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MODELLING THE POLICY ISSUES IN SERVICES TRADE

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ABSTRACT. This paper considers what special features of services need to be taken into account in modelling services trade, and summarises methods to quantify barriers to services trade. One feature of services trade policy is the formal recognition within the WTO of commercial presence as a method by which services are traded. To capture services delivered *via* FDI, modellers need to distinguish the ownership as well as the location of economic activity. To capture the policy-relevant features of barriers to services trade, modellers need to recognise that restrictions on market access are not just discriminatory, but can also affect domestic new entrants. There is a range of theoretical and empirical challenges to fleshing out this research agenda.

JEL Classification: F1; F2.
Keywords: Trade; International Factor Movements; International Business.

RÉSUMÉ. Cet article étudie quels sont les aspects relatifs aux services qui doivent être pris en compte pour modéliser les échanges de services et il résume les méthodes disponibles pour quantifier les barrières à ces échanges. Une caractéristique de la politique commerciale appliquée dans les services est la reconnaissance formelle par l'OMC de la présence commerciale comme méthode d'échange des services. Pour mesurer les services qui transitent *via* l'IDE, les modélisateurs ont besoin de distinguer tant la propriété que la localisation de l'activité économique. Pour mesurer les aspects politiques des obstacles aux échanges de services, les modélisateurs admettent que les restrictions à l'accès au marché ne sont pas les seules mesures discriminatoires, car celles-ci peuvent aussi affecter de nouvaux entrants nationaux. Approfondir ce domaine de recherche conduit à faire face à de nombreux défis tant théoriques qu'empiriques

Classification *JEL* : F1 ; F2.
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Why worry?

Why should trade theorists and trade policy practitioners worry about services?

The answers are compelling:
– 60 per cent of the world's GDP is earned there (World Bank 2001);
– close to a third of world trade is generated there (Karsenty 2000);
– as will be shown, barriers to services trade are significant;[2] and
– services trade barriers are currently subject to negotiation in both multilateral and regional forums.

So it is incumbent on both trade theorists and trade policy practitioners to understand the nature of services, trade in services and services trade barriers. The aim should not just be to identify theoretical possibilities. It should also be to identify negotiating priorities, so as to maximise net benefits and reduce unintended consequences in a policy area that is still, sadly, largely unchartered territory empirically. With services sectors being large in most economies, the downside risk from getting it wrong is significant, and the risk is certainly there (e.g. Dee, Hardin and Holmes 2000; Francois and Wooten 2001).

What follows is a discussion of these issues from the perspective of an empirical trade policy modeller who works in a policy advisory organisation and who borrows (probably not enough) from trade theorists. The discussion may therefore miss some theoretical issues and contributions, but to compensate, will include data and parameter issues that could nevertheless use some input from trade theorists.

What is special about services?

These days, a trade theorist might say there is surprisingly little that is special about services. It is now commonplace to treat both manufactures and services as having increasing returns to scale, firm-level product differentiation and Dixit-Stiglitz preferences among firms (e.g. Francois, 1990; the survey by Markusen, 1995; Markusen, Rutherford and Tarr, 1999; Brown Deardorff and Stern, 2000),[3] with only the interpretations sometimes differing about the source of the firm-level product differentiation and the nature of the fixed costs producing the economies of scale. Only the agricultural sector is routinely treated, in theoretical models at least, as being a constant returns to scale, homogeneous product industry. But perhaps this has as much to do with needing a simple mechanism to pin down returns to sectorally mobile factors as it has to do with reality in a world where agricultural policy issues now include genetic engineering, varietal property rights and geographical indications.

2. Dee and Hanslow (2001) suggest that the global gains from eliminating barriers to trade in services, based on preliminary estimates of those barriers, could be about the same as those from eliminating all remaining barriers to trade in agriculture and industrials.
3. Francois, McDonald and Nordstrom (1995) show how this treatment is close to the Armington preference structures in conventional computable general equilibrium models.

Ethier and Horn (1991) identified one characteristic that seemed to be special about services – many were customised to the needs of individual purchasers. This is one level of product differentiation below that now included in most trade models. Brown, Deardorff and Stern (1996, p. 21) stated "We do view this as a potentially critical property of services for the effects of their international trade, although at the present time it does not seem possible to incorporate this property into any formal empirical analysis". I am not aware of any subsequent analysis that has included this characteristic explicitly, but it seems to be implicit in the choice of nesting structure of demand for varieties in some more recent models of services trade. This issue is discussed below.

