Measuring the Cost of International Trade in Services

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Abstract

We present a new dataset of international trade costs in services sectors. Using a theory-based methodology combined with data on domestic shipments and cross-border trade, we find that trade costs in services are much higher than in goods sectors: a multiple of two to three times in many cases. Trade costs in services have remained relatively steady over the last ten years, whereas trade costs in goods have fallen overall at an impressive rate. We also present two examples of the ways in which our dataset could be used in future work. First, we examine the impact of regional trade agreements on trade costs in services. Although we find that intra-bloc trade costs are lower than those facing outside countries, the differential is usually quite small for services, and in some cases has even been narrowing over time. This finding accords with the observation that because service sector reform is about re-regulation, "preferential" agreements tend to involve less discrimination than in goods markets. Second, we show for the first time that services sectors with lower trade costs tend to be more productive, and experience faster productivity growth. This result lines up well with the evidence from goods markets.

JEL Codes: F13; F15.

Keywords: Trade policy; Trade in services; Regional integration; Productivity.

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1 Introduction

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. So it is striking that while goods exports account for nearly 20% of the G-20's combined GDP, the corresponding figure for services is less than 5%. Although services trade was growing rapidly prior to the full onset of the Global Financial Crisis crisis—by 19% in 2007, according to the WTO—it still represents a surprisingly modest share of the international economy (WTO, 2009).

The question, of course, is: why? It is tempting to argue that a large part of the services sector is non-tradable. This is becoming less true over time, however. The traditional example of a haircut is instructive. In today's economy, a haircut is tradable in a number of ways. When a Paris stylist flies to Los Angeles to work on an American movie set, there is trade in services under GATS Mode IV. When an American salon chain opens a store in Europe or Japan, sales by its foreign affiliate are considered to be trade in services under GATS Mode III. So although some services are traded in only small quantities relative to domestic production, it is not because they are strictly speaking non-tradable. Rather, it is only under special circumstances that they can be *profitably* traded.

More generally, this analysis suggests that a large part of the explanation for why services trade is so much smaller in value than goods trade must lie in trade costs, i.e. the full range of costs a firm confronts when it decides to sell its services overseas. In goods markets, these costs include tariffs, non-tariff measures, transport charges, costs imposed by "behind-the-border" regulatory measures, and costs related to geographical, cultural, and institutional differences. In services sectors, trade costs are largely related to regulatory measures that either create entry barriers or increase the cost burdens facing firms, in addition to geographical, cultural, and institutional differences.

Some sources of trade costs are relatively easy to quantify. Ad valorem tariffs are an example. However, many trade costs in both goods and services stem from regulatory measures, and thus are much more difficult to quantify. Previous attempts at quantification of the barriers to trade in services have either inferred trade costs in an ad hoc way from observed trade flows, or have constructed inventories of regulatory measures and summarized them in index form (see Dee, 2003 for a review). Although both approaches have made it possible to obtain a basic idea of the nature and extent of trade costs in services, the academic and policy communities are still far from an understanding of international services markets comparable to that of goods markets.

This paper provides some of the first systematic evidence on the level of trade costs in international services markets. We find that they are very high compared with goods, perhaps twice or three times as high in ad valorem terms. This difference goes part of the way towards explaining why goods trade still dominates services trade so strongly in the global economy.

We also find that trade costs in goods and services change very differently over time. During the last decade, overall trade costs in goods markets have fallen by nearly 15% on a worldwide basis. But in services, they have remained essentially stable. In some sectors, such as construction, they have even increased markedly. Among major trading economies, the only exception to this rule is China: partly as a result of signing a WTO Accession Agreement with real "bite" in services, trade costs in services between China and the rest of the world have fallen noticeably. Unilateral liberalization and the efforts of the private sector have also contributed to this outcome. This finding suggests an important role for external commitment mechanisms in supporting trade facilitation in services. The contrast with the currently lackluster progress of the WTO's services negotiations–which could clearly provide a major impetus for reform–is striking.

This paper builds on and extends previous work by applying a theory-consistent, and comprehensive measure of trade costs. Our measure is "top down" in the sense that it infers trade costs from observed patterns of trade and production. This approach contrasts with the "bottom up" approach of most previous work on trade costs in services, which has started by coding qualitative data on regulatory measures and then estimating their economic impact based on summary measures of restrictiveness.

In concrete terms, our methodology has three important advantages. First, our "top down" approach means that our measures capture the full range of cost factors affecting international trade in services. Even unobservable trade costs are accounted for. Previous work, by contrast, mostly captures the costs related to certain types of regulatory measures, but cannot be said to have produced comprehensive estimates of trade costs in services.

Second, our methodology is theory-based, and relies on an identity relationship rather than econometric estimation. Previous work that infers trade costs from gravity model estimates tends to confound true trade costs with noise in the data, which results in estimates that are difficult to interpret. Of course, the cost of relying heavily on theory is that if it is incorrect, then the decomposition might also be erroneous. However, Novy (2009) shows that the approach we use here can be applied successfully to a variety of theoretical models of trade; it obviously captures a deep regularity in the relationship between trade costs, production, and trade flows. He also shows that it is highly robust to the possibility of measurement error. As a result, we are confident that our measures represent the best data currently available on the level of trade costs in international services markets.

Third, our approach has very limited data requirements. Using easily obtainable data from national accounts and trade databases, we can calculate trade costs for a wide variety of countries over a relatively long time period–a first in the services trade literature. The main limitation of our data is that they focus on GATS Modes 1-2, namely pure cross-border services trade, and transactions involving movement of the consumer (as reflected in balance of payments data). Comparable information on GATS Modes 3-4 is not yet available across a wide enough variety of countries, sectors, and years to make a similar analysis feasible.[1] Nonetheless, the availability of our trade cost measures opens up a variety of paths for research on trade in services, which to date has been heavily constrained by the relative lack of availability of panel data.

As examples of the kinds of research questions that can be addressed using these data, we conduct two econometric analyses of issues that have thus far received scant attention in the services literature due to lack of data. The first examines the impact of regional trade agreements (RTAs) on trade costs in services–and we find that although they have to some extent reduced within-bloc

[1] An interesting avenue for further research would be to apply our approach to data on FDI. In services sectors, FDI data are frequently used as a proxy for trade under GATS Mode 3. However, the quality and availability of FDI data would represent real challenges for this type of work.

trade costs, the differential is not as large as might be expected. The second question we consider is the relationship between trade costs and productivity in services sectors. As in goods sectors, we find that lower trade costs are associated with higher productivity, and faster productivity growth.

The next section provides some descriptive results on trade costs in services using our new data. Section 3 examines the links between RTAs and trade costs in services. Section 4 looks at trade costs and productivity in services sectors. Section 5 concludes, and discusses possible directions for future research in this area.

2 Trade costs in services, 1995-2007

2.1 Methodology

Starting from the standard, theory-consistent gravity model of Anderson and Van Wincoop (2003), Novy (2009) develops a comprehensive measure of bilateral trade costs.[2] Equation 1 presents that measure in ad valorem equivalent terms. It is the 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 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. The parameter γ is a measure of firm-level heterogeneity if the model is instead derived from Chaney (2008).

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

Intuitively, Novy's measure captures the fact that if a country's trade costs vis-à-vis the rest of the

[2] In fact, Novy (2009) shows that basically the same measure can be derived from a wide variety of theoretical models of international trade. The interpretation of some parameters changes depending on the model used, but the overall approach remains very similar.

world 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 make inferences about the level of trade costs and their variation over time.

This approach has three main advantages over the readily available alternatives. First, it represents a comprehensive measure of the full range of trade costs, namely the costs of providing goods or services across borders relative to the costs of providing them within countries. In goods markets, it captures international shipping—as in work using CIF/FOB ratios—but also a much wider variety of cost factors (see Anderson and van Wincoop, 2004 for a full review). In services, it takes account of factors such as: geographical, cultural, and linguistic distance; regulatory barriers to trade; regulatory heterogeneity; access to finance for accessing new markets; differences in business and investment climates; and other behind-the-border measures that have asymmetric impacts on domestic and foreign suppliers. Even the effects of regulatory measures that are discriminatory in fact but not in law are included in this measure of trade costs.

The second advantage of Novy's measure is that its data requirements are minimal. As a result, it is feasible to obtain measures of trade costs in services sectors, where data availability is much more limited than for goods. We are thus able to obtain data on production, exports, and trade costs across a wide variety of countries, sectors, and time periods.

