The measurement and effects of barriers to trade in basic telecommunication services: the role of negotiations*

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Abstract: Using econometric methods, this analysis develops quantity impacts of impediments to trade in voice telephone services, focusing on the perspective of negotiated agreements. These impacts, estimated on the basis of market, demographic, and policy variables, establish a baseline from which the achievements of future trade rounds, including the Doha Round, could be compared. In a departure from previous literature in this area, this article draws on documents appended or pertaining to the General Agreement on Trade in Services (GATS) to identify barriers to trade in voice telephone services, and to estimate quantity impacts on this basis. The article finds that market access and national treatment commitments scheduled by WTO members under the GATS, when complemented by commitments to pro-competitive regulatory disciplines, may be formulated into meaningful policy variables. These policy variables are found to be statistically significant in explaining market penetration in voice telephone services, as are variables for income and private sector ownership.

1. Introduction

The measurement of barriers to trade in services, and the gains associated with removing such barriers, has been of keen interest for the past several years. This is due in part to the ongoing Doha Round negotiations in the World Trade Organization (WTO), where services liberalization is part of the built-in agenda, and in part to growing recognition of the prominence of the service sector in overall economic activity. In particular, there is continued interest in liberalizing infrastructure service industries, including telecommunications, finance, energy, and transportation. These services exert an economy-wide influence as they constitute inputs to all other economic activities, including trade.

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This article estimates quantity impacts of negotiated commitments affecting voice telephone services. We present policy variables derived from commitments to market access, national treatment, and pro-competitive regulatory principles scheduled under the General Agreement on Trade in Services (GATS). This represents a departure from previous work in the area, in which policy variables were formulated on the basis of alternative information sources. GATS commitments have been chosen in the interest of establishing a measure of trade liberalization bound through negotiations. We acknowledge that services negotiations do not effect liberalization, but rather act as an instrument by which prior unilateral liberalization can be bound in place, thereby discouraging the implementation of trade-impeding measures in the future and promoting greater transparency and legal certainty. We also acknowledge that (i) actual market conditions may be more open than what is indicated in a schedule, reflecting autonomous liberalization measures by the government(s) concerned, and that (ii) WTO Members remain free at any time, regardless of scheduled commitments, to operate non-discriminatory licensing and qualification mechanisms, technical standards, and public policy obligations (e.g. universal service requirements). Nevertheless, in finding (as we do below) that negotiated bindings influence effective market access, our work provides for the measurement of negotiated achievements, thereby assisting in the assessment of results and, in turn, building support for the process among trade policymakers.

In what follows below, we first (in Section 2) present some descriptive information on the Fourth Protocol to the GATS (basic telecommunications), followed by a discussion of some relevant previous literature on impediments to trade in telecommunications services (in Section 3). We then present our methodology and data in Section 4, our econometric results in Section 5, and concluding remarks (along with some policy implications) in Section 6.

2. **The Fourth Protocol to the GATS (basic telecommunications)**

Supplemental schedules of specific commitments for basic telecommunication services were appended to the GATS on February 8, 1998, with the adoption of the Fourth Protocol to the GATS. The supplemental schedules, along with initial GATS schedules that entered into force on January 1, 1995, contain much of the detail of the Fourth Protocol.

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1 Examples suggested by a referee are that Ireland, Portugal, and Spain abolished access limitations well before the indicated phase-out date, while on the other hand even full market access, national treatment, and compliance with the Reference Paper allows no inferences on the existence of legitimately maintained regulatory barriers (such as standards, and licensing, and qualification requirements).


3 It is important to take the initial schedules into account because important horizontal (i.e., cross-sectoral) limitations on foreign investment and temporary entry and stay (of services personnel) are found there. Horizontal commitments must be read together with sector-specific commitments to identify potential business opportunities and pertinent restrictions.
In the supplemental telecommunication schedules, one finds market access, national treatment, and additional commitments pertaining to seven basic telecommunication service sectors: voice telephone services, packet-switched data transmission services, circuit-switched data transmission services, telex services, telegraph services, facsimile services, and private leased circuit services. Member countries schedule commitments by sector and mode of supply (i.e., cross-border supply, consumption abroad, commercial presence, and movement of natural persons). Due to the positive listing methodology employed in the GATS, member countries can schedule commitments to all, none, or a combination of basic telecommunication sectors. Commitments are of two types. Full commitments (also called full bindings) on market access guarantee the absence of four types of quantitative barriers, including limits on the number of suppliers, as well as of constraints on the form of legal incorporation, including joint-venture requirements, and the level of foreign equity participation (Article XVI:2). Full commitments on national treatment guarantee the absence, in fact, of any measures that would modify the ‘conditions of competition’ (Article XVII: 3) to the detriment of foreign services or service suppliers. Partial commitments indicate the existence of limitations on market access and/or national treatment with regard to any of the four modes of supply.

Others who have endeavored to measure NTBs in services have tended to formulate policy variables by drawing on information sources other than the GATS schedules. One explanation for this is the difference in research objectives. Other research has tended to focus on measuring trade liberalization, however achieved. As noted, this article focuses on liberalization bound through negotiations. From this perspective, liberalization is associated with a country’s agreement to bind previously liberalized practices or trade liberalizing practices planned for the future.