What is special about services trade?

There is one characteristic of services trade policy that is special, and is starting to influence the way that services trade itself is modelled. That characteristic is the formal recognition within the WTO of commercial presence as a method by which services are traded.

Although there has been little progress in achieving multilateral or plurilateral agreement on liberalising barriers to FDI generally, there has been progress in setting up a multilateral mechanism to liberalise FDI in services. That mechanism is the General Agreement on Trade in Services (GATS) under the WTO. The GATS is set up to liberalise trade in services, and it formally recognises commercial presence, along with three other modes (cross-border trade, consumption abroad, and the movement of natural persons), as a method by which services are traded. Regional Trade Agreements are also increasingly including provisions to liberalise services and FDI.

So comprehensive modelling of services trade policy now needs to take into account liberalisation of FDI in services as well as liberalisation of other modes of services delivery.

At a theoretical level, this means that models need to distinguish the ownership of services activity from the location of that activity. The remainder of this section discusses some of the theoretical, data and parameter issues involved in modelling that distinction, while the next section looks at the issue of getting credible measures of the extent of barriers to FDI and conventional trade in services.

Theoretical issues in modelling ownership and location

By happy coincidence, many of the features required to model the location of economic activity were already being built into both analytical and empirical models of services trade *via* the recognition of increasing returns to scale and firm-level product differentiation, along with transport costs and the corresponding home market effect. Indeed, some of us who built increasing returns to scale into conventional CGE models that already had international capital mobility and an extensive treatment of tariffs and transport costs were unaware that we were adding "economic geography" to our models until Paul Krugman (1991, 1998) told us so!

But in models that differentiate the ownership and location of economic activity, a number of seemingly innocuous modelling choices can sometimes have alarming effects on model results.

Are economies of scale regional?

One early choice is whether the economies of scale in services are regional or global.[4] In treatments that assume large group monopolistic competition, where the equilibrium mark-up of price over marginal cost is directly related to the extent of product differentiation, this boils down to the same thing (although Neary (2001) argues that perhaps it shouldn't) as whether domestic and foreign firms, although differentiated, are perfect substitutes at the margin. Equivalently, do all firms appear in a single nest in the preference functions, or are there multiple nests with different elasticities of substitution at each node? If economies of scale are global, they will obviously be much stronger than if they are regional.

Francois, McDonald and Nordstom (1995) argued that for manufactures, economies of scale should be seen as global. Although a Honda Civic may not be a perfect substitute for a Ford Fiesta, consumers the world over would feel equally better off whether it was a Fiesta or a Civic that was added to their choice set. And the extent to which economies of scale in production could be exploited would depend on the global, not regional, sales of Civics or Fiestas. One way to rationalise this is to see the fixed costs of production, such as R&D and other "headquarters" services, as being incurred at a single, global headquarters. Increased sales anywhere in the world could help to defray the centralised fixed costs.

As Ethier and Horn (1991) noted, services are often customised to the needs of individual purchasers. Although this appears never to have been modelled explicitly, it is easy to think of service firms who want to do this as needing to incur fixed costs to learn about either the regional characteristics of the individuals they are serving, or the regional regulatory frameworks in which they are operating. For example, accounting firms would need to invest in learning about the tax laws in the countries in which they were operating. In models where accounting firms could set up regional offices, and where those regional offices operated as separate profit centres, the fixed costs of acquiring regional knowledge would be offset against regional, not global sales. And from a customer's perspective, accounting firms that had not invested in regional knowledge would not be viewed as being perfect substitutes at the margin.

This was the thinking behind treating economies of scale as regional rather than global in Dee and Hanslow (2001).[5] Similar thinking seems to have been at play in Markusen, Rutherford and Tarr (1999). It would be interesting to see whether the relationship between

4. The possibility of global economies of scale was first noted by Ethier (1982).
5. In fact, Dee and Hanslow (2001) treated economies of scale as regional in all sectors, based on the observation that even commodities such as Toyota Camrys and McDonalds hamburgers are often customised to meet regional tastes.

regional economies of scale and Ethier and Horn's insight could be worked out formally, or whether the heuristic is a poor one and should be dispensed with. One question begged in the process, however, is whether regional service firms do indeed operate as separate profit centres. Markusen, Rutherford and Hunter (1995) offer a forceful example of how the welfare effects of trade liberalisation can differ when firms instead coordinate their decision-making across regional locations.