Third, Novy's measure relies on a theory-based rearrangement of data, rather than econometric estimation. It thus does not suffer from the possibility of omitted variables bias, which potentially affects traditional gravity models of services markets.[3] Another potential problem with gravity model-based estimates of trade costs such as Walsh (2006) is that they tend to confound trade restrictions and noise in the data, both of which are associated with trade flows that diverge from expected values based on model estimates.

Using the methodology described in the Appendix, we construct Novy (2009) measures of trade

[3]Novy (2009) shows that even allowing for measurement error does not introduce substantial uncertainty into measures of trade costs inferred using Equation 1.

costs in services covering up to 61 countries and 12 services sectors. As a point of comparison, we also compile data on 17 goods sectors. Data at this level of detail are only available for a subset of countries, however, and so we also use an aggregate version of the data. This approach allows us to expand the analysis to other countries for which disaggregated output data are unreliable and/or relatively unavailable.

The next subsection briefly describes the outcome of that exercise, focusing on the major trading economies. In each case, we are careful to use a consistent sample, in the sense of country-partner-sector combinations that are observed consistently over the full time period for which the analysis is presented. This limitation is important in order to avoid entry and exit of countries or sectors from the sample, with corresponding changes to measured trade costs that reflect that dynamic rather than the underlying situation.

In all calculations, the elasticity of substitution σ is set equal to 8, which is the same rule of thumb used by Novy (2009). It is very close to the typical country's average elasticity of substitution reported by Broda et al. (2006) of 6.8. Setting $\sigma = 8$ is equivalent to setting $\gamma = 7$, which is also reasonable in light of previous work on firm level productivity distributions.[4] Although ad valorem equivalents are quite sensitive to the value chosen for σ or γ, using indices relative to a base year reduces that problem to economically insignificant levels. For example, using $\sigma = 10$ results in substantially different estimated worldwide ad valorem equivalents for services: 106% in 1995 and 107% in 2007, compared with 153% and 155% respectively with $\sigma = 8$. However, the change in those numbers over time is nearly identical: 1.3% versus 1.4%. The next subsection presents results using both methods.

[4]The work referred to in this paragraph relates exclusively to goods markets. We are not aware of any comparable studies of the elasticity of substitution in services markets, which is why we assume a common elasticity for both sectors. It might be thought that services tend to be "tailor-made" to a greater extent than goods, i.e. that they have a lower elasticity of substitution. If so, our estimates of ad valorem equivalents in services markets would tend to be on the low side.

2.2 Descriptive Results

First, Table 1 column 1 compares our results with those reported in Novy (2009) for USA trade costs in goods vis-a-vis its major trading partners. Ours are generally very close to his, although slightly higher in some cases. This finding provides reassurance that our new data, which cover a much broader range of countries and sectors than previous estimates, are reliable with regard to existing work. It is worth stressing that the relatively high numbers reported in Table 1 reflect the full range of cost factors that affect international transactions, not just protection (i.e. tariffs in the case of goods markets).[5] Based on a comprehensive review of the literature, Anderson and van Wincoop (2004) estimate that international trade costs of the type we are measuring amount to around 74% in ad valorem equivalent terms for goods markets. Our number is thus slightly lower than theirs, even though both figures may seem high to those used to discussing rates of protection in advanced countries, which are generally in single digits.

The standout result from Table 1 is that the level of trade costs is much higher in services sectors than in goods–about double, on average, for the US and its major trading partners. The same result emerges from Table 2, which compares trade costs of major trading economies vis-a-vis the rest of the world. The absolute levels of trade costs in services are very high: over 100% in all cases, and over 200% for India. These figures should be interpreted with caution, since they rely on an assumption as to the value of the elasticity of substitution, and on an assumption that it is the same in goods and services sectors. But even if the numbers are subject to uncertainty, the relative pattern of trade costs is clear: they are much higher in services sectors than in goods sectors.

At first glance, the results in Table 1 might appear surprising: even between two markets that are close geographically and culturally, and that are perceived to be relatively open–the USA and Canada–there are trade costs in services of around 100%, compared with only 30% in goods. It is important to remember, however, that this number is not a measure of protection; rather, it

[5]For goods markets, it would in principle be possible to net out the effect of tariffs so as to arrive at a figure for non-tariff trade costs. That figure would essentially capture non-tariff and other regulatory measures, transport costs, and geographical, cultural, and institutional differences.

Table 1: Comparison of trade costs in goods and services, USA vis-a-vis major partners, 2000. (Percent ad valorem equivalent.)

Partner	Goods (Novy)	Goods (Us)	Services
Canada	25	29	100
Germany	70	70	121
Japan	65	66	125
Korea	70	70	122
UK	63	68	111
Simple average	59	61	116

Table 2: Comparison of trade costs in goods and services, major trading economies vis-a-vis the rest of the world, latest year. (Percent ad valorem equivalent.)

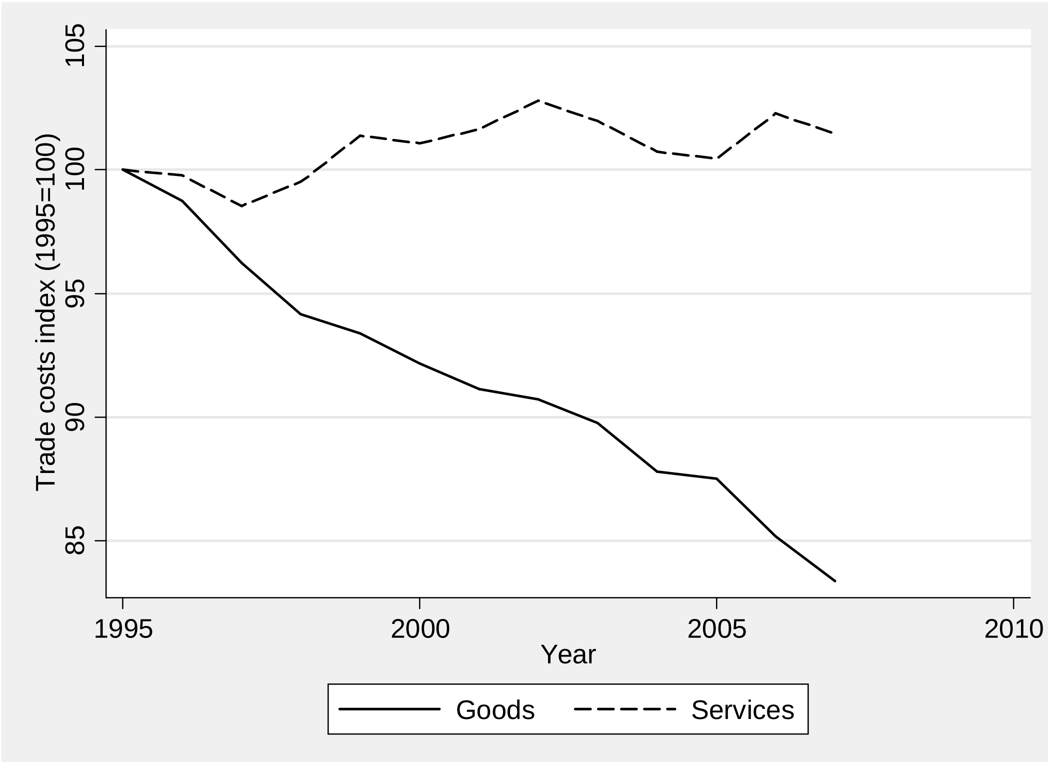
Country	Goods	Services	Services (Walsh, 2006)
USA	91	144	77
Canada	77	165	82
EU	72	143	n/a
Japan	100	173	0
China	91	183	121
India	139	205	114
Simple average	95	169	79

encompasses all types of trade costs.

The same reasoning applies to the estimates in Table 2. It is to be expected that the measures we present will be substantially higher than, for example, the ad valorem equivalents reported by Walsh (2006) for services markets. Taking that author's results as a measure of protection, it is by no means unrealistic that additional trade costs–i.e. those not related to direct trade protection–should add an additional 70% or so to the overall level of trade costs for the USA vis-a-vis the rest of the world. The comparison with goods markets is again instructive. The World Bank's Overall Trade Restrictiveness Index suggests a protection rate in the USA of a little over 6% for goods, but total trade costs are more on the order of 60%. So in ad valorem terms, total trade costs in services are perhaps double the rate of protection, whereas in goods the multiple is more like ten times.

