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Abstract

This paper provides the first evidence linking lower international trade costs with higher productivity in services sectors. On average, lowering trade costs by 10% is associated with a gain in total factor productivity of around 0.5%, which is an effect of similar magnitude to that for goods sectors.

JEL Codes: F13; F15.

Keywords: Trade policy; Trade in services; Productivity.

Word Count: 1952.

1 Introduction

For goods sectors, there is extensive empirical evidence that lower trade costs are associated with higher productivity at the firm- and sector-levels (e.g., Pavcnik, 2002). Lower trade costs lead to contraction and exit by smaller, less-productive firms, and the transfer of resources to larger, more productive ones (Melitz, 2003). The overall result is a gain in measured sectoral productivity.

Nearly two-thirds of all economic activity in the G-20—and over three-quarters in France, the USA, and the UK—is made up of services. Breinlich and Criscuolo (2011) show that many of the stylized facts regarding services firms are similar to those for goods manufacturers. For example, production is highly concentrated in a small number of firms, and exporters tend to be larger and more productive than other firms. VanDerMarel (2011) shows that regulation in services sectors has an important influence on the productivity of services firms: as for tariffs in goods markets, more restrictive regulation is associated with lower productivity. However, the present paper is the first one to present evidence on the links between services productivity and trade costs, using a comprehensive measure that captures all regulatory and other burdens on international service providers.

The paper proceeds as follows. The next section discusses our data and methodology for measuring trade costs. Section 3 presents regression results linking trade costs and productivity in services sectors. Section 4 concludes.

2 Measuring Trade Costs in Services

Starting from the standard, theory-consistent gravity model of Anderson and van Wincoop (2003), Novy (2010)develops a comprehensive measure of bilateral trade costs.[1] Equation 1 presents that measure in ad valorem equivalent terms as τ_{ijkt}, where k indexes sectors and t indexes time. It is the

[1] In fact, Novy (2010) shows that basically the same measure can be derived from a wide variety of theoretical models of international trade, including Chaney (2008) and Eaton and Kortum (2002). The interpretation of some parameters changes depending on the model used, but the overall approach remains very similar. Novy's approach builds on Head and Ries (2001).

geometric average of bilateral trade costs for exports from country i to country j and from country j to country i, expressed relative to domestic trade costs in each country ($\frac{t_{ij}}{t_{ii}}$ and $\frac{t_{ji}}{t_{jj}}$ respectively). To calculate it, all that is required is data on domestic production relative to nominal exports in both countries ($\frac{x_{ii}}{x_{ij}}$ and $\frac{x_{jj}}{x_{ji}}$ respectively). The parameter σ is the elasticity of substitution among varieties in a sector, assuming the Anderson and Van Wincoop-based derivation of Novy's measure of trade costs.

$$\tau_{ijkt} = \left(\frac{t_{ijkt}.t_{jikt}}{t_{iikt}.t_{jjkt}}\right)^{\frac{1}{2}} - 1 = \left(\frac{x_{iikt}.x_{jjkt}}{x_{ijkt}.x_{jikt}}\right)^{\frac{1}{2(\sigma-1)}} - 1 \quad (1)$$

Intuitively, Novy's measure captures the fact that if a country's trade costs vis-à-vis its trading partners fall, then a part of its production that was previously consumed domestically will instead be shipped overseas. Trade costs are thus closely related to the extent to which a country trades with itself rather than other countries, and data on this kind of relative openness can be used to track the level of trade costs and their variation over time. Importantly, this measure of trade costs is "top down" rather than "bottom up". By this we mean that it infers the ratio of inter- to intra-national trade costs based on observed patterns of production and trade around the world, rather than building up an estimate of trade costs based on data covering particular types of impediments to trade. It thus takes account of all factors that influence trade costs, and is not subject to the kind of omitted variables bias that calls into question the results of previous attempts to measure trade costs in services by analyzing the results of gravity model estimates (e.g., Walsh, 2006).

We use this approach to calculate new trade costs measures for up to 61 countries and 29 ISIC Rev.3 sectors, including 12 services sectors, for the period 1995-2007. Our measure of trade costs captures the costs associated with "pure" cross-border services trade under Modes 1 and 2 of the General Agreement on Trade in Services (GATS). We do not extend the analysis to sales by foreign affiliates (GATS Mode 3) or movement of service providers (GATS Mode 4) due to lack of data. For production (gross sectoral output), our primary data sources are EU KLEMS, the OECD's STAN database, and the UN's National Accounts Official Country Data. In addition, we use Input-Output (IO) tables for major Asian economies like China, India, Indonesia, and Taiwan, which are not represented in other sources.[2] Data come from the OECD's set of IO tables, and are interpolated because the tables are only updated every five years. To ensure cross-country comparability, gross output data are converted into USD before being combined with trade data to get a measure of trade costs. This is done using bilateral nominal exchange rates from the OECD and the IMF's International Financial Statistics database (market rates, period average).

For data on trade in goods, we rely on the OECD's ITCS database which provides data on bilateral trade flows directly in the ISIC Rev.3 format. Things are more complicated for services, where we combine three data sources. First is the OECD's TISP database (International Trade in Services by Partner Country). Second is Eurostat's balance of payments statistics. And third is the UN's Service Trade database. All data are converted from the EBOPS classification to ISIC Rev. 3 using a concordance. In line with Novy (2010), we assume $\sigma = 8$ throughout, but our results are robust to alternative assumptions.