Is McDonalds the same the world over?

Since it would seem to make sense to allow the strength of substitution to vary by ownership and location, one way to do this is to "nest" the preference structure, so that customers (either households, or firms purchasing the services as intermediate inputs, or both) choose across locations and then across places of ownership, or vice versa.

The key question here is which way round it should be. Unless the model builder wants to incorporate complementarity indirectly into their model, the nests should be ordered in increasing order of elasticity of substitution.

Petri (1997) had one of the pioneering empirical treatments of services traded both cross-border and *via* FDI. He modelled customers as first choosing among ownership categories, then among locations. This treatment assumes that in any given sector, individual US owned firms are closer substitutes for each other than for Australian firms, irrespective of location.

By contrast, Dee and Hanslow (2001) assumed that customers choose among locations and then among ownership categories. From an Australian perspective, a US multinational located in Australia is a closer substitute for an Australian owned firm than it is for a US firm located in the United States – McDonalds is not the same the world over.[6]

A key reason for their choice was that Petri's treatment produced a model in which multilateral liberalisation of tariffs on manufactured goods produced large economic welfare losses, for most individual economies and for the world as a whole – an uncomfortable result at odds with conventional trade theory.

"Depending on relative shares, there is no guarantee that the price of the US aggregate would be dominated by the removal of the tariff on imports, rather than by endogenous changes in the cost structure of US multinationals in Australia. Simulations with a model of this structure showed that the price of the US aggregate rose relative to the price of the Australian aggregate in the face of a tariff cut, encouraging resources in Australia to move into the domestic protected sector as its protection was removed. This led to a deterioration in allocative efficiency and an overall economic welfare loss. The story was repeated in many other regions" (Dee and Hanslow, 2001, p. 119–20).

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6. More than one international burger chain now offers its version of an "Australian" burger in Australia – no pickle, but with a rasher of bacon, a fried egg, and above all, a slice of beetroot. Clearly, international transport costs also play a role in consumer choices, but need to be modelled explicity, and independently of the way preferences are characterised.

The treatment that assumes McDonalds is not the same the world over has subsequently been adopted by others, for example Brown, Deardorff and Stern (2000) and Lee and van der Mensbrugghe (2001).

Free entry?

In commenting on the recent book by Fujita, Krugman and Venables (1999) on new economic geography, Neary (2001) wondered whether the assumption of large group monopolistic competition, and the assumption of free entry that goes with it, was always appropriate. He suggested that models with restricted entry and scope for strategic behaviour might have more to say about the forces leading to the agglomeration of economic activity.

In the context of modelling services trade, many of the relevant trade barriers are regulatory barriers that protect the incumbents from new entry, be it from domestic or foreign firms. It would not make much policy sense to model complete liberalisation of services trade without allowing for new entry to occur.

But as Low and Mattoo (2000) note, recent liberalisation discussions have tended to focus on freeing up ownership restrictions rather than necessarily allowing new entry per se, with the danger that rents would simply be transferred to foreign multinationals. Francois and Wooten (2001) also show how, in the continuing presence of significant barriers to cross-border trade, freeing up entry restrictions could result in new foreign entrants being invited to join the domestic cartel. So issues of restricted entry and group size may be relevant for partial services trade liberalisation scenarios.

Which factors of production move?

The above considerations deal with how to specify the output of FDI firms in various locations. But is it labour, capital or both that moves when FDI firms relocate?

Although it is at first sight natural to model FDI as the movement of capital, Markusen, Rutherford and Tarr (1999) build a model in which the distinguishing characteristic of services delivered *via* FDI is the intensity with which they use skilled labour from both home and host locations – capital does not appear in their model at all.

More generally, FDI firms can be modelled as using combinations of capital, local labour (of various skills), and local and imported goods and services, which could include imported 'headquarters' services intensive in the use of skilled labour in the supplying country. Examples (to varying degrees) of this general approach include Petri (1997), Brown, Deardorff and Stern (2000) and Dee and Hanslow (2001). The question of how to obtain data with which to calibrate the cost structures of FDI firms is discussed later.