As noted above and in the Appendix, our calculation of the level of trade costs in ad valorem equivalent terms is sensitive to our assumed value for σ, the intra-sectoral elasticity of substitution, or γ, an indicator of firm-level heterogeneity. By expressing results in terms of a base year–i.e., as

Figure 1: World aggregate trade costs indices for goods and services, 1995-2007 (1995=100).



index numbers–the sensitivity problem practically disappears. Index number results are very close for values of γ in the range five to nine, around our central value of seven (as in Novy, 2009).

The index number approach is useful for examining performance over time (Figure 1 through Figure 5). We see that on a world aggregate basis (Figure 1), trade costs in goods have declined by more than 15% over the last ten years. The same is by no means true for services: trade costs have barely moved over the last decade, and if anything, may have slightly increased. The same pattern emerges for most of the major trading economies in the next set of figures. It is interesting to note that the US services index declines by a few points over the period 1995-1998, but the EU index does not–even though this period should coincide with realization of the full impact of the 1992 program on the internal market in services.

The obvious exception to the pattern described above and in Figure 1 through Figure 4 is China (Figure 5): trade costs have declined substantially in services markets as well as in goods. It is important to highlight two caveats to this finding. First, Table 2 shows that China still has high

Figure 2: US trade cost indices for goods and services, 1995-2007 (1995=100).

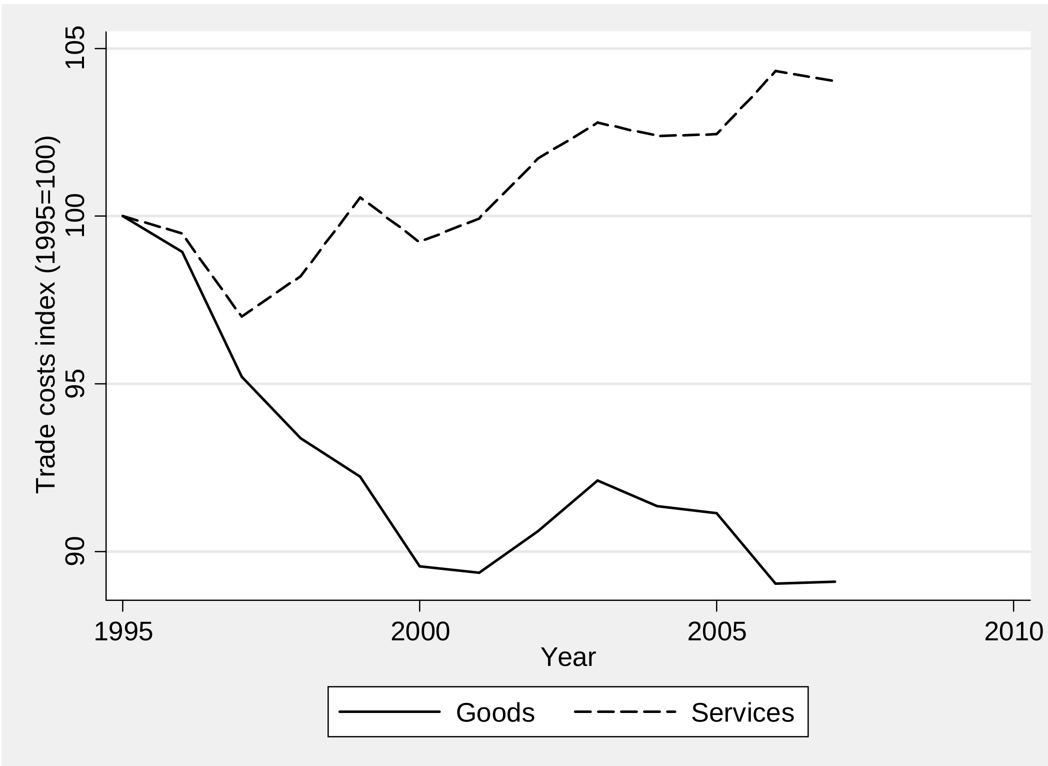


Figure 3: EU trade cost indices for goods and services, 1995-2007 (1995=100).

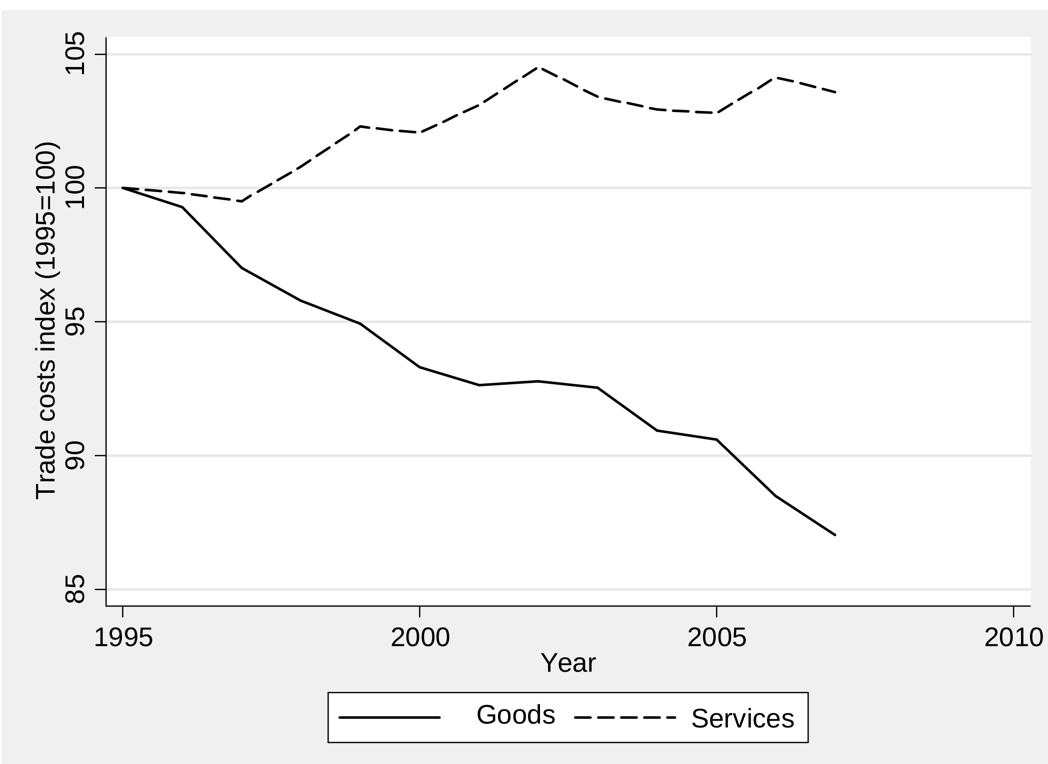
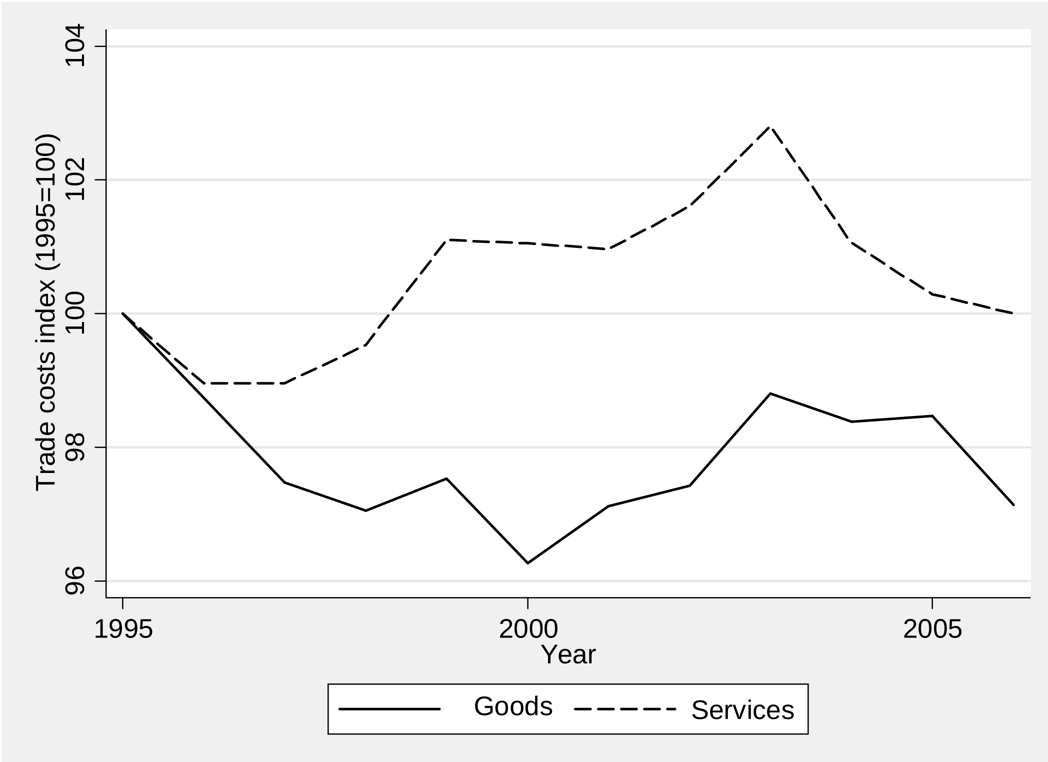


Figure 4: Japan trade cost indices for goods and services, 1995-2007 (1995=100).

