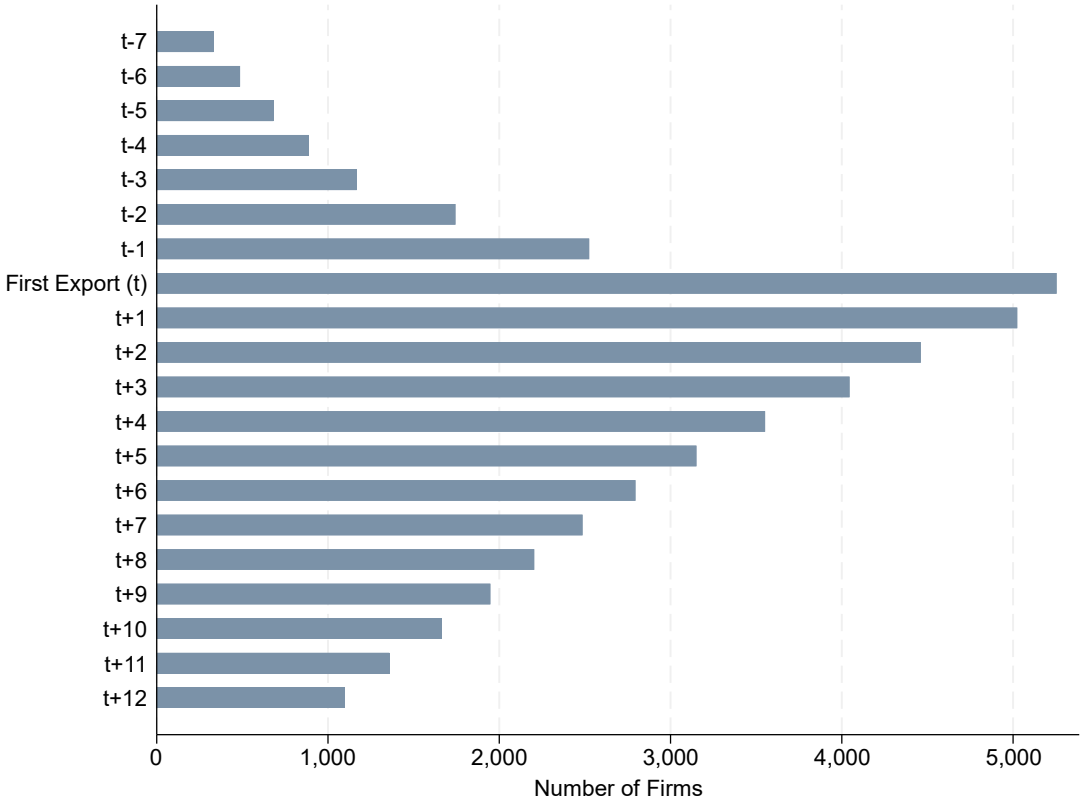


Figure C4.2: Difference in difference coefficient by year, goods exporters vs exporters-to-be, 2009 to 2019, ABS/HMRC TiG dataset, post 2005 sample, Great Britain, 2005 to 2022

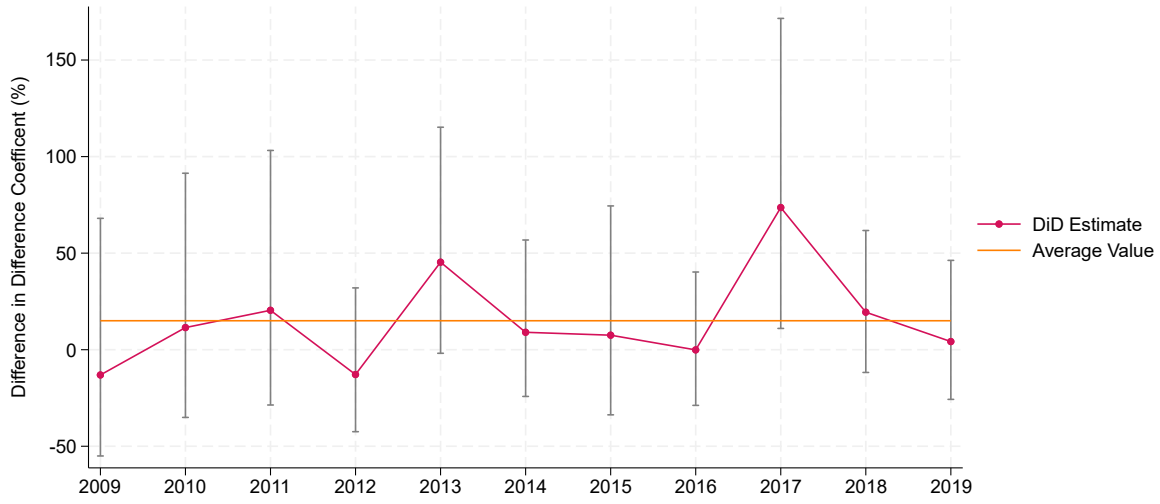


Table C4.1: Productivity differences of goods exporters-to-be compared to never-goods exporters every period before the time of first export, ABS-TiG firms born after 2005, Great Britain, 2005 to 2022

VARIABLES	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	t+3	t+4	t+5	t+6	t+7
	Ln output per worker												
Treatment	0.546***	0.400***	0.529***	0.436***	0.401***	0.608***	0.619***	0.570***	0.604***	0.576***	0.535***	0.539***	0.573***
	(0.0516)	(0.0612)	(0.0682)	(0.0614)	(0.0425)	(0.0587)	(0.0590)	(0.0629)	(0.0550)	(0.0527)	(0.0516)	(0.0554)	(0.0584)
Observations	162,718	162,856	163,122	163,535	164,128	166,294	165,053	164,707	164,435	164,205	164,000	163,832	163,668
R-squared	0.120	0.120	0.120	0.120	0.120	0.121	0.122	0.121	0.122	0.122	0.121	0.121	0.122
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note(s): The regressions control for age, foreign ownership and employment. Standard errors are clustered at the industry division (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1.