A common feature of all these approaches is that labour is completely immobile regionally, and is traded only indirectly through trade in intermediate goods and services. This approach is nevertheless consistent with the temporary movement of people. If people move for less than a year, they do not officially change residence, their earnings are therefore recorded in balance of payments statistics as an international transaction (and in a model of the above

sort could be lumped in with repatriation of profits), and if their movement is strictly short term, the chances are that most of the income so earned is spent back home, so from the expenditure side, it looks as if no movement has occurred.

Nevertheless, multinational operations often require the movement of people, particularly expatriate executives and specialists, for more than a year. Although this is a sensitive policy issue, none of the above modelling approaches handles such labour migration directly. Because of the complementarities involved, Dee and Hanslow (2001) lumped barriers to the permanent movement of people together with other barriers to FDI, and barriers to the temporary movement of people together with barriers to the other three modes of service delivery, but did not model either the temporary or permanent movement of people directly. This approach is adequate when the focus of attention was on barriers to FDI. But barriers to the temporary movement of people per se is an issue of intense interest, especially to developing economies. If it is to be modelled directly, then the underlying flows of people will also need to be modelled. Winters *et al.* (2001) show how this can be done, taking into account differences in the productivity of temporary and permanent workers, and the importance of worker remittances to home country income.

Who owns the FDI capital and how is it financed?

Almost by definition of what distinguishes foreign direct investment from portfolio capital, it makes sense to model FDI capital as being wholly owned by asset holders in the "home" country, rather than as being partially owned elsewhere. This nevertheless raises some theoretical and data issues associated with partial ownership in practice that are canvassed by Baldwin and Kimura (1998), Dee and Hanslow (2001), Karsenty (2000) and Kimura and Baldwin (1998).

The next question is why asset holders in the home country prefer to hold FDI capital in one location rather than another, or instead of other assets. The simplest way to deal with this is to assume perfect substitution between different types of capital and other financial assets, particularly bonds, so that global arbitrage ensures that FDI capital earns the going world real interest rate everywhere, and asset ownership does not need to be modelled explicitly (except if asset accumulation is to be allowed for – see McDougall (1993) for a very useful example of the latter approach).

However, if the source of firm-level product differentiation happens to be firm-specific assets in the form of human capital held in the head of the FDI capital owner back home, then the assumption of perfect arbitrage sits very uncomfortably with the notion of rents earned by firm-specific assets.

Petri (1997) realised this, and had asset holders in each home base allocate their (fixed) total wealth among capital in different locations according to a structure of preferences that did not assume perfect substitution, and hence did not impose perfect arbitrage nor perfect capital mobility. Brown and Stern (2001) similarly allow for less than perfect capital mobility.

Dee and Hanslow (2001) combine Petri's (1997) treatment of less than perfect substitution across capital in different locations, with McDougall's (1993) treatment of perfect arbitrage for bonds (which could also be seen to include portfolio capital) and his treatment of asset accumulation, to have a model in which the accumulation of FDI capital can be financed by international borrowing and lending. And the returns to FDI capital ultimately accrue to the region that finances it, which may not be the same as the region that nominally "owns" it.

While not necessarily critical to model outcomes in terms of relative goods and factor price or quantity movements, these modelling "frills" are critical to the way the gains from services trade liberalisation are distributed regionally. Simple analytical models of services trade rightly tend to abstract from such issues, but probably need to acknowledge that their welfare results are qualified accordingly.

Nevertheless, the theoretical and empirical underpinnings for the rate of return to FDI capital remain weak. While it is tempting to assume that FDI capital earns a premium because of rents to firm-specific assets, there is still the question "over what?" Domestically located capital? Or some other asset? There are alternative models that suggest that, because of a "lemons" problem, FDI capital might instead earn a discount (Gordon and Bovenberg, 1996). Does FDI capital have a role to play in explaining the equity premium puzzle (e.g. Kocherlakota, 1996), the home equity bias (e.g. Lewis, 1999), or any of the other "six major puzzles in international macroeconomics" (e.g. Obstfeld and Rogoff, 2000; McKibbin and Vines, 2000)? Or have we "missed the boat", and should we be assuming perfect arbitrage for FDI capital after all? These questions deserve a great deal more theoretical and empirical research.

Data and parameter issues in modelling ownership and location

Brown, Deardorff and Stern (2000) observe that "although the New Trade Theory is perhaps best known for introducing new reasons why countries may lose from trade, in fact its greatest contribution is to expand the list of reasons for gains from trade".