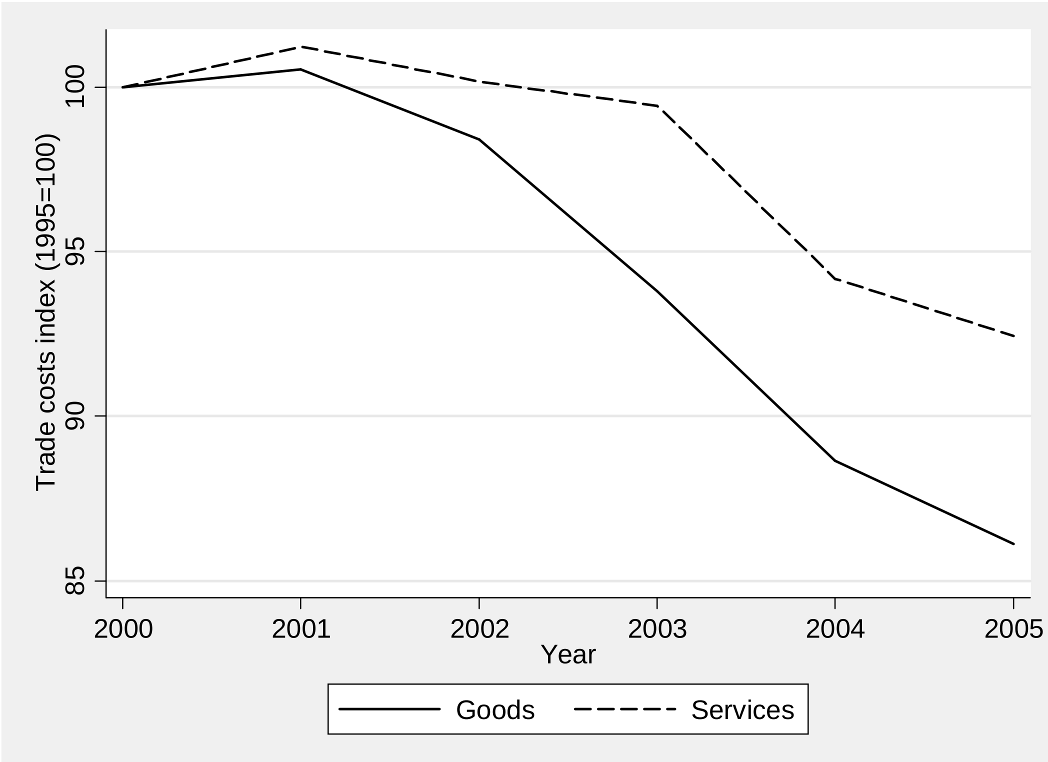


levels of trade costs relative to other major economies. So there is still considerable room for further reductions. Nonetheless, the proportional reductions since 2000 are impressive.

The second caveat is that the trade costs that we are measuring represent an average of trade costs facing foreign producers exporting to China, and trade costs facing Chinese firms exporting to other countries. Thus, we cannot conclude that the very large trade cost reductions observed for China are solely due to policy reforms undertaken at home. They are also linked to trade cost reductions by China's trading partners following accession to the WTO, which provided China with permanent MFN status.

Nonetheless, our findings are in line with recent work suggesting that the terms of China's WTO Accession Agreement had real "bite" in services, in the sense that they required significant liberalization of applied policies (Mattoo, 2004). This is in stark contrast to most countries' GATS schedules submitted at the end of the Uruguay Round: they established binding policy ceilings, but contained little in the way of genuine liberalization. Whatever liberalization has occurred since the

Figure 5: China trade cost indices for goods and services, 1995-2007 (1995=100).



Uruguay Round has been undertaken unilaterally or preferentially, and it is therefore not surprising that for other countries, changes in trade costs on a multilateral basis have been limited.

Another case that is deserving of attention is that of the EU. Since trade policies are set in Brussels, one might expect a certain level of uniformity of trade costs with respect to the rest of the world. However, this is not the case. First, different countries display highly divergent levels of trade costs in goods and services markets alike. Germany, for instance, has tariff equivalents of 65% and 127% for goods and services respectively for 2007. The same figures for another large Eurozone economy, France, are 91% and 168%, while for a small economy like Ireland, they are 114% and 165%. For a "new" EU member like Poland, the tariff equivalents are 75% and 144%. This pattern suggests that there are a range of factors that influence trade costs, but which remain heterogeneous at the level of individual member states. It is beyond the scope of this paper to delve into the reasons for that heterogeneity in detail, but it seems likely that future work could uncover evidence of regulatory measures and other behind-the-border factors that exert a significant influence on trade costs, but which are not fully encompassed in the EU's common trade policy.

In addition, we find that changes in services trade costs over time are also very different across EU countries (Figure 6 - Figure 9). There are substantial reductions in trade costs between 1995 and 2007 in Germany, Ireland, and Poland, but a noticeable increase over the same period in France. This is in marked contrast with goods markets, where all four economies register substantial declines in trade costs. Although more in-depth analysis is needed before drawing any firm conclusions, this heterogeneity in time paths suggests that member states may have taken substantially different tracks in implementing the single market for services, and that significant imperfections remain (witness the aborted Bolkestein Directive).

Finally, the case of Poland is interesting for what it can potentially say about the process of EU accession. In services markets, we see that trade costs only started to fall rapidly from about 2002 onwards. The changes for 2002-03 and 2003-04 were particularly large, on the order of 5% each year. The rate of decline in goods trade costs, however, is much more consistent over the full sample. This example tends to suggest that the degree of "bite" in the single market for goods is substantially greater than that of the single market for services: the process of acceding to the EU is associated with a consistent decline in trade costs of over 25% for goods, but a stop-and-start fall of less than 20% for services.

The index number approach is also useful for examining the evolution of sectoral trade costs over time. As an example, Figure 10 presents a comparison between construction, transport, financial, and computer services. Trade costs in construction services have increased markedly over the last decade, by nearly 20%. Construction is also the most insulated sector, with ad valorem equivalent trade costs of around 200%. Of course, performance is likely to vary markedly across countries; the figure presents aggregate data for the world as a whole, and therefore includes relatively restricted as well as fairly open markets.

None of the other three sectors exhibits a substantial increase in trade costs over time. Trade costs in transport services have remained approximately constant over the last decade. By contrast, trade costs in financial and computer services have fallen by more than 10%. This finding is perfectly

Figure 6: Germany trade cost indices for goods and services, 1995-2007 (1995=100).