Table C4.2: Productivity differences between of goods exporters-to-be every period before the time of first export, ABS-TiG firms born after 2005, Great Britain, 2005 to 2022

VARIABLES	(1) t-5	(2) t-4	(3) t-3	(4) t-2	(5) t-1	(6) t	(7) t+1	(8) t+2	(9) t+3	(10) t+4	(11) t+5	(12) t+6	(13) t+7
Treatment	0.0917**	0.0991**	0.0611	-0.0184	-0.0560	0.112***	0.0325	0.00578	0.104**	0.0490	0.0286	0.0569	0.114*
	(0.0451)	(0.0486)	(0.0672)	(0.0522)	(0.0368)	(0.0255)	(0.0304)	(0.0423)	(0.0442)	(0.0520)	(0.0600)	(0.0809)	(0.0616)
Observations	6,509	6,509	6,509	6,509	6,509	8,507	7,620	7,452	7,364	7,248	7,189	7,136	7,054
R-squared	0.236	0.236	0.236	0.236	0.236	0.221	0.221	0.223	0.224	0.229	0.226	0.208	0.230
Year FE	No	No	No	No	No	No	No	No	No	No	No	No	No
Industry FE	No	No	No	No	No	No	No	No	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

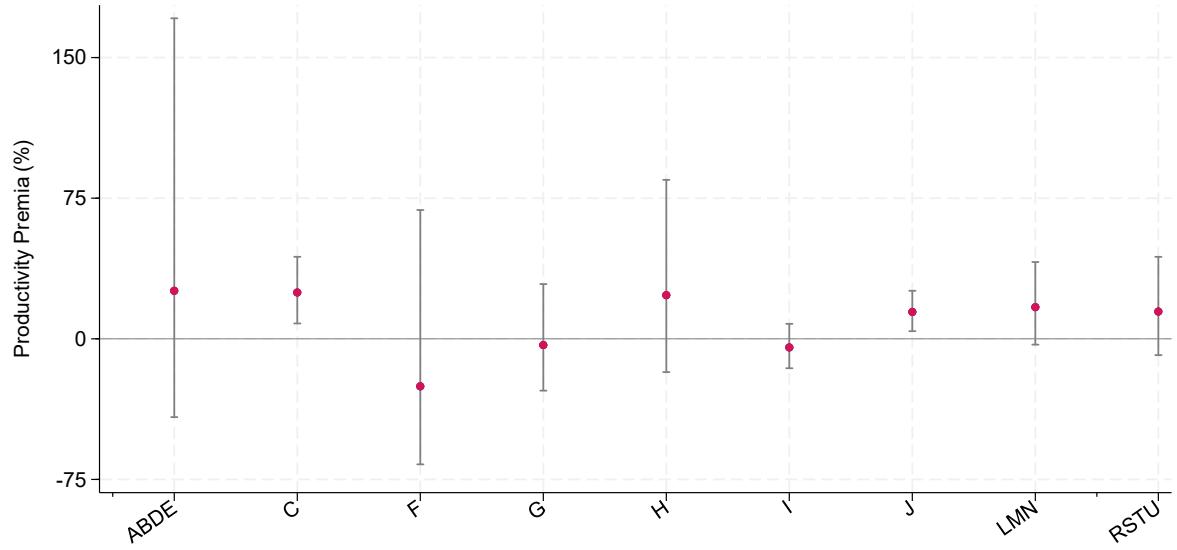
Note(s): The regressions control for age, foreign ownership and employment. Standard errors are clustered at the industry division (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1.

Table C4.3: Two-way fixed effects model, goods trade only, post 2005 sample, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)
	Ln(Labour Productivity)			
Treatment	0.0592	0.109***	0.104***	0.105***
	(0.0366)	(0.0357)	(0.0358)	(0.0360)
Log of Employment		-0.288***	-0.282***	-0.282***
		(0.0325)	(0.0312)	(0.0312)
Foreign Owned				-0.0373
				(0.0446)
Constant	4.002***	5.214***	5.193***	5.199***
	(0.0282)	(0.145)	(0.139)	(0.139)
Observations	16,100	16,100	16,100	16,100
R-squared	0.680	0.688	0.694	0.694
Year FE	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	Yes
Region FE	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

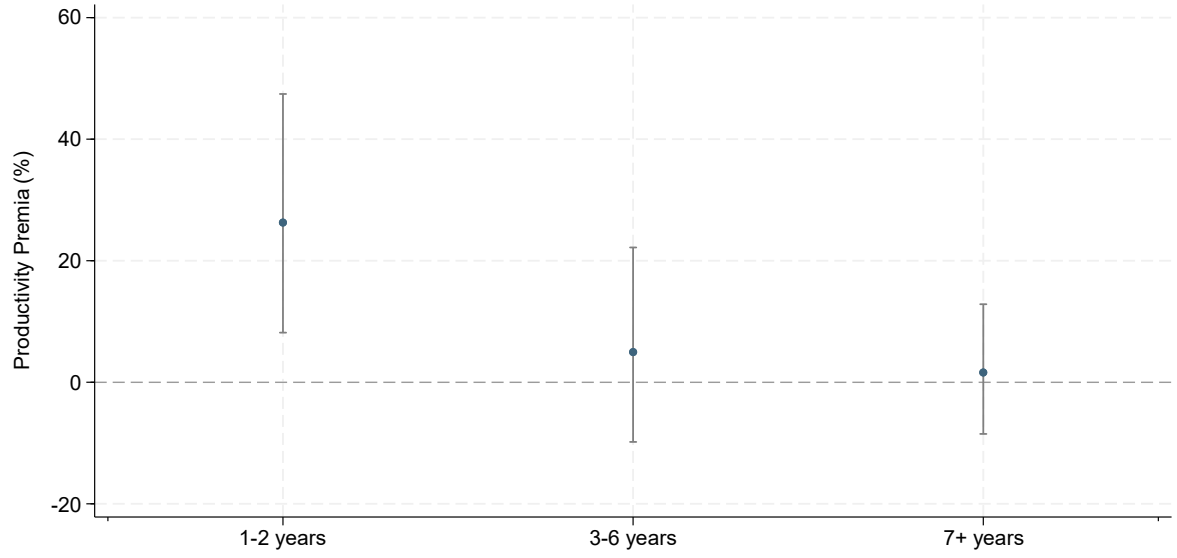
Note(s): Treatment corresponds to a dummy equal to one in years following a firms first goods export and zero in the years prior to this initial goods export as determined in the linked ABS/HMRC TiG data. Standard errors are clustered at the industry division (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1.