The gestalt shift often comes from judicious choice of data and parameters. This is what can take analytical models beyond the realm of identifying theoretical possibilities, to identifying sensible (or at least weeding out non-sensible) economic policy options.[7]

There is a serious lack of data on the activities of offshore affiliates from which to obtain costs and sales shares for the activities of FDI firms, but the situation is improving. Karsenty (2000) documents the development of a new statistical framework, FATS, to provide information on the activities of foreign affiliates. The OECD, in cooperation with EUROSTAT, initially provided data on this basis for 18 countries.[8] Provision of such data for further countries is to be encouraged, especially since Petri (1997) shows just how sensitive are

7. Neary (1999) gives a good example of where calibration to real world data rules out multiple solutions and hysteresis in models of new economic geography.

8. These were Canada, the Czech Republic, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Poland, Sweden, Turkey, the United Kingdom and the United States.

imputed estimates to different imputation methods. But for what it is worth, the results from empirical models tend to be even more sensitive to estimates of the size of barriers to services trade than they are to estimates of the underlying services trade and FDI flows.

Another key issue (not unique to services) is the appropriate value of behavioural parameters, such as CES elasticities of substitution, that cannot be obtained from calibration to underlying data flows. Compared with Armington formulations, in models that assume firm-level product differentiation and Dixit-Stiglitz preferences, these parameters perform a double duty, so their values are in that sense doubly important – they not only determine the price-sensitivity of demand for particular varieties, but they also determine the extent to which customers (households and/or producers) benefit *via* a type of endogenous productivity improvement from having more varieties available. These productivity effects can contribute to violations of the Stopler-Samuelson effects from conventional trade theories – instead, all factors of production can gain in real terms from trade liberalisation in a single sector (e.g. Brown, Deardorff and Stern, 2000).

Markusen, Rutherford and Tarr (1999) showed these anti-Stolper-Samuelson effects to be particularly strong, using a model with domestic/import substitution elasticities of 3 and elasticities of substitution among individual domestic or imported varieties of 5. But it could be argued that these values are unduly low. They are at the top end of econometric estimates of substitution, not among individual varieties, but among product groups (see the survey in Jomini et al., 1994, as well as Hertel 1997). Francois, McDonald and Nordstrom (1995) argued for using values larger than this when substitution among the products of individual firms was concerned. Recent work that chooses parameter values, not from conventional econometric estimation, but according to how they help the models to track historical trade trends, also argue for substantially higher values (Gehlhar, 1997; Hillberry et al., 2001). Since in models with large group monopolistic competition, the elasticity of endogenous productivity with respect to industry output (proportional to the number of varieties) is just the inverse of the elasticity of substitution among individual varieties, one wonders whether Markusen, Rutherford and Tarr would have achieved the same spectacular results using an elasticity of, say, 15 (as in Dee and Hanslow, 2001) instead of 5.

Clearly, parameter values matter, and conventional econometric techniques are unlikely to be of much help when the relevant concepts are substitution at or below the firm level. The methods pioneered by Gehlhar (1997) offer one way of getting more realistic estimates, but must deal convincingly with the problem that elasticities of substitution are not the only unobservable exogenous factors that can be selected to match history.

What is special about services trade barriers?

Hoekman and Primo Braga (1997) noted that because service delivery often needs to take place "face to face", tariffs are not a feasible means of trade protection because customs officials are unable to observe the transaction. Instead, services trade barriers are primarily regulatory, and like other non-tariff barriers, therefore difficult to quantify.

The GATS outlines the sorts of trade barriers that will be negotiated.

As noted, the GATS recognises commercial presence as a mode of service delivery, so some of the important barriers to services trade are those that impede FDI by service firms.

The GATS also distinguishes barriers to market access and derogations from national treatment. Findlay and Warren (2000) argue that barriers to market access can be interpreted as being non-discriminatory barriers that affect the entry of any new firms, be they domestic or foreign, while derogations from national treatment are clearly those barriers that discriminate against foreign firms. Examples of market access barriers would be restrictions on the total number of bank licences, or restrictions on the total number of telecommunications carriers. Examples of derogations from national treatment would be restrictions on the number of foreign bank licences, or restrictions on foreign ownership of telecommunications carriers.