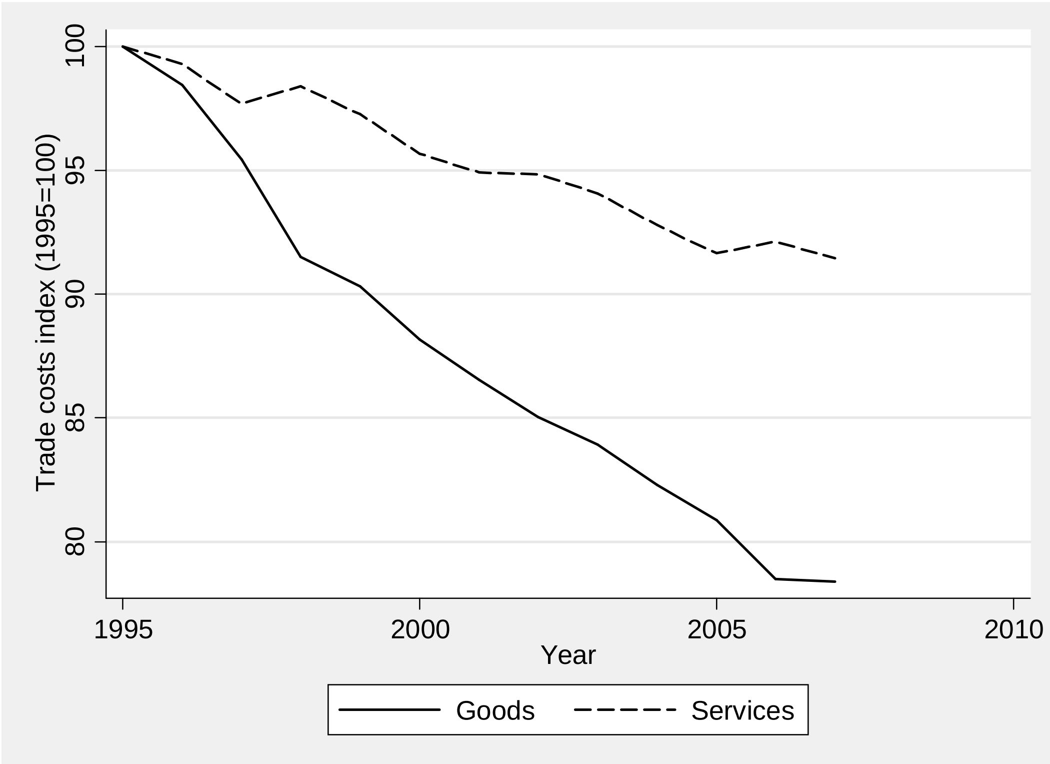


Figure 7: France trade cost indices for goods and services, 1995-2007 (1995=100).

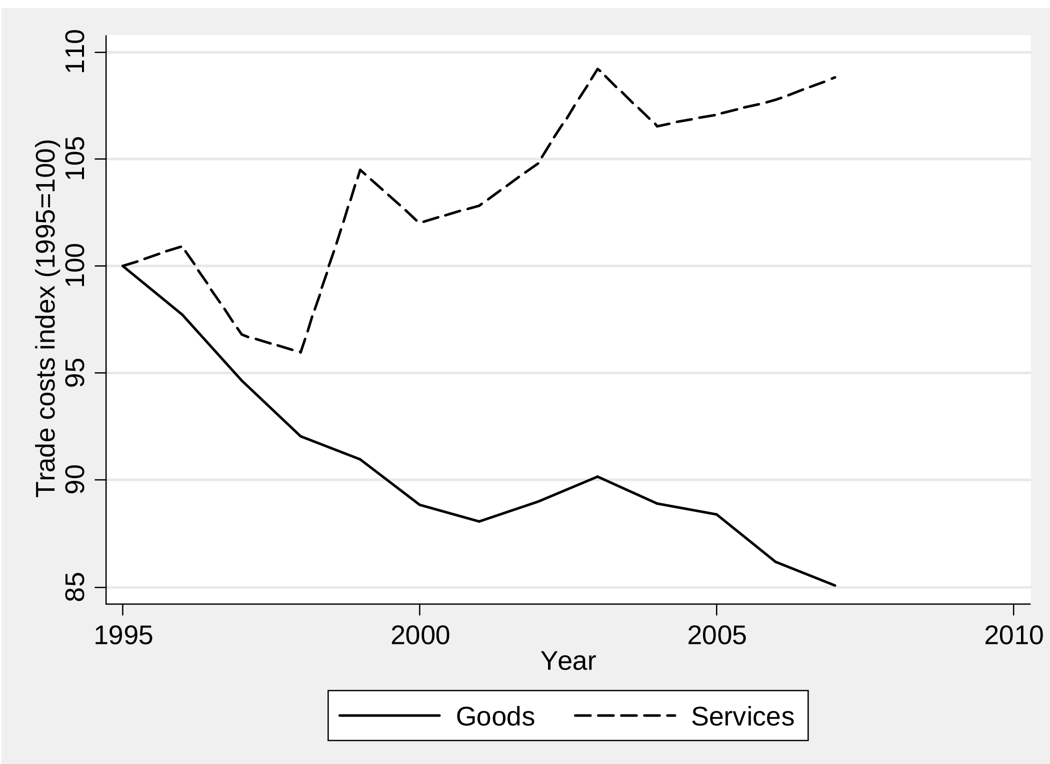


Figure 8: Ireland trade cost indices for goods and services, 1995-2007 (1995=100).

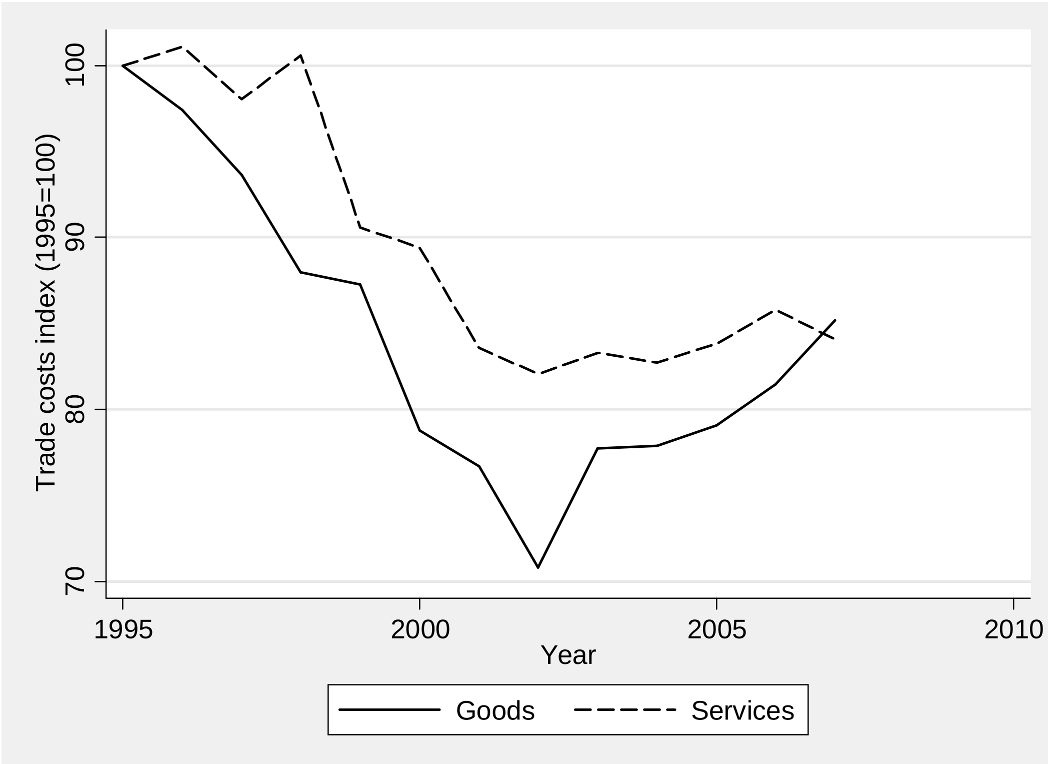


Figure 9: Poland trade cost indices for goods and services, 1995-2007 (1995=100).