A second reason why other researchers have not formulated policy variables by drawing on GATS schedules is that these schedules suffer from information gaps (not surprising, as inter-governmental treaties are not intended to serve as inventories of trade measures) that hinder efforts to measure the effect of regulatory barriers. In particular, GATS commitments do not address some issues that strongly influence the competitive environment, thereby calling into question whether commitments guarantee effective market access. The following section indicates the manner in which the Fourth Protocol fills this gap. Another difficulty with the GATS is that, where no commitment has been scheduled, it remains unclear whether or not a trade impediment exists that would fall under the

4 National treatment usually accords to foreign firms the same rights and obligations accorded to domestic firms.
5 Note that most of these restrictions, in particular those of a quantitative nature, may be operated in either discriminatory or non-discriminatory form. The existence of discriminatory elements would need to be specified in the country’s schedule in addition to the inscription of the measure per se.
6 A commitment to market access or national treatment is also referred to as a binding.
relevant GATS provisions (Articles XVI or XVII). Such situations are identified by the absence of any entry for the sector of interest (voice telecommunication services in this instance) or, in scheduled sectors, by the inscription of the word ‘unbound’ with regard to one or more modes of supply. No information on regulatory policy, whether liberal or not, is provided in the schedules. Unfortunately, the Fourth Protocol does not address this issue, which of course is a limitation of this approach.

Telecommunication schedules are supplemented by two additional documents that fill information gaps typically found in schedules: a note circulated by the Chairman of the Group on Basic Telecommunications (GBT),\(^7\) and the regulatory reference paper.\(^8\) In combination, these documents assist firms in identifying regulations, practices, and legal obligations that may enhance the value of market access and national treatment commitments. The note issued by the GBT Chairman on January 16, 1997, provides useful guidance on scheduling and interpreting basic telecommunication commitments, though it lacks legal status. The note stipulates that market access and national treatment commitments on basic telecommunication services, unless otherwise stated in the schedules, encompass local, long-distance, and international services; for public and non-public use; on a facilities and resale basis; through any means of technology (e.g., cable, cellular, and satellite). With these stipulations, the note ensures that commitments are scheduled in a manner that accurately reflects regulatory rules and practices, among which there is broad diversity across countries. By virtue of the note, basic telecommunication service commitments were rendered more transparent and practical in terms of identifying business opportunities.

The reference paper is considered by many observers as one of the major achievements of the GBT, and perhaps of the entire Uruguay Round of services negotiations. The reference paper was intended to safeguard the value of market access commitments by seeking to render specific regulatory practices competitively neutral. In this sense, the reference paper effectively addresses the intent of Article VI(4) of the GATS framework, which pertains to domestic regulation.\(^9\)

Article VI(4) contains a negotiating mandate to develop disciplines to ensure that technical standards, qualification requirements and procedures and licensing requirements do not constitute unnecessary barriers to trade in services. Accordingly, any such standards or requirements should be (1) based on objective and transparent criteria, such as competence and the ability to supply the service;

7 World Trade Organization (1997).
8 World Trade Organization (2003). In fact, through its inscription by many Members into the column relating to ‘additional commitments’, the reference paper is an integral part of these Members’ telecom schedules and carries the same legal weight as any other specific commitment.
9 As noted by a referee, in addition to the link discussed below between the reference paper and Article VI(4), other GATS provisions were also related to the reference paper – these include Article III (on transparency), Article VI(2) (on judicial review), Article VIII (on monopolies and exclusive suppliers), and Article IX (on business practices).
(2) not more burdensome than necessary to ensure the quality of the service; and
(3) in the case of licensing procedures, not in themselves a restriction on the supply of the service. The reference paper embodies these broad principles, but makes them specific to basic telecommunication services. Countries could bind to all or part of the reference paper. In binding to the entire reference paper, countries committed to:

- prevent anti-competitive practices, including cross-subsidization among other practices;
- provide interconnection on a timely basis, and upon request, under nondiscriminatory terms, conditions, and quality, with cost-oriented rates that are transparent, reasonable, and sufficiently unbundled (so that competing suppliers need not pay for services or facilities they do not require);
- assure that universal service obligations are administered in a transparent, nondiscriminatory, and competitively neutral manner;
- assure public availability of licensing criteria, with timely notification of the terms and conditions of licensing and reasons for the denial of licenses upon request;
- maintain or create independent and impartial regulators not accountable to any supplier of basic telecommunication services; and
- allocate scarce resources, including frequencies, numbers, and rights of way, in an objective, timely, transparent, and nondiscriminatory manner.

3. Literature review

Efforts to measure NTBs on services are relatively new, with most work dated after completion of the Uruguay Round. Marko (1998), among the first to approach the GBT Agreement in a quantitative fashion, computes frequency measures for 69 GBT signatories based on GATS market access and national treatment commitments for all four modes of supply. She uses two methods to compute the measures, first by considering only full commitments, and second by constructing a five-point weighting system to assess partial commitments scheduled by member countries. Marko estimates that 45% of the basic telecommunication services markets represented by participants in the extended negotiations on basic telecom (signatories to the Fourth Protocol) is open to free trade, reflecting how much remains to be done.