Figure C4.3: Two-way fixed effects model coefficient by broad macro sector, post 2005 sample, Great Britain, 2005 to 2022



Note(s) the same as in Table C4.3

Figure C4.5: Two-way fixed effects model coefficient by firm age at time of first export, post 2005 sample, Great Britain, 2005 to 2022

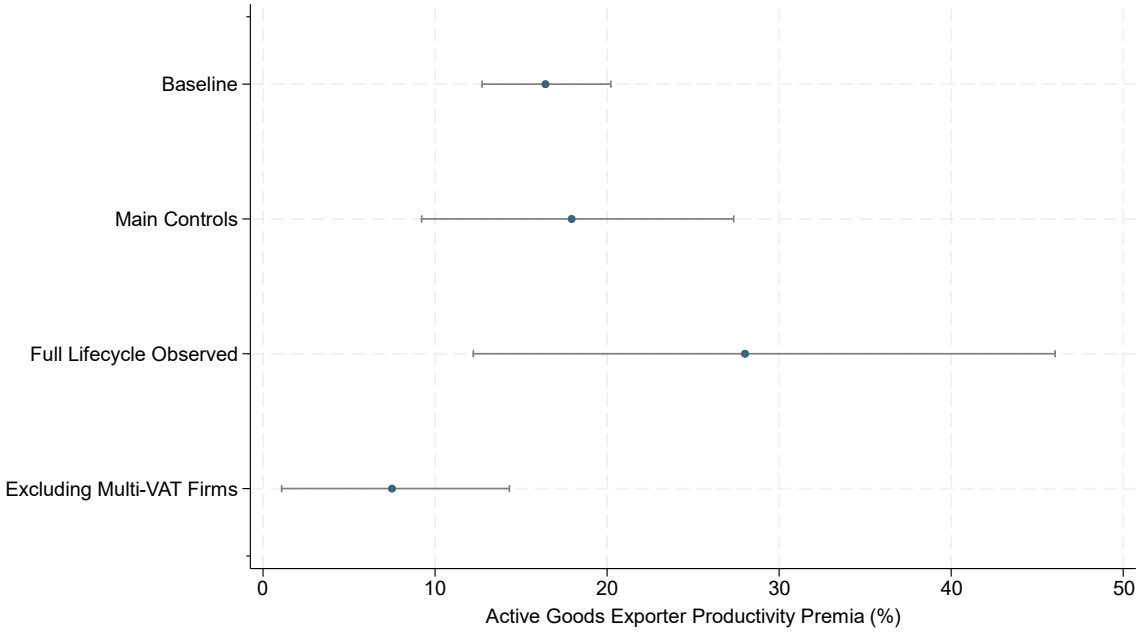


Note(s) the same as in Table C4.3

Productivity of active vs inactive exporters:

We present some stylised results on the importance of continuous compared to intermittent exporting. Trade is patchy, as reported in Appendix B2, the average exporter will export only 60% of their alive years after entering international markets. Actively exporting matters:

Figure C4.6: Productivity differences between active and dormant goods exporters, post 2005 sample, Great Britain, 2005 to 2022



Note(s): The coefficient presents the “productivity premium” of being an active goods exporter among firms who have ever exported goods. Our “main controls” model controls for employment, foreign ownership, age and region and industry by year differences in productivity. “Full lifecycle observed” repeats the “main controls” model while restricting to firms which we see from birth to death between 2005 and 2022. “Excluding multi-VAT” drops out larger (more administratively complicated firms) where apportionment has taken place. Error bars reflect 95% confidence intervals. Standard errors are clustered at the industry division (two-digit industry).

Active goods exporters are 17% more productive than firms that have exported previously but are not exporting in that year, controlling for employment and foreign ownership and including year, cohort and industry fixed effects.

When controlling for the number of additional years of trade, active goods exporters are 13% more productive with every additional year equivalent to an additional 1% of GVA per worker. These results are robust to excluding firms in complex VAT enterprises, or firms we don’t observe the full lifecycle.

D: Regression robustness checks

D1: Weights options

Figure D1.1: Between and within firm productivity premium of combined trade status for any trade in goods or services under different weights options, ABS, 2011 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Unweighted	Firm-weighted	Employment-weighted	Unweighted	Firm-weighted	Employment-weighted
Importer Only	0.228***	0.189***	0.274***	0.0330***	0.0598***	0.0340**
	(0.0243)	(0.0356)	(0.0333)	(0.0106)	(0.0170)	(0.0162)
Exporter Only	0.252***	0.248***	0.320***	0.0257*	0.0446**	0.0359
	(0.0294)	(0.0359)	(0.0413)	(0.0135)	(0.0186)	(0.0493)
Importer & Exporter	0.406***	0.444***	0.435***	0.0457***	0.0889***	0.0532**
	(0.0374)	(0.0528)	(0.0459)	(0.0121)	(0.0182)	(0.0244)
Log of Employment	0.0292**	-0.0163	0.0175	-0.387***	-0.391***	-0.409***
	(0.0122)	(0.0165)	(0.0123)	(0.0200)	(0.0230)	(0.0312)
Foreign Owned	0.232***	0.532***	0.123***			
	(0.0259)	(0.0507)	(0.0387)			
Log of Age	0.0655***	0.0316**	0.0984***			
	(0.0114)	(0.0145)	(0.0173)			
Constant	3.281***	3.324***	3.051***	5.535***	4.812***	6.104***
	(0.0316)	(0.0319)	(0.0431)	(0.0857)	(0.0703)	(0.179)
Observations	385,593	385,593	385,593	216,868	216,868	216,868
R-squared	0.201	0.139	0.304	0.767	0.856	0.830
Year FE	Yes	Yes	Yes	No	No	No
Industry FE	Yes	Yes	Yes	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Figure D1.2: Between and within firm productivity premium of combined trade status for any trade in goods or services under different weights options, ABS/HMRC-TIG, 2005 to 2022