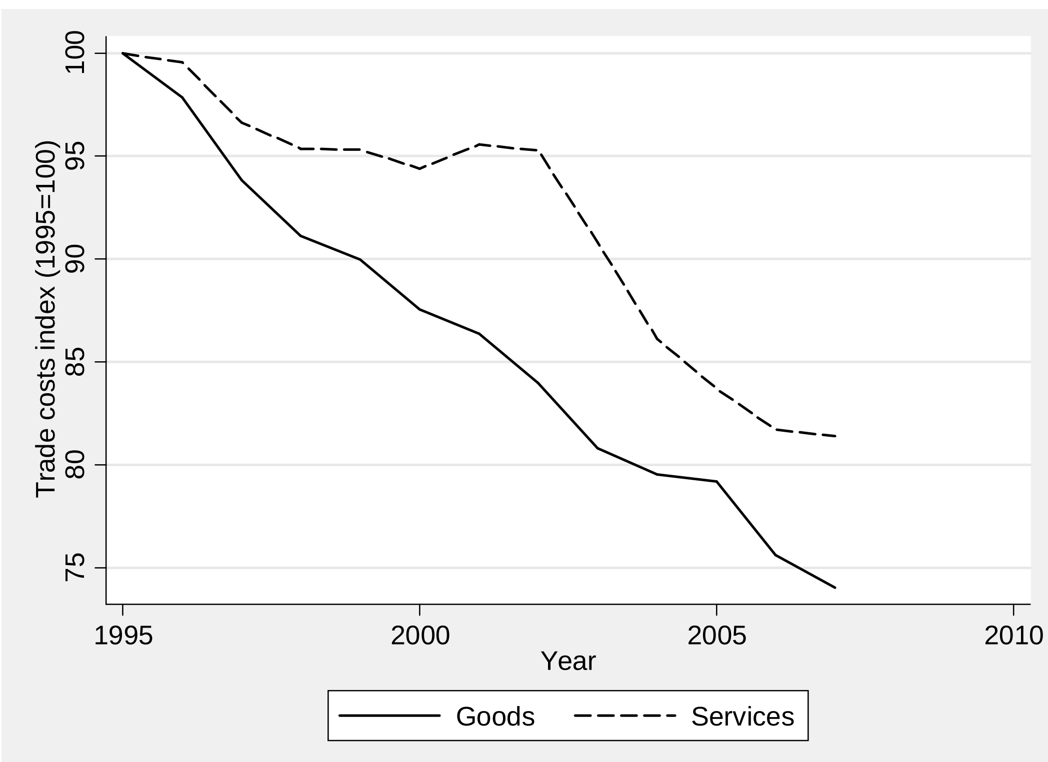


Figure 10: Trade costs indices for construction services, transport services, financial services, and computer services, 1995-2007 (1995=100).

consistent with the rise of outsourcing in those sectors over roughly the same time period: as trade costs fall, probably due to improved information and communications technologies (ICTs), it becomes feasible for firms to have more of these kinds of tasks performed overseas. Sectors such as transport and construction, on the other hand, are largely immune to such developments because of the need for physical proximity between producer and consumer.

3 Trade costs and regional trade agreements

In this section, we analyze the impact of regional trade agreements (RTAs) on bilateral trade costs, as a first example of the potential uses to which our new data can be put. Figure 11 shows the evolution of trade costs within RTAs and outside RTAs over the period 2000-2007. Average trade costs (for both goods and services) are represented in this figure on the basis of a trade-weighted average across sectors and partners that is calculated separately for pairs of countries within RTAs and pairs of countries that are not part of an RTA.[6] We include only country pairs for which we have information for all years so that changes in the composition of the two groups only reflect changes in RTA membership.

Figure 11: Trade costs within and outside RTAs

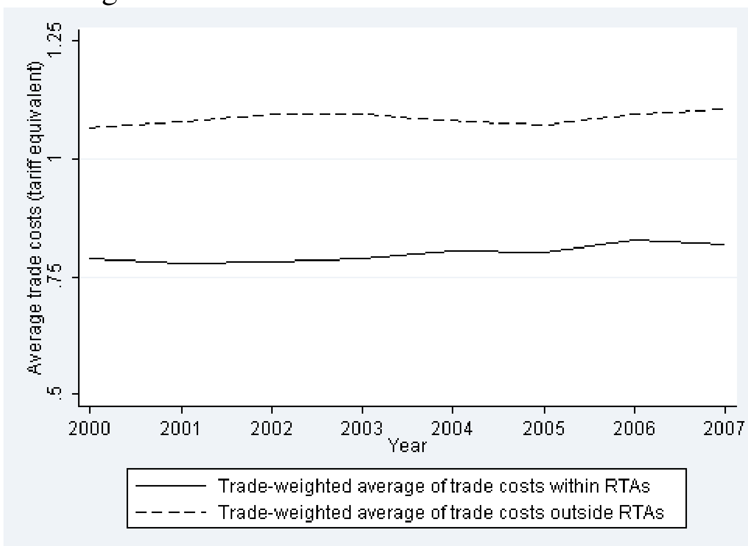
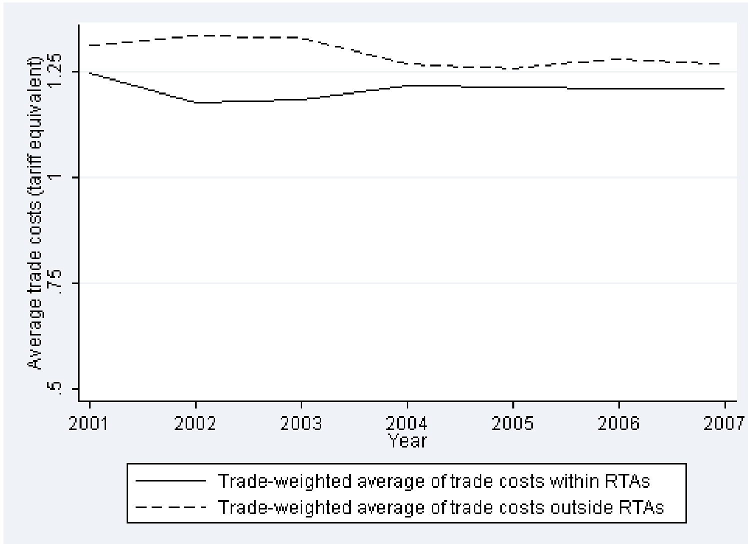


Figure 11 shows that trade costs are on average lower within RTAs. For 2007, trade costs within RTAs represent a tariff-equivalent of 82%, while outside RTAs the tariff equivalent is 110%.[7] Regionalism can therefore be understood as having a real impact on trade costs. The discrepancy between trade costs within and outside RTAs is the same at the beginning and at the end of the period. The increase in the number of RTAs that have entered into force, as well as the deepening of some of these RTAs (such as new Member states in the EU), had no significant impact on trade costs. Figure 11 basically shows two flat lines.

Focusing now on trade costs in services industries, Figure 12 shows that trade costs are generally higher for services with tariff-equivalents reaching 127% outside RTAs and 121% within in 2007. The difference between trade costs within and outside the RTA is less important for services than for goods. Services RTAs appear less preferential and, taking into account the high level of trade

[6]In the WTO database, the number of RTAs in force (as of February 2010) is 202.
[7]Calculated with sigma=8.

Figure 12: Trade costs for services industries within and outside services RTAs



costs in services, do not offer clearly improved market access for foreign services providers. What is also interesting in Figure 12 is that the gap between trade costs within and outside RTAs has been decreasing for services industries. The sample of countries is the same for all years, so the only compositional change that could explain the convergence in the two curves would be that RTAs recently signed are on average less preferential or less effective in reducing trade costs.

While the above figures already highlight the impact of RTAs on trade costs, an econometric analysis can tell us more by controlling for a certain number of variables that could explain the trends observed, beyond the entry into force of RTAs. Moreover, we have stressed that RTAs in services can be very preferential or almost non-preferential, depending on the schedules of commitments negotiated. This is why we need also to test the contribution of RTAs to reduced trade costs on the basis of the extensiveness of services commitments.

We create two variables to assess services provisions in RTAs. The first one is a dummy variable that takes the value of one when an RTA includes services provisions[8]. The second variable is an index based on a detailed analysis of services schedules of commitments in RTAs. The index is equal to zero when there are no preferential commitments in the RTA (as compared to GATS

[8]The list of agreements with services provisions comes from WTO Regional Trade Agreements Information System. The list includes 76 agreements in force as of February 2010 and notified under GATS Article V.

commitments that represent the MFN treatment of services trade) and takes the value of 100 when full market access and national treatment are granted on a preferential basis for services trade in the 155 sub-sectors of the GATS Sectoral Classification List. More information on the calculation of the index can be found in Annex B.

Both the RTA dummy and the services RTA index are bilateral variables that account for preferential treatment in services trade. In the case of the dummy variable, we assume that by signing a regional trade agreement, countries have introduced preferential treatment for services trade. However, because of the diversity of services commitments and differences in the ambition of services RTAs, one can assume that the index we have created is a better variable to assess the role of RTAs in reducing trade costs as it reflects at the industry level whether there are specific market access and national treatment commitments that can facilitate trade in services.[9]

The empirical model that is estimated is the following:

$$\tau_{ijkt} = \beta_0 + \beta_1 RTA_{ijkt} + d_{ijk} + d_t + \varepsilon_{ijkt} \tag{2}$$

where τ_{ijkt} is the log of the bilateral trade costs calculated as in Equation 5. The RTA variable can be the log of the index we have created at the industry level (RTA_index_{ijkt}) or a dummy variable (RTA_dummy_{ijt}) that has a value of one when the two countries have a RTA.[10] We also include another dummy variable that indicates that one country is party to a RTA and not the other ($RTA\_diversion_{ijt}$). This second dummy variable can potentially capture trade-diverting effects where trade costs with non-parties are higher than trade costs within the RTA. In Equation 2, distance and other common geographic variables, as well as GDP, do not appear because we have fixed-effects by country-partner-sector and by year. The influence of geography on trade costs, as well as market size and sector-specific characteristics, are covered by these fixed effects. Thus we expect the RTA variable to capture the impact of the preferential treatment granted to services

[9] On differences across RTAs in services schedules of commitments, see Marchetti and Roy (2008).