Thus modellers have to be prepared to recognise not only the activities of offshore affiliates and barriers to FDI flows, but also that barriers to services trade are not just discriminatory, but can also affect domestic new entrants. Dee, Hanslow and Phamduc (2003) discuss how these features of services trade barriers affect the applicability of conventional trade theorems such as the Stolper-Samuelson and Rybczynski theorems. Dee and Hanslow (2001) demonstrate just how important the additional components are empirically.

How to measure barriers to services trade?

The Productivity Commission and colleagues at Australian National University recently completed a three-year collaborative project designed to generate estimates of barriers to services trade. As with any research project, there are things we would now do differently, and issues we wish we had recognised earlier. Nevertheless, the project has generated the beginnings of a reasonably comprehensive (in terms of country and sectoral coverage) set of estimates of barriers to services trade. These estimates include barriers to services delivered *via* FDI, and non-discriminatory restrictions on market access.

The project has quantified regulations affecting trade in banking (McGuire, 1998; McGuire and Schuele, 2000; Kalirajan *et al.*, 2000), telecommunications (Warren, 2000a, 2000b), maritime (Kang, 2000; McGuire, Schuele and Smith, 2000), wholesale and retail distribution (Kalirajan, 2000), education (Kemp, 2000), professional services (Nguyen-Hong, 2000) and foreign investment in services (Hardin and Holmes,1997) for selected economies. Wherever possible, this research has also measured the "first round" impact of these barriers on economic outcomes – prices, costs, profits or quantities produced. The results of the research are summarised in TABLE 1. It shows, for example, that while Australia has reasonably liberal trade in banking and telecommunications services, it is less liberal in legal, accountancy and maritime services. The table also shows that developing countries often, but not always, have the least liberal services trade regimes. Finally, it confirms that the price impacts of services trade barriers in some key infrastructure industries are significant.

Table 1 - Trade restrictiveness indexes and their price effects for selected services

	Domestic*		Foreign*		Price effect**	
	Maximum (country)	Australia (rank***)	Maximum (country)	Australia (rank)	Maximum (country)	Australia (rank)
Legal	0.33 (Austria, Japan)	0.27 (24/29)	0.58 (France, Turkey)	0.42 (10/29)	ne	ne
Accountancy	0.31 (India)	0.16 (12/34)	0.63 (Philippines)	0.41 (18/34)	ne	ne
Architectural	0.25 (Canada)	0.03 (12/34)	0.44 (Austria)	0.15 (12/34)	ne	ne
Engineering	0.2 (Austria, Germany)	0.04 (15/34)	0.39 (Austria)	0.08 (6/34)	14.5 (Austria)	2.8 (6/20)
Distribution	0.26 (Korea)	0.03 (5/38)	0.40 (Malaysia)	0.10 (7/38)	ne	ne
Banking	0.27 (Malaysia)	– (1/38)	0.65 (Malaysia)	0.12 (22/38)	60.6 (Malaysia)	9.3 (21/38)
Telecommunications	0.47 (Turkey)	0.04 (7/38)	0.80 (Turkey)	0.04 (7/38)	138.4 (Indonesia)	0.3 (8/37)
Maritime	0.28 (Korea)	0.13 (14/35)	0.64 (Philippines)	0.42 (21/35)	ne	ne

* The restrictiveness index scores range from 0 to 1. The higher the score, the greater are the restrictions for an economy.

** The price effect of restrictions is measured as a percentage.

*** Rank refers to the position of Australia relative to other countries in the study, where 1 is the least restrictive economy. For example, 24/29 means Australia is the 24th least restrictive economy of the 29 economies included in the study — that is, there are five economies more restrictive than Australia.

ne: Not estimated. – Zero.

Sources: Kalirajan (2000); Nguyen-Hong (2000); Kalirajan *et. al.* (2000); McGuire and Schuele (2000); McGuire, Schuele and Smith (2000); Warren (2000a); Warren (2000b).

OECD (2000) gives an excellent summary of the "state of the art" in the field of services trade barrier estimation, as it stood then. It compares our methodology with the few available alternatives (Hoekman, 1995, Francois and Hoekman, 1999), and identifies areas for further research. Some of these issues are discussed below.

The methodology used at the Productivity Commission and the Australian National University proceeds as follows.