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Unweighted	Firm-weighted	Employment-weighted	Unweighted	Firm-weighted	Employment-weighted
Importer Only	0.286***	0.296***	0.291***	0.0466***	0.0727***	0.0356***
	(0.0244)	(0.0452)	(0.0284)	(0.00733)	(0.0180)	(0.0110)
Exporter Only	0.287***	0.309***	0.299***	0.0359***	0.0788***	0.0265**
	(0.0264)	(0.0383)	(0.0292)	(0.00880)	(0.0260)	(0.0132)
Importer & Exporter	0.464***	0.543***	0.423***	0.0816***	0.151***	0.0472**
	(0.0393)	(0.0565)	(0.0464)	(0.0130)	(0.0271)	(0.0205)
Log of Employment	0.00163	-0.0327**	-0.0126	-0.347***	-0.377***	-0.348***
	(0.0121)	(0.0158)	(0.0121)	(0.0161)	(0.0195)	(0.0263)
Foreign Owned	0.210***	0.435***	0.109***			
	(0.0214)	(0.0378)	(0.0353)			
Log of Age	0.0651***	0.0244*	0.115***			
	(0.0119)	(0.0137)	(0.0194)			
Constant	3.336***	3.371***	3.106***	5.323***	4.689***	5.748***
	(0.0321)	(0.0311)	(0.0452)	(0.0697)	(0.0576)	(0.153)
Observations	662,863	662,863	662,863	346,992	346,992	346,992
R-squared	0.206	0.130	0.296	0.723	0.818	0.791
Year FE	Yes	Yes	Yes	No	No	No
Industry FE	Yes	Yes	Yes	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

Figure D1.3: Between and within firm productivity premium by goods and services combined trade status under different weights options, ABS, 2011 to 2022

VARIABLES	(1) Unweighted	(2) Firm-weighted	(3) Employment-weighted	(4) Unweighted	(5) Firm-weighted	(6) Employment-weighted
Goods Exporter Only	0.171***	0.219***	0.143***	0.00887	0.0202	-0.00687
	(0.0288)	(0.0226)	(0.0314)	(0.0124)	(0.0169)	(0.0373)
Service Exporter Only	0.252***	0.277***	0.285***	0.0237	0.0442**	0.0519
	(0.0329)	(0.0405)	(0.0469)	(0.0142)	(0.0190)	(0.0361)
Both Goods & Services Exporter	0.203***	0.220***	0.220***	0.0352**	0.0719**	0.0185
	(0.0245)	(0.0363)	(0.0361)	(0.0170)	(0.0274)	(0.0345)
Goods Importer Only	0.191***	0.214***	0.226***	0.0308***	0.0574***	0.0354*
	(0.0183)	(0.0372)	(0.0286)	(0.00842)	(0.0171)	(0.0198)
Service Importer Only	0.206***	0.127*	0.208***	0.0179	0.0516***	0.0142
	(0.0354)	(0.0703)	(0.0443)	(0.0125)	(0.0194)	(0.0233)
Both Goods & Services Importer	0.244***	0.303***	0.246***	0.0362***	0.0367	0.0368*
	(0.0250)	(0.0356)	(0.0384)	(0.0119)	(0.0232)	(0.0215)
Log of Employment	0.0291**	-0.0168	0.0175	-0.387***	-0.391***	-0.409***
	(0.0122)	(0.0164)	(0.0124)	(0.0200)	(0.0229)	(0.0312)
Foreign Owned	0.220***	0.527***	0.115***			
	(0.0255)	(0.0501)	(0.0376)			
Log of Age	0.0657***	0.0317**	0.0981***			
	(0.0114)	(0.0144)	(0.0173)			
Constant	3.287***	3.323***	3.062***	5.537***	4.813***	6.104***
	(0.0324)	(0.0319)	(0.0418)	(0.0856)	(0.0695)	(0.180)
Observations	385,593	385,593	385,593	216,868	216,868	216,868
R-squared	0.202	0.139	0.304	0.767	0.856	0.830
Year FE	Yes	Yes	Yes	No	No	No
Industry FE	Yes	Yes	Yes	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Figure D1.4: Between and within productivity premium by goods and services combined trade status under different weights options, ABS/HMRC-TIG, 2005 to 2022

VARIABLES	(1) Unweighted	(2) Firm-weighted	(3) Employment-weighted	(4) Unweighted	(5) Firm-weighted	(6) Employment-weighted
Goods Exporter Only	0.219***	0.348***	0.160***	0.0470***	0.0978***	0.0240
	(0.0259)	(0.0361)	(0.0286)	(0.0109)	(0.0269)	(0.0163)
Service Exporter Only	0.211***	0.262***	0.189***	0.0194**	0.0564***	0.00381
	(0.0240)	(0.0343)	(0.0321)	(0.00914)	(0.0139)	(0.0137)
Both Goods & Services Exporter	0.295***	0.402***	0.322***	0.0619***	0.121***	0.0513**
	(0.0296)	(0.0294)	(0.0514)	(0.0109)	(0.0259)	(0.0241)
Goods Importer Only	0.250***	0.359***	0.234***	0.0593***	0.0877***	0.0376**
	(0.0223)	(0.0239)	(0.0300)	(0.00872)	(0.0194)	(0.0161)
Service Importer Only	0.157***	0.133**	0.150***	0.0221***	0.0501***	0.0134
	(0.0279)	(0.0541)	(0.0379)	(0.00648)	(0.0156)	(0.0123)
Both Goods & Services Importer	0.322***	0.457***	0.300***	0.0817***	0.119***	0.0551***
	(0.0286)	(0.0293)	(0.0388)	(0.0113)	(0.0197)	(0.0160)
Log of Employment	-0.000227	-0.0394**	-0.0147			
	(0.0123)	(0.0154)	(0.0131)			
Foreign Owned	0.179***	0.391***	0.0832**			
	(0.0198)	(0.0403)	(0.0333)			
Log of Age	0.0644***	0.0243*	0.114***			
	(0.0118)	(0.0137)	(0.0192)			
Constant	3.347***	3.377***	3.124***	5.319***	4.687***	5.747***
	(0.0320)	(0.0299)	(0.0438)	(0.0685)	(0.0570)	(0.151)
Observations	662,863	662,863	662,863	369,911	369,911	369,911
R-squared	0.206	0.132	0.298	0.751	0.837	0.808
Year FE	Yes	Yes	Yes	No	No	No
Industry FE	Yes	Yes	Yes	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