[10] In the index presented in Annex B, there is a different value for each signatory in a given RTA as parties do not take the same commitments. The index we use in the estimation of the bilateral trade costs is the geometric average of the two indexes, the trade cost being also the geometric average of the trade costs in the two trading economies.

Table 3: Services trade costs and RTAs: regression results

	All industries	Services (dummy)	Services (index)	Services (diversion)
	(1)	(2)	(3)	(4)
RTA_dummy	-0.051**	-0.163***		-0.342***
	(0.008)	(0.020)		(0.032)
RTA_index			-0.043***	
			(0.005)	
RTA_diversion				-0.200***
				(0.027)
Obs.	86,692	36,322	33,522	36,322
R-squared	0.047	0.076	0.076	0.082

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

providers. Table 3 below presents the results of regressions where we pool across sectors.

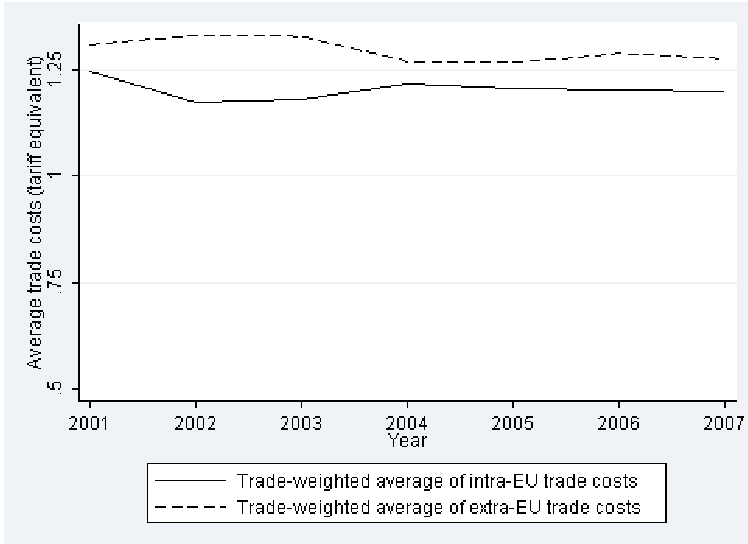
In the four regressions in Table 3, the variables measuring the contribution of RTAs all have the expected sign. Participating in an RTA is correlated with lower trade costs. In the first column, where all industries are pooled together, we check that this is the case not only for services industries but for other industries as well. In Column 2 of Table 3, we have, however, a stronger coefficient when pooling only services industries. Services RTAs have a higher impact on the reduction of trade costs in services industries. The coefficient on the dummy variable implies that being part of a services RTA is correlated with trade costs on average 15% lower. This is higher than the difference in the tariff-equivalent trade costs shown on Figure 12. In the regression, we control for many other variables that can influence this difference (through the country-partner-sector and year fixed-effects) and we can see that the Figure was to some extent misleading and that the average trade costs observed are influenced by other economic characteristics beyond participation in an RTA.

In the next Column of Table 3, the RTA index has a smaller coefficient than the one estimated for the RTA dummy variable. One should take into account that the variable is no longer a dummy, and that the index has a value between 0 and 100 that corresponds to the preferential treatment granted in RTAs. The coefficient can therefore not be directly compared with the one found for the dummy variable. The negative and very significant coefficient indicates not only that belonging to a RTA has a positive impact on the reduction of trade costs, but also that more extensive RTA provisions are associated with a higher impact. This could also explain the discrepancy between the econometric results and Figure 12.

Lastly, in Column 4 of Table 3, in addition to the RTA dummy variable, we test for the impact of RTAs on non-parties through another dummy variable that takes the value of one when only one of the two countries belongs to a given RTA. The negative and significant coefficient found for the *RTA_diversion* variable indicates that trade costs are also lower for non-parties, but to a lesser extent. This is an interesting result that highlights an important difference between services trade and goods trade liberalization. Because behind-the-border barriers and domestic regulations are more important for services trade, trade liberalization is often not on a discriminatory basis. For example, reforms in the telecoms sector can facilitate the access for all foreign providers and not providers from specific countries as opposed to others. Tariffs in the case of goods offer a better way of discriminating between parties to an RTA and non-parties. In the case of services, reforms triggered by the signature of an RTA are likely to benefit all players at the end of the day, especially in the context of the liberal rules of origin observed for services providers (Fink and Nikomborirak, 2007; Baldwin et al., 2009). This line of argument suggests that, at the end of the day, it is unilateral and non-discriminatory policy reforms that matter most in services markets: they are effectively the basis for anything that happens at the regional and multilateral levels.

Even in the market where services reforms have been the most comprehensive -the European Union-, Figure 13 shows that intra-EU trade costs and extra-EU trade costs are not significantly different. In 2007, the difference in the tariff-equivalent is just 1 percentage point higher than on Figure 12. In our sample, most observations correspond to trade flows between EU countries and the trade-weighted average also accentuates the weight of EU services trade flows. This is why Figure 13 is not fundamentally different from Figure 12. The level of trade costs among EU countries remains fairly high and there does not seem to be a specific single market effect. One should however keep in mind that the measure we use captures a difference between internal and external trade and EU reforms could have had an impact both on the internal market of EU member countries and EU trade flows (both intra- and extra-EU trade).

Figure 13: Trade costs for services industries within and outside the European Union



4 Trade costs and productivity

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. The overall result is a productivity gain.

Breinlich and Criscuolo (2008) 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. VanDer-Marel (Forthcoming) 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.

We adopt two empirical strategies to explore these links. 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:

$$
\begin{aligned}
\log\left(TFP_{ijkt}\right) &= b_1 L.\tau_{ijkt} + d_{ijk} + d_t + e_{ijkt} \\
D.\log\left(TFP_{ijkt}\right) &= b_1 L.\tau_{ijkt} + b_2 L.\log\left(TFP_{ijkt}\right) + d_{ijk} + d_t + e_{ijkt}
\end{aligned}
\tag{3}
$$

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. As in the descriptive statistics section of the paper, this approach yields a measure of bilateral trade costs with respect to the rest of the world. We again 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_{ijk} and d_t indicate fixed effects by country-sector and year respectively:

$$
\begin{aligned}
\log\left(TFP_{ikt}\right) &= b_1 L.\tau_{ikt} + d_{ik} + d_t + e_{ikt} \\
D.\log\left(TFP_{ikt}\right) &= b_1 L.\tau_{ikt} + b_2 L.\log\left(TFP_{ikt}\right) + d_{ik} + d_t + e_{ijt}
\end{aligned}
\tag{4}
$$

Regression results are in Tables 4-5.[11] 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 4) the level effect is approximately the same for goods and services (columns 1-2), and is highly statistically significant in both cases. The TFP growth effect is much stronger for goods; the services parameter

[11] All results were obtained using our standard parameter assumption, i.e. $\gamma = 7$. In additional results, available on request, we show that they are robust to different values of that parameter (5 and 9).

Table 4: 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 5: 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%

is estimated less precisely, but remains 10% significant.

Results are slightly weaker using aggregated data. For services, there is still a negative and statistically significant coefficient in levels, but the coefficient in the growth rate regression is very small and statistically insignificant. In goods, by contrast, the levels coefficient is only marginally significant at the 15% level, whereas the coefficient in the growth rate regression is large in absolute value, and highly statistically significant.

5 Conclusion

This paper uses a new, theory-based methodology due to Novy (2009) to present some of the first systematic evidence on the level of trade costs in services sectors. It also discusses changes in those costs over time. We find strong evidence that trade costs in services are much higher than in goods: perhaps a multiple of two or even three times. The data also suggest that trade costs in goods have fallen substantially over the last decade, but that they have remained essentially stable in services markets. China's experience is different, however, and is suggestive of an important role for external commitment mechanisms such as the WTO in reducing trade costs in services.