First, qualitative information on barriers to services trade is converted first into a quantitative "restrictiveness index". This involves identifying all relevant categories of restrictions, then for each country, (a) scoring their actual restrictions in each category according to their restrictiveness, and then (b) weighting together the different category scores according to an assessment of their relative economic significance. Note that in both steps, a judgement is required, although arguably, more in the second step than the first. For example, when the

relevant category is restrictions on the proportion of foreign ownership, it makes sense to score "no more than 25 per cent foreign ownership" as twice as restrictive as "no more than 50 per cent foreign ownership". What is more contentious is how to weight restrictions on foreign ownership together with other restrictions, such as licensing requirements or restrictions on lines of business.

McGuire (1998) shows how inadequate it is to restrict the information gathering at this stage to that listed by Member countries in their GATS schedules. He found that there were 165 separate restrictions on trade in financial services contained in Federal and State legislation in Australia, compared with 38 restrictions listed in Australia's GATS schedule. For this reason, the project's information gathering has extended to APEC, ITU, OECD, Tradeport, USTR, and other sources.

The first step produces an index score for each country of the form:

$$R = R_1 + R_2$$

where R_1 and R_2 are sub-indexes of individual services trade restrictions, scaled so that their maximum possible values reflect the relative economic significance of the individual restrictions, and where the maximum values sum to unity.

The second step is to enter the restrictiveness index into an econometric model of economic performance in the sector in question (where Y is some measure of performance, such as price, quantity, price/cost margin, or productivity), along with whatever other factors (X) economic theory suggests might be important determinants of performance (these can be industry-specific or economy-wide):

$$Y = \alpha + \beta R + \gamma X + \varepsilon$$

So far, the Productivity Commission's econometric work has been purely cross-sectional (cross-country), but panel estimation is also possible, although this involves collecting information about restrictions on services trade for more than one time period. In related work, the OECD has collected panel data on domestic regulatory regimes (a "beyond the border" issue) in OECD countries, and has used panel estimation techniques to quantify their effects (Gonenc and Nicoletti, 2000; Boylaud and Nicoletti, 2000; Steiner, 2000).

Finally, with an estimate of β in hand, the model can be used to predict the "first round" effects of liberalisation (equivalent to the extent of the vertical shift in the supply or demand curve in partial equilibrium analysis). If total liberalisation would yield a restrictiveness index score of zero, then βR itself gives an estimate of the effects of current restrictions on economic performance, relative to a free-trade benchmark (and holding other factors constant). Mathematical manipulation can convert this into a percentage "tax equivalent" (the appropriate manipulation depending on the particular measure of performance and the particular functional form for the estimating equation). However, a "free trade" benchmark need not always coincide with zero regulation. The method is flexible enough to allow that in a free trade situation, it would still be appropriate to have prudential regulation of financial ser-

vices, safety regulation of air passenger transport services, and so on. Thus, free trade could be associated with an alternative value R' of the restrictiveness index, and the value of $\beta(R - R')$ would then be converted into a regulatory tax equivalent.[9]

Assessment

The first thing to note about the methodology is how it can be generalised to include additional countries. Once an estimate of β has been obtained from a particular sample, all that is required for additional countries is to produce an index score R to characterise their services trade restrictions, and their "tax equivalents" can be calculated from βR or $\beta(R - R')$ without redoing the econometrics. Obviously, the original sample needs to be fairly representative for such "out-of-sample forecasting" to be appropriate. In the Productivity Commission's estimation, we have tried to ensure that the samples include the individual APEC economies, the members of the European Union, and key economies from the rest of the world (preferably Switzerland, Turkey, India, and/or South Africa). The Productivity Commission has made the services trade barrier estimates from the project, as well as the modelling framework used by Dee and Hanslow (2001), available on its web site, and published the "tax equivalents" in readily accessible form in its recent Trade and Assistance Review publications.[10]

A second advantage of the methodology is that it produces estimates of the effects of trade barriers that are explicitly linked to characterisations of the restrictions themselves, rather than being generated as an "unexplained residual".

The OECD (2000) survey paper highlights several issues associated with the methodology.

The first is the judgmental nature of the weights used to create the initial restrictiveness index. This is certainly an issue if the overall restrictiveness index is used by itself as an indicator for policy purposes. But it is less of an issue when the index is used in econometric work to generate a "tax equivalent". This is because, wherever possible, the Productivity Commission has entered the components of the index separately into the econometrics:

$$Y = \alpha + \beta_1 R_1 + \beta_2 R_2 + \gamma X + \varepsilon$$

so that the econometric estimates β_1 and β_2 then provide non-judgemental, data-driven estimates of the weights to be attached to R_1 and R_2.