D2. TiG vs ABS productivity premium for consistent years 2011 to 2022

Figure D2.1: Comparison of between and within productivity premium by combined trade status when estimated using ABS vs ABS/HMRC-TIG data for same 2011 to 2022 period

	(1)	(2)	(3)	(4)
	Ln(labour productivity)			
VARIABLES	ABS	ABS/HMRC-TIG	ABS	ABS/HMRC-TIG
	Between firm (2011-2022)		Within firm (2011-2022)	
Importer Only	0.189***	0.300***	0.0598***	0.0727***
	(0.0356)	(0.0539)	(0.0170)	(0.0180)
Exporter Only	0.248***	0.322***	0.0446**	0.0788***
	(0.0359)	(0.0451)	(0.0186)	(0.0260)
Importer & Exporter	0.444***	0.518***	0.0889***	0.151***
	(0.0528)	(0.0625)	(0.0182)	(0.0271)
Log of Employment	-0.0163	-0.0274*	-0.391***	-0.377***
	(0.0165)	(0.0157)	(0.0230)	(0.0195)
Foreign Owned	0.532***	0.478***		
	(0.0507)	(0.0470)		
Log of Age	0.0316**	0.0308**		
	(0.0145)	(0.0143)		
Constant	3.324***	3.327***	4.812***	4.689***
	(0.0319)	(0.0314)	(0.0703)	(0.0576)
Observations	385,593	430,782	216,868	369,911
R-squared	0.139	0.140	0.856	0.836
Year FE	No	Yes	No	No
Industry FE	No	Yes	No	No
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes

Shared note(s) below under Table D2.2

Figure D2.2: Comparison of between and within productivity premium by trade type when estimated using ABS vs ABS/HMRC-TIG data for same 2011 to 2022 period

	(1)	(2)	(3)	(4)
	Ln(labour productivity)			
VARIABLES	ABS	ABS/HMRC-TIG	ABS	ABS/HMRC-TIG
	Between firm (2011-2022)		Within firm (2011-2022)	
Goods Exporter Only	0.219***	0.367***	0.0202	0.0978***
	(0.0226)	(0.0452)	(0.0169)	(0.0269)
Service Exporter Only	0.277***	0.262***	0.0442**	0.0564***
	(0.0405)	(0.0375)	(0.0190)	(0.0139)
Both Goods & Services Exporter	0.220***	0.402***	0.0719**	0.121***
	(0.0363)	(0.0372)	(0.0274)	(0.0259)
Goods Importer Only	0.214***	0.353***	0.0574***	0.0877***
	(0.0372)	(0.0315)	(0.0171)	(0.0194)
Service Importer Only	0.127*	0.131**	0.0516***	0.0501***
	(0.0703)	(0.0618)	(0.0194)	(0.0156)
Both Goods & Services Importer	0.303***	0.443***	0.0367	0.119***
	(0.0356)	(0.0323)	(0.0232)	(0.0197)
Log of Employment	-0.0168	-0.0347**	-0.391***	-0.379***
	(0.0164)	(0.0154)	(0.0229)	(0.0195)
Foreign Owned	0.527***	0.434***		
	(0.0501)	(0.0517)		
Log of Age	0.0317**	0.0306**		
	(0.0144)	(0.0142)		
Constant	3.323***	3.335***	4.813***	4.687***
	(0.0319)	(0.0301)	(0.0695)	(0.0570)
Observations	385,593	430,782	216,868	369,911
R-squared	0.139	0.141	0.856	0.837
Year FE	No	Yes	No	No
Industry FE	No	Yes	No	No
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

D3 Impact of productivity outlier stringency

In these tables we present the impact different choices of outlier trimming have on the results. Column (1) shows the productivity premium without any outlier trimming applied. Column (2) shows the impact of trimming the top and bottom 1 percentile of labour productivity by year and industry division where these thresholds are applied based on the weighted distribution. Column (3) shows the impact of only dropping traders that export or import above the top or bottom 1 percentile of trade value by year and industry division. Column (4) corresponds to the results in the paper shows the impact of trimming both trade value and labour productivity combined. For outputs using

Figure D3.1 Between firm productivity premium by combined trade status for different outlier trimming options, ABS, 2011 to 2022

VARIABLES	(1) No Trimming	(2) OPW Trimming	(3) Trade Value Trimming	(4) OPW and Trade Value Trimming
Importer Only	0.207***	0.189***	0.207***	0.189***
	(0.0374)	(0.0356)	(0.0374)	(0.0356)
Exporter Only	0.264***	0.247***	0.265***	0.248***
	(0.0356)	(0.0359)	(0.0355)	(0.0359)
Importer & Exporter	0.487***	0.446***	0.485***	0.444***
	(0.0527)	(0.0531)	(0.0524)	(0.0528)
Log of Employment	-0.0231	-0.0152	-0.0244	-0.0163
	(0.0165)	(0.0165)	(0.0165)	(0.0165)
Foreign Owned	0.620***	0.537***	0.613***	0.532***
	(0.0537)	(0.0497)	(0.0549)	(0.0507)
Log of Age	0.0361**	0.0315**	0.0362**	0.0316**
	(0.0142)	(0.0145)	(0.0142)	(0.0145)
Constant	3.336***	3.323***	3.336***	3.324***
	(0.0309)	(0.0320)	(0.0308)	(0.0319)
Observations	402,538	394,056	393,182	385,593
R-squared	0.136	0.139	0.136	0.139
Year FE	No	No	No	No
Industry FE	No	No	No	No
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Figure D3.2 Between firm productivity premium by combined trade status for different outlier trimming options, ABS/HMRC-TiG, 2005 to 2022