3 Trade Costs and Productivity

We adopt two empirical strategies to explore the links between trade costs and productivity in services sectors. First, we use our dataset in its most disaggregated form. Each observation corresponds to a reporting country-partner-sector-year combination. Since we are using bilateral data, and our trade costs measures reflect the geometric mean of costs in both directions, it makes sense to use a bilateral measure of productivity as well. To do this, we take the geometric average of sectoral TFP in the exporter and importer, as reported in the EU-KLEMS database. This measure covers 21 countries and 23 sectors. (See O'Mahony and Timmer, 2009 for details on the estimation of TFP.) The models for productivity and productivity growth are as follows, where d_{ijk} and d_t indicate fixed effects by country-partner-sector and year respectively:

$$\log\left(TFP_{ijkt}\right) = b_1\tau_{ijkt-1} + d_{ijk} + d_t + e_{ijkt} \qquad (2)$$

[2] We have both gross output and exports at the industry level in the IO tables (the two variables needed to calculate domestic trade), but data have to be interpolated because the tables are only updated every five years.

$$\Delta\log\left(TFP_{ijkt}\right) = c_1\tau_{ijkt-1} + c_2\log\left(TFP_{ijkt-1}\right) + d_{ijk} + d_t + e_{ijkt}$$

Our models can be seen as sector-level analogues of the productivity versus trade regressions familiar from the firm level literature (e.g., Pavcnik 2002). In both cases, we relate our productivity measures to lagged trade costs so as to reduce endogeneity concerns. Fernandes (2007) adopts a similar approach. The extensive use of fixed effects is also a way of limiting the likelihood that endogeneity influences our results. They control for shocks that are idiosyncratic to each country-pair-sector combination, and common to all country-pair-sectors but varying across years. In the productivity growth equation, we control for the lagged level of productivity to take account of the fact that productivity processes tend to be persistent over time.

The second part of our empirical approach uses data aggregated to the reporting country-sector-year level, by summing trade and production variables across all partners, and recalculating trade costs for each country. This approach yields a measure of bilateral trade costs with respect to the rest of the world. We ensure a consistent sample over the estimation period by limiting consideration to those country-partner-sector observations that are present in all years from 1995-2007. The basic models for this second approach are as follows, where d_{ik} and d_t indicate fixed effects by country-sector and year respectively:

$$\log\left(TFP_{ikt}\right) = b_1\tau_{ikt-1} + d_{ik} + d_t + e_{ikt} \qquad (3)$$

$$\Delta\log\left(TFP_{ikt}\right) = c_1\tau_{ikt-1} + c_2\log\left(TFP_{ikt-1}\right) + d_{ik} + d_t + e_{ijt}$$

Regression results are in Tables 1-2. In line with the literature on manufacturing firms, our data support the hypothesis that lower trade costs are associated with higher productivity, and faster productivity growth in services sectors. Using bilaterally disaggregated data (Table 1) the level effect is approximately the same for goods and services (columns 1-2), and is highly statistically significant in both cases. A 10% decrease in trade costs is associated with a TFP increase of around 0.5% in both cases. The TFP growth effect, however, is much stronger for goods; the services

Table 1: Regression results using bilaterally disaggregated data.

	(1)	(2)	(3)	(4)
	TFP		TFP Growth	
	Services	Goods	Services	Goods
L.Log(Trade Costs)	-0.049***	-0.057***	-0.006*	-0.037***
	(0.005)	(0.010)	(0.002)	(0.004)
L.Log(Geo. Ave. TFP)			-0.170***	-0.244***
			(0.009)	(0.009)
Observations	18368	70912	18242	69162
R2	0.169	0.144	0.114	0.163
Groups	3202	5876	3194	5802
Fixed effects	Ctry-Part-Sect	Ctry-Part-Sect	Ctry-Part-Sect	Ctry-Part-Sect
	Year	Year	Year	Year

Note: OLS estimation with robust standard errors. Significant at: *** 1% ** 5% * 10%

Table 2: Regression results using unilateral (aggregate) data.

	(1)	(2)	(3)	(4)
	TFP		TFP Growth	
	Services	Goods	Services	Goods
L.Log(Trade Costs)	-0.051*	-0.236	-0.001	-0.264***
	(0.025)	(0.155)	(0.010)	(0.070)
L.Log(TFP)			-0.161***	-0.366***
			(0.031)	(0.045)
Observations	1280	2540	1280	2540
R2	0.104	0.048	0.099	0.208
Groups	128	254	128	254
Fixed effects	Country-Sector	Country-Sector	Country-Sector	Country-Sector
	Year	Year	Year	Year

Note: OLS estimation with robust standard errors. Significant at: *** 1% ** 5% * 10%

parameter is estimated less precisely, but remains 10% significant. A 10% decrease in trade costs is associated with an increase in the TFP growth rate of 0.4% for goods, but only 0.06% for services.

Results are slightly weaker using aggregated data (Table 2). For services, there is still a negative and statistically significant coefficient in levels. Its magnitude is very similar to the estimate obtained using disaggregated data. However, the coefficient in the growth rate regression is very small and statistically insignificant. In goods, by contrast, the levels coefficient is statistically insignificant, whereas the coefficient in the growth rate regression is large in absolute value, and highly statistically significant.

4 Conclusion

This paper has used a new measure of trade costs to provide some first evidence on the links between trade costs and productivity in services markets. We find strong evidence that services sectors facing lower trade costs tend to be more productive, and some evidence that they experience higher productivity growth. As is the case for goods markets, this result is consistent with models in which lower trade costs lead to the shrinkage or exit of less productive firms and the transfer of resources to larger, more productive ones. The effect we find is economically as well as statistically significant: a 10% reduction in trade costs is associated with a TFP increase of around 0.5%. Further research in this area could use firm-level data covering services sectors to confirm our findings.

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