Often this approach is precluded by one of two econometric problems – multicollinearity, or lack of in-sample variation in one or more of the restrictiveness index components. However, the recent regulatory work by the OECD (Gonenc and Nicoletti, 2000; Boylaud and Nicoletti, 2000; Steiner 2000) is suggestive of how factor analysis (of which principal components is an application) could be used to overcome these problems. Prior to any econometric estimation,

9. For example, if the performance measure is price P, then with the simple functional forms shown above, the price impact $(P - P')/P'$ can be calculated as $\beta(R - R')/[P - \beta(R - R')]$.
10. Go to http://www.pc.gov.au/research/memoranda/servicesrestriction/index.html.

they used factor analysis to identify a set of orthogonal "factors" that explained most of the variation in their original data on regulatory restrictions. But as Doove *et al.* (2001) point out, high cross-country variation in restrictions may have little or no relationship with the relative economic importance of particular restriction categories:[11] "… the use of factor analysis could lead to paradoxical results – in the sense that the more important restrictions, if they were applied widely and consistently across countries, could also have low cross-country variation and thus low factor analysis weights". (p. 17)

If, instead, principal components were used as the method of econometric estimation, then problems of multicollinearity would be overcome and orthogonal linear combinations of individual restrictions could be identified that explained most of the variation in economic outcomes – a truer measure of economic significance.

A final issue is how to interpret the "tax equivalent" measures. There are two related issues:
– what is the appropriate measure of performance *Y*;
– what does each measure tell us about whether the restrictions are rent-creating or cost-escalating.

Take the second issue first. Restrictions could either create pure rents for incumbent firms, and should therefore be modelled as tax or tariff equivalents, in the same way as the MultiFibre Arrangement. Liberalisation would be modelled as the elimination of those tax or tariff equivalents, yielding "triangle gains" associated with improvements in allocative efficiency, along with redistributive effects associated with the elimination of rents to incumbents. As Dee and Hanslow (2000) demonstrate, the former effects would not be trivial, but the latter effects could also be significant. Alternatively, restrictions could increase the real resource cost of doing business. Liberalisation would be modelled as a productivity improvement (saving in real resources), and yield "rectangle gains" from freeing those resources for use elsewhere. Rectangle gains are likely to exceed triangle gains by a significant margin, given the importance of the services sectors in most economies.

To date, most modellers have made an *a priori* judgement about which treatment is appropriate (e.g. Hertel, 1999; Brown, Deardorff and Stern, 2000; Dee and Hanslow, 2001), but the truth is likely to lie in between, and to differ from sector to sector. Pure rents are relatively rare in practice, but it is easy to imagine them being a component of the returns to international finance and telecommunications companies, for example, given the artificial barriers to new entry in those sectors in many countries. On the other hand, it is easy to imagine how the trade restrictions built into the international system of bilateral air service agreements frustrate the ability of airlines to reap network economies, and thus increase their real costs of doing business.

11. Doove *et al.* (2001) extend the cited OECD examinations of regulatory regimes to non-OECD countries, and generate overall price impact measures for these regimes.

Ideally, the empirical work involved in estimating the economic effects of the barriers should give insights as to whether they are rent-creating or cost-escalating. For example, if the restrictions are believed to create rents, then the relevant measure of performance to use in the econometric analysis would be price/cost margins. If the restrictions are believed to raise costs, then the relevant performance measure would be a measure of costs or productivity. Even more ideally, each study should use a range of performance measures to identify what type of effects are being created. In practice, only one or two measures of performance are used, and not always the most appropriate ones in hindsight.

Where restrictions are believed or shown to raise real resource costs, there is a subsidiary set of questions to answer. Do the restrictions raise fixed costs, sunk costs, or ongoing operating costs? And what is the commodity or primary factor composition of the real resource costs so created? In practice, little information is likely to be provided on these subsidiary questions in the process of estimating the barriers. But this will be a fruitful area for different modellers to take different theoretical approaches in their applications, and to test the implications accordingly.

Thus additional work on estimating barriers to services trade is warranted, not only to increase the sectoral and country coverage of the estimates, but also to give additional insights into the types of economic effects that are being created.

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