VARIABLES	(1) No Trimming	(2) OPW Trimming	(3) Trade Value Trimming	(4) OPW and Trade Value Trimming
Importer Only	0.323***	0.296***	0.324***	0.296***
	(0.0439)	(0.0453)	(0.0438)	(0.0452)
Exporter Only	0.328***	0.309***	0.328***	0.309***
	(0.0410)	(0.0383)	(0.0410)	(0.0383)
Importer & Exporter	0.611***	0.546***	0.606***	0.543***
	(0.0563)	(0.0569)	(0.0557)	(0.0565)
Log of Employment	-0.0411**	-0.0317**	-0.0423***	-0.0327**
	(0.0159)	(0.0158)	(0.0158)	(0.0158)
Foreign Owned	0.516***	0.440***	0.508***	0.435***
	(0.0399)	(0.0369)	(0.0410)	(0.0378)
Log of Age	0.0278**	0.0243*	0.0280**	0.0244*
	(0.0136)	(0.0137)	(0.0136)	(0.0137)
Constant	3.385***	3.370***	3.385***	3.371***
	(0.0303)	(0.0311)	(0.0302)	(0.0311)
Observations	695,208	677,930	678,568	662,863
R-squared	0.129	0.131	0.129	0.130
Year FE	No	No	No	No
Industry FE	No	No	No	No
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

Figure D3.3 Between firm productivity premium by trade type for different outlier trimming options, ABS, 2011 to 2022

VARIABLES	(1) No Trimming	(2) OPW Trimming	(3) Trade Value Trimming	(4) OPW and Trade Value Trimming
Goods Exporter Only	0.246***	0.221***	0.244***	0.219***
	(0.0229)	(0.0226)	(0.0229)	(0.0226)
Service Exporter Only	0.291***	0.276***	0.292***	0.277***
	(0.0389)	(0.0405)	(0.0390)	(0.0405)
Both Goods & Services Exporter	0.241***	0.220***	0.240***	0.220***
	(0.0352)	(0.0363)	(0.0353)	(0.0363)
Goods Importer Only	0.231***	0.215***	0.230***	0.214***
	(0.0392)	(0.0372)	(0.0392)	(0.0372)
Service Importer Only	0.156**	0.127*	0.157**	0.127*
	(0.0710)	(0.0703)	(0.0710)	(0.0703)
Both Goods & Services Importer	0.317***	0.307***	0.313***	0.303***
	(0.0369)	(0.0354)	(0.0370)	(0.0356)
Log of Employment	-0.0236	-0.0158	-0.0249	-0.0168
	(0.0165)	(0.0164)	(0.0164)	(0.0164)
Foreign Owned	0.615***	0.531***	0.609***	0.527***
	(0.0528)	(0.0491)	(0.0538)	(0.0501)
Log of Age	0.0362**	0.0316**	0.0363**	0.0317**
	(0.0142)	(0.0144)	(0.0142)	(0.0144)
Constant	3.335***	3.322***	3.336***	3.323***
	(0.0308)	(0.0320)	(0.0307)	(0.0319)
Observations	402,538	394,056	393,182	385,593
R-squared	0.136	0.140	0.136	0.139
Year FE	No	No	No	No
Industry FE	No	No	No	No
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Figure D3.4 Between firm productivity premium by trade type for different outlier trimming options, ABS/HMRC-TiG, 2005 to 2022

VARIABLES	(1) No Trimming	(2) OPW Trimming	(3) Trade Value Trimming	(4) OPW and Trade Value Trimming
Goods Exporter Only	0.391***	0.351***	0.387***	0.348***
	(0.0389)	(0.0361)	(0.0387)	(0.0361)
Service Exporter Only	0.280***	0.261***	0.280***	0.262***
	(0.0333)	(0.0343)	(0.0333)	(0.0343)
Both Goods & Services Exporter	0.430***	0.405***	0.425***	0.402***
	(0.0289)	(0.0292)	(0.0291)	(0.0294)
Goods Importer Only	0.391***	0.360***	0.390***	0.359***
	(0.0206)	(0.0239)	(0.0205)	(0.0239)
Service Importer Only	0.167***	0.133**	0.168***	0.133**
	(0.0541)	(0.0541)	(0.0541)	(0.0541)
Both Goods & Services Importer	0.505***	0.462***	0.497***	0.457***
	(0.0286)	(0.0294)	(0.0283)	(0.0293)
Log of Employment	-0.0486***	-0.0388**	-0.0492***	-0.0394**
	(0.0155)	(0.0154)	(0.0155)	(0.0154)
Foreign Owned	0.468***	0.393***	0.464***	0.391***
	(0.0417)	(0.0394)	(0.0429)	(0.0403)
Log of Age	0.0278**	0.0242*	0.0278**	0.0243*
	(0.0135)	(0.0137)	(0.0135)	(0.0137)
Constant	3.391***	3.377***	3.392***	3.377***
	(0.0290)	(0.0299)	(0.0289)	(0.0299)
Observations	695,208	677,930	678,568	662,863
R-squared	0.131	0.132	0.130	0.132
Year FE	No	No	No	No
Industry FE	No	No	No	No
Region FE	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

D4 The impact of standard error clustering

Throughout this paper we cluster standard errors at the industry division, below we showcase the impact of other assumptions about standard errors.

Column (1) assumes errors are independently identically distributed, “Robust” standard errors reported in column (2) refer to Huber-White standard errors. These are obtained using the Huber-White sandwich estimator for the variance and are robust to violations of homoskedasticity. Robust standard errors assume observations are independent but not identically distributed.

Clustered standard errors, reported in columns 3,4,5 are robust to violations of independence. They allow for observations in a given industry division (column 3) in a given industry division and year (column 4) or within a given firm (column 5) to be correlated with one another. Violations of independence mean additional observations within the same industry, for instance, do not offer as much new information about the variable of interest as they would have were observations independent. As a result standard errors and respective confidence intervals are wider, making it harder to identify significant results.