There are many potential empirical applications of our data. We examine two here. First, we find that trade costs within services RTAs are lower than outside RTAs, but that the differential is not particularly large, and in some cases has even been narrowing over time. Contrary to the experience in goods markets, we find that services RTAs can also reduce trade costs for non-member countries. One likely reason is that services RTAs are linked to general regulatory reform programs that have only limited discriminatory effects. The presence of liberal rules of origin in services RTAs might also be part of the explanation.

The second question we address is the impact of trade costs on productivity and growth in services markets. We find strong evidence that services sectors facing lower trade costs tend to be more productive, and have 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.

Future work can extend ours in a number of directions. First, to the extent possible, it would be beneficial to include additional countries in the database. However, limits on the availability of national accounts and trade data at a sufficient level of disaggregation make further progress difficult at this time.

Second, it will be important to decompose overall trade costs into those that are amenable to policy action, and those that are "natural" or at least non-compressible. The latter category includes cultural and linguistic differences, for example. We expect, however, that regulation plays a large part in the persistence of high trade costs in services, either directly or indirectly. Regulatory barriers obviously hinder services trade. By contrast, regulation that reinforces the main conduits by which services are traded across borders –like ICTs– tends to reduce trade costs. We have seen evidence of this type of effect in the computer and financial services sectors, for example. Better understanding the direct and indirect effects of regulation will be crucial to facilitating trade in services in the future.

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A Calculation of trade costs

Trade costs in services are calculated as in Novy (2009) using the following equation:

$$\tau_{ijkt} = \left(\frac{x_{iikt} . x_{jjkt}}{x_{ijkt} . x_{jikt}} \right)^{\frac{1}{2\gamma}} \tag{5}$$

Where x_{ijkt} is the production from country i consumed in country j for sector k in year t, and γ is the shape parameter of the Pareto distribution which indicates the degree of heterogeneity prevailing in a given sector (See Chaney, 2008). This methodology for computing time-varying trade costs therefore requires data on both domestic output and bilateral trade at the sector level. We use a 29 sector classification based on ISIC Rev.3, which is the industry classification used in national accounts data such as input-output tables. In what follows, we provide a brief overview of the way data were collected and handled in order to calculate τ_{ijkt} across countries, sectors and years.

Domestic output

Because we are primarily interested in total domestic demand for a given sector, one cannot rely on sectoral GDP data as the latter do not comprise intermediate consumption. We thus use gross sectoral output. Our primary data sources are EU KLEMS and the OECD's STAN database, which are for the most part compatible as long as one does not get into productivity analysis (O'Mahony and Timmer, 2009). In addition, STAN also provides data on total exports at the sector level which may prove useful when computing 'intranational trade', that is x_{iikt}. Both sources rely on the ISIC Rev.3 classification so that no further corrections are needed with respect to sector correspondence.

However, because country coverage remains limited to OECD and EU countries, we also rely on the UN's National Accounts Official Country Data. The latter provide data for several emerging and developing economies such as Croatia, Namibia, Colombia, and Nicaragua. Yet, only a few data points are in effect compatible with our primary sources as reporting and methodology differ widely across countries. We therefore end up with quite aggregated data for sectors as broad as

‘Transport, storage and communications’.

This prompted us to use Input-Output (IO) tables for major Asian economies like China, India, Indonesia or Taiwan. Data come from the OECD’s set of IO tables which detail sector-level gross output using an ISIC Rev.3-compatible classification. Since IO tables are only typically released every five years, we had to interpolate missing values for these four countries. While this inevitably entails some smoothing, it allows us to bring the analysis to a more disaggregated level for countries as important as China.

Gross output data are most of the time expressed in millions of local currency and at basic prices. A prior conversion into USD is therefore required if we are to combine them with trade data and get a measure of trade costs that is comparable across countries. This is done using bilateral nominal exchange rates from the OECD and the IMF’s International Financial Statistics database (market rates, period average). With regards to basic prices, the problem is that those do not comprise the whole range of taxes/subsidies confronting buyers. This may prove problematic when combining gross output with trade flows. Since there is no easy way to address this issue, we chose to apply a rough conversion factor to output data whenever possible. The latter is calculated for each country/industry as the ratio of intermediate consumption valued at purchasers prices over intermediate consumption valued at basic prices, both of which can be found in Input-Output (IO) tables. Intermediate consumption is being used instead of gross industry output because IO tables only contain output valued at basic prices. The underlying assumption thus made is that - for a given country/industry - the ratio for intermediate consumption prices applies equally to industry output. Note that this conversion factor can only be used in cases where an IO table is available.

Trade flows

For goods, we rely on the OECD’s ITCS database which provides data on bilateral trade flows directly at the ISIC Rev.3 format. The flows being expressed in current USD, no further adjustment proved necessary. Things are more complicated for services where our data sources are threefold. 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. Aside from data availability concerns arises the issue of aggregation. Because data for mode 1 and mode 2 trade in services essentially come from balance of payments statistics, they are released using the EBOPS classification. We thus had to use a conversion key from EBOPS to ISIC Rev.3 that allows comparison to be made with other data. Unfortunately, such a conversion inevitably entails losses of information. This is particularly the case for industries such as "Computer activities" and "Other business activities" (see Miroudot et al., 2009).

B Services RTA index

To assess the impact of Regional Trade Agreements (RTAs) on trade costs, we compute an index that captures the extent to which services RTAs are preferential as compared to the GATS. This first requires going through all services RTAs that are covered in our trade dataset, and comparing GATS specific commitments to those undertaken within RTAs.[12] We do so for each party to an agreement, subsector and mode of supply. In each case, we distinguish between fully committed subsectors ("Full" subsectors), partially committed subsectors ("Partial" subsectors), and subsectors for which no commitment has been undertaken ("Unbound" subsectors). In addition, remaining restrictions for those subsectors that are "Partial" are classified according to (i) whether they pertain to the Market Access principle or to the National Treatment principle, and to (ii) the nature of the restriction itself – that is whether it consists of licensing requirements, residency requirements, discriminatory measures with regard to taxes and subsidies etc. Horizontal restrictions – those that apply to all subsectors – are also taken into account and reported for all subsectors.

Once this is done, an initial score of 100 is assigned to each agreement, country, subsector and mode of supply regardless of its degree of commitment (including the GATS). Then, depending on whether the subsector is Full, Unbound or subject to some restrictions, some points are deducted from this amount. The precise number of points granted to each restriction is shown in Table 6.

[12] The analysis of preferential commitments in RTAs is part of an OECD project on which the authors have also worked. See Miroudot, Sauvage and Sudreau, *forthcoming*.

Table 6: Scores assigned to RTA commitments - Deduction by type of restrictive measure and mode of supply

	Mode 1	Mode 2	Mode 3	Mode 4
Market access				
Unbound	-50	-50	-50	-50
Restrictions on foreign ownership	0	0	-20	0
Quantitative restrictions	-20	0	-5	0
Scope of sub-sector limited	-15	-20	-15	-15
Restrictions to the movement of people	0	0	0	-20
Restrictions on the number of competitors	-5	0	-5	0
National treatment				
Unbound	-30	-30	-30	-30
Nationality/residency/licensing requirements	-15	0	-15	0
Restrictions to the movement of people	0	0	0	-15
Measures related to taxes and subsidies	-2.5	-5	-2.5	0
Measures related to competition	-2.5	-5	-2.5	0
Restrictions on ownership of property/land	-2.5	-5	-2.5	0
Other discriminatory measures	-2.5	-5	-2.5	0

One assumption is that market access matters relatively more than national treatment (i.e. entry barriers and quantitative restrictions are more trade-restrictive than discrimination between foreign and domestic companies).

Since we work with data on cross-border trade in services, we assign Mode 1 a much larger weight (80%) than is the case for the other modes. Yet, we choose not to give a zero-weight to Modes 3 and 4 to account for the potential complementarities that may exist between modes of supply.

We are now left with a score ranging between 0 and 100 for each agreement/country/subsector. The next step is then to compute for each RTA the difference between the agreement's score and the GATS score. This difference therefore takes on values from -100 to 100. Because an agreement that is worse than GATS (i.e. GATS-minus) is de facto ineffective, we replace all negative values by zeros, which means no preferential treatment at all. Hence, the higher the value of the index, the more preferential the RTA for a given country/subsector.

Last, we convert W/120 subsectors into ISIC Rev.3 sectors using the UN's Provisional Central Product Classification as intermediate correspondence. Since W/120 subsectors and ISIC Rev. 3

sectors do not match one-to-one, we average the RTA index when needed using equal weights. Eventually, we get an index of the preferential content of RTAs for each party to an agreement that is compatible with our trade costs data at the sector level.