Table D4.1 Between firm productivity premium by combined trade status, statistical significance for different standard error options, ABS, 2011 to 2022

VARIABLES	(1) None	(2) Robust	(3) Clustered (Industry)	(4) Clustered (Industry x Year)	(5) Clustered (Firm)
Importer Only	0.189***	0.189***	0.189***	0.189***	0.189***
	(0.00860)	(0.0189)	(0.0356)	(0.0212)	(0.0190)
Exporter Only	0.248***	0.248***	0.248***	0.248***	0.248***
	(0.00808)	(0.0227)	(0.0359)	(0.0245)	(0.0227)
Importer & Exporter	0.444***	0.444***	0.444***	0.444***	0.444***
	(0.00764)	(0.0189)	(0.0528)	(0.0218)	(0.0190)
Log of Employment	-0.0163***	-0.0163***	-0.0163	-0.0163***	-0.0163***
	(0.00195)	(0.00411)	(0.0165)	(0.00620)	(0.00414)
Foreign Owned	0.532***	0.532***	0.532***	0.532***	0.532***
	(0.0165)	(0.0437)	(0.0507)	(0.0437)	(0.0442)
Log of Age	0.0316***	0.0316***	0.0316**	0.0316***	0.0316***
	(0.00181)	(0.00526)	(0.0145)	(0.00712)	(0.00526)
Constant	3.324***	3.324***	3.324***	3.324***	3.324***
	(0.00386)	(0.0108)	(0.0319)	(0.0141)	(0.0108)
Observations	385,593	385,593	385,593	385,593	385,593
R-squared	0.139	0.139	0.139	0.139	0.139
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses. Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Table D4.2 Within firm productivity premium statistical by combined trade status, significance for different standard error options, ABS, 2011 to 2022

VARIABLES	(1) None	(2) Robust	(3) Clustered (Industry)	(4) Clustered (Industry x Year)	(5) Clustered (Firm)
Importer Only	0.0598***	0.0598***	0.0598***	0.0598***	0.0598***
	(0.00762)	(0.0123)	(0.0170)	(0.0132)	(0.0134)
Exporter Only	0.0446***	0.0446***	0.0446**	0.0446***	0.0446***
	(0.00899)	(0.0155)	(0.0186)	(0.0156)	(0.0169)
Importer & Exporter	0.0889***	0.0889***	0.0889***	0.0889***	0.0889***
	(0.00781)	(0.0142)	(0.0182)	(0.0145)	(0.0160)
Log of Employment	-0.391***	-0.391***	-0.391***	-0.391***	-0.391***
	(0.00559)	(0.0153)	(0.0230)	(0.0167)	(0.0165)
Foreign Owned					
Log of Age					
Constant	4.812***	4.812***	4.812***	4.812***	4.812***
	(0.0173)	(0.0467)	(0.0703)	(0.0511)	(0.0506)
Observations	216,868	216,868	216,868	216,868	216,868
R-squared	0.856	0.856	0.856	0.856	0.856
Year FE	No	No	No	No	No
Industry FE	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes

Notes same as in Table D4.1.

Table D4.3 Between firm productivity premium by combined trade status, statistical significance for different standard error options, ABS/HMRC-TiG, 2005 to 2022

VARIABLES	(1) None	(2) Robust	(3) Clustered (Industry)	(4) Clustered (Industry x Year)	(5) Clustered (Firm)
Importer Only	0.296***	0.296***	0.296***	0.296***	0.296***
	(0.00771)	(0.0190)	(0.0452)	(0.0205)	(0.0191)
Exporter Only	0.309***	0.309***	0.309***	0.309***	0.309***
	(0.00662)	(0.0171)	(0.0383)	(0.0198)	(0.0171)
Importer & Exporter	0.543***	0.543***	0.543***	0.543***	0.543***
	(0.00685)	(0.0146)	(0.0565)	(0.0196)	(0.0147)
Log of Employment	-0.0327***	-0.0327***	-0.0327**	-0.0327***	-0.0327***
	(0.00151)	(0.00301)	(0.0158)	(0.00498)	(0.00304)
Foreign Owned	0.435***	0.435***	0.435***	0.435***	0.435***
	(0.0131)	(0.0327)	(0.0378)	(0.0328)	(0.0330)
Log of Age	0.0244***	0.0244***	0.0244*	0.0244***	0.0244***
	(0.00143)	(0.00392)	(0.0137)	(0.00547)	(0.00393)
Constant	3.371***	3.371***	3.371***	3.371***	3.371***
	(0.00306)	(0.00810)	(0.0311)	(0.0110)	(0.00811)
Observations	662,863	662,863	662,863	662,863	662,863
R-squared	0.130	0.130	0.130	0.130	0.130
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses. Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.

Table D4.4 Within firm productivity premium by combined trade status, statistical significance for different standard error options, ABS/HMRC-TiG, 2005 to 2022

VARIABLES	(1) None	(2) Robust	(3) Clustered (Industry)	(4) Clustered (Industry x Year)	(5) Clustered (Firm)
Importer Only	0.0727***	0.0727***	0.0727***	0.0727***	0.0727***
	(0.00608)	(0.0107)	(0.0180)	(0.0101)	(0.0122)
Exporter Only	0.0788***	0.0788***	0.0788***	0.0788***	0.0788***
	(0.00651)	(0.0121)	(0.0260)	(0.0136)	(0.0138)
Importer & Exporter	0.151***	0.151***	0.151***	0.151***	0.151***
	(0.00633)	(0.0117)	(0.0271)	(0.0124)	(0.0136)
Log of Employment	-0.377***	-0.377***	-0.377***	-0.377***	-0.377***
	(0.00332)	(0.00878)	(0.0195)	(0.0110)	(0.0104)
Foreign Owned					
Log of Age					
Constant	4.689***	4.689***	4.689***	4.689***	4.689***
	(0.00957)	(0.0251)	(0.0576)	(0.0318)	(0.0299)
Observations	369,911	369,911	369,911	369,911	369,911
R-squared	0.836	0.836	0.836	0.836	0.836
Year FE	No	No	No	No	No
Industry FE	No	No	No	No	No
Region FE	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes

Notes same as in Table D4.3.

D5 Productivity premium only for the “fixed effects” samples of firm

Table D5.1 Between firm productivity premium by trade type, estimated only for firm that are also present in the fixed effects regression used to estimate the equivalent within firm productivity premium

VARIABLES	(1) ABS 2011 to 2022	(2) ABS/HMRC-TiG 2005 to 2022
Goods Exporter Only	0.162***	0.214***
	(0.0238)	(0.0279)
Service Exporter Only	0.240***	0.234***
	(0.0392)	(0.0334)
Both Goods & Services Exporter	0.188***	0.258***
	(0.0277)	(0.0294)
Goods Importer Only	0.209***	0.270***
	(0.0367)	(0.0223)
Service Importer Only	0.265***	0.233***
	(0.0691)	(0.0478)
Both Goods & Services Importer	0.261***	0.353***
	(0.0318)	(0.0292)
Log of Employment	0.0206	-0.00985
	(0.0218)	(0.0167)
Foreign Owned	0.192***	0.150***
	(0.0347)	(0.0233)
Log of Age	0.00729	-0.0154
	(0.0148)	(0.0136)
Constant	3.412***	3.576***
	(0.0519)	(0.0381)
Observations	216,869	369,883
R-squared	0.325	0.294
Year FE	Yes	Yes
Industry FE	Yes	Yes
Region FE	Yes	Yes
Ind x Year FE	Yes	Yes
Firm FE	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

Table D5.2 Between firm productivity premium by combined trade status, estimated only for firm that are also present in the fixed effects regression used to estimate the equivalent within firm productivity premium

	(1)	(2)
	Ln(Labour Productivity)	
VARIABLES	ABS 2011 to 2022	ABS/HMRC-TiG 2005 to 2022
Importer Only	0.268***	0.309***
	(0.0546)	(0.0387)
Exporter Only	0.259***	0.277***
	(0.0385)	(0.0344)
Importer & Exporter	0.420***	0.493***
	(0.0443)	(0.0394)
Log of Employment	0.0209	-0.00839
	(0.0219)	(0.0167)
Foreign Owned	0.204***	0.169***
	(0.0365)	(0.0239)
Log of Age	0.00688	-0.0150
	(0.0149)	(0.0136)
Constant	3.405***	3.566***
	(0.0526)	(0.0377)
Observations	216,869	369,883
R-squared	0.324	0.294
Year FE	Yes	Yes
Industry FE	Yes	Yes
Region FE	Yes	Yes
Ind x Year FE	Yes	Yes
Firm FE	No	No

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). The coefficients in columns marked as "ABS" are taken from a regression where goods and services trade status are taken from the ABS. In columns marked as "ABS/HMRC TiG", services trade status is taken from the ABS and goods trade status is derived from HMRC TiG data.

D5 Extensive margin regressions for the post-2005 sample

Table D5.1 Productivity premium, post 2005 sample, ABS, Great Britain, 2011 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Labour Productivity)					
Exporter	0.249***			0.0607*		
	(0.0346)			(0.0348)		
Importer	0.135***			0.0399		
	(0.0418)			(0.0305)		
Goods Exporter Only		0.210***			0.0129	
		(0.0402)			(0.0482)	
Service Exporter Only		0.271***			0.0937**	
		(0.0451)			(0.0370)	
Both Goods & Services Exporter		0.220***			0.0880*	
		(0.0423)			(0.0496)	
Goods Importer Only		0.149***			0.0712*	
		(0.0446)			(0.0401)	
Service Importer Only		0.0854			0.0128	
		(0.0746)			(0.0447)	
Both Goods & Services Importer		0.266***			0.00621	
		(0.0568)			(0.0565)	
Importer Only			0.115***			0.0637*
			(0.0411)			(0.0353)
Exporter Only			0.232***			0.0912**
			(0.0425)			(0.0412)
Importer & Exporter			0.398***			0.0938**
			(0.0559)			(0.0449)
Log of Employment	-0.0929***	-0.0934***	-0.0930***	-0.392***	-0.391***	-0.392***
	(0.0174)	(0.0173)	(0.0173)	(0.0300)	(0.0299)	(0.0300)
Foreign Owned	0.615***	0.612***	0.615***			
	(0.107)	(0.107)	(0.108)			
Log of Age	0.0961***	0.0961***	0.0960***			
	(0.0163)	(0.0163)	(0.0164)			
Constant	3.316***	3.316***	3.317***	4.546***	4.545***	4.543***
	(0.0269)	(0.0268)	(0.0267)	(0.0820)	(0.0817)	(0.0822)
Observations	145,323	145,323	145,323	51,028	51,028	51,028
R-squared	0.157	0.157	0.157	0.874	0.874	0.874
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS, a firm is therefore an exporter or an importer when it either declares a positive value of services trade or says it participated in goods trade.

Table D5.2 Productivity premium, post 2005 sample, ABS/HMRC-TiG, Great Britain, 2005 to 2022

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Ln(Labour Productivity)					
Exporter	0.270***			0.120***		
	(0.0368)			(0.0362)		
Importer	0.201***			0.0465		
	(0.0529)			(0.0392)		
Goods Exporter Only		0.348***			0.173***	
		(0.0785)			(0.0528)	
Service Exporter Only		0.252***			0.0898**	
		(0.0413)			(0.0396)	
Both Goods & Services Exporter		0.492***			0.209***	
		(0.0595)			(0.0703)	
Goods Importer Only		0.305***			0.104*	
		(0.0372)			(0.0543)	
Service Importer Only		0.0968			0.00425	
		(0.0654)			(0.0536)	
Both Goods & Services Importer		0.478***			0.117*	
		(0.0448)			(0.0650)	
Importer Only			0.238***			0.0542
			(0.0582)			(0.0549)
Exporter Only			0.295***			0.129***
			(0.0511)			(0.0458)
Importer & Exporter			0.444***			0.164***
			(0.0673)			(0.0420)
Log of Employment	-0.113***	-0.119***	-0.113***	-0.389***	-0.392***	-0.389***
	(0.0161)	(0.0159)	(0.0160)	(0.0257)	(0.0254)	(0.0255)
Foreign Owned	0.543***	0.508***	0.545***			
	(0.0989)	(0.104)	(0.0986)			
Log of Age	0.0927***	0.0915***	0.0927***			
	(0.0136)	(0.0136)	(0.0136)			
Constant	3.343***	3.348***	3.342***	4.492***	4.490***	4.492***
	(0.0233)	(0.0224)	(0.0236)	(0.0720)	(0.0705)	(0.0727)
Observations	199,723	199,723	199,723	67,120	67,120	67,120
R-squared	0.153	0.154	0.153	0.865	0.865	0.865
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes	Yes	Yes

Note(s): Structure of trade status variables and baseline categories are given in appendix table C1.1. Standard errors are given in parentheses and are clustered at the industry division level (2-digit industry). Stars correspond to p-values of *** p<0.01, **p<0.05, *p<0.1. Results are weighted by survey sample weights (firm weights). Results in this table are derived from the ABS/HMRC TiG dataset, a firm is therefore an exporter or an importer when it declares a positive value of services trade in the ABS or has positive customs declarations in the HMRC dataset.