Warren (2000) takes the quantitative approach further, performing regression analysis on market (income per capita, service quality, unmet demand), demographic (housing density), and policy variables of his own construction in an attempt to explain market penetration, measured as mainlines per hundred...

10 Bindings to the principles set forth in the reference paper could take effect upon the Fourth Protocol’s entry into force, or at a later date specified by the member country.

11 A mainline is a telephone line connecting a subscriber’s terminal equipment to the public switched network and which has a dedicated port in the telephone exchange equipment.
persons, in 136 countries. He constructs four policy variables associated with market access (MA) and national treatment (NT) mostly from data provided by the International Telecommunication Union. The variable MA/Trade captures policies that impede market access of all potential entrants (domestic and foreign) by restricting provision of cross-border telecommunication services; MA/Invest, policies that discriminate against all potential entrants (domestic and foreign) seeking to supply services through partially or wholly owned foreign affiliates; NT/Trade, policies that impede market access of potential foreign entrants by restricting provision of cross-border services; and NT/Invest, policies that discriminate against potential foreign entrants seeking to supply services through foreign-invested affiliates. In regressions performed by Warren, he reports that the latter three policy variables appear to be statistically significant, along with income per capita, unmet demand, and service quality, and that these variables jointly explain 88 to 89% of variation in market penetration.

It is always desirable to demonstrate the sensitivity of empirical results to specification of policy measures. Our approach below complements the previous work, examining whether negotiated bindings can be viewed as a determinant of market penetration in telecommunications services. If so, the link between policy and results will be shown to be more robust.

4. Methodology and data

This analysis uses ordinary least squares (OLS) to estimate the relationship between market penetration in the year 2000, measured by mainlines per hundred persons, and selected market, demographic, and policy variables in 67 countries. Although market penetration does not measure the quantity of basic telecommunication services consumed, it does measure the capacity over which consumption, including inbound and outbound international calls, could take place. Further, low market penetration tends to be associated with state-owned and -operated telecommunication monopolies. In fact, it is low market penetration that has motivated many countries to open their markets to foreign investment in the expectation, or under the requirement, that better capitalized carriers would increase market penetration rates. National calling minutes or international calling minutes may be superior variables for measuring quantity, but data are not available for many of the 67 countries of interest here.

In explaining market penetration, we estimate a reduced-form of supply and demand factors. On the demand side, we anticipate that telephone service is a normal good, so that income should have a positive impact on market penetration.

12 One issue that is not formally addressed is the relationship between fixed and mobile telecommunications usage. While the focus here is on fixed mainline penetration, some preliminary work suggests that similar results may hold for mobile phone penetration.
On the supply side, increased population density may be a proxy for reduced cost per household of establishing telecommunication networks (so we would expect a positive impact on market penetration). Also supply-related, the role of the private sector in the telecommunications industry would be expected to be cost-reducing, leading to a positive impact on penetration although, as noted below, the link may be more complicated than this, especially in developing economies. Similarly, market reform – defined as the passage of telecommunication reform legislation and establishment of an independent regulator – should increase market penetration. Finally, the policy measures which are the focus of this article are intended to increase penetration, though it is an empirical question as to their impact; we take a broad view of policy measures, anticipating that GATS commitments affecting all aspects of the telecommunications sector (including cellular and satellite) may feed back to affecting the core wireline penetration.

We define the independent variables as follows:

- **LOG(Y)**, the natural log of gross domestic product (GDP) per capita in 1998, resulting in a semi-log specification;\(^{13}\)
- **PS**, the share of the incumbent telecommunications carrier held by the private sector in 1998;
- **PSOECD**, the share of the incumbent held by the private sector in OECD countries in 1998 (set to zero for non-OECD firms);
- **PD**, for population density in 1998;
- **REFORM**, a dummy variable that equals 1 if a country had undertaken telecommunication market reform by 1998, and 0 otherwise;\(^ {14}\) and
- **policy variables** GATSPOLICY, MAPOLICY, and NTPOLICY, explained below.

The three policy variables are highly correlated and therefore their effects are examined via three separate specifications. GATSPOLICY is a composite policy variable that reflects a scoring of market access and national treatment commitments (taking values from 0 to 1); the scope of commitments, referring to the share of basic telecommunication sub-sectors bound (taking values from 0 to 1);\(^ {15}\) reference paper bindings, referring to the share of reference paper principles bound (taking values from 0 to 1); and the depth of commitments, referring to the extent to which all commitments scheduled applied to local, long-distance, and international services over public and non-public works; wireline, cellular, and

\(^{13}\) The natural log of Y was selected because a scatter diagram of the data suggested that mainlines per hundred increased at a decreasing rate as income increased.

\(^{14}\) Note that REFORM reflects domestic policy implementation rather than negotiated commitments under the GATS (the latter reflected in our policy measures).

\(^{15}\) The scope of basic telecommunication services bound by countries enters into the equation because it is more economic to provide telecommunication services in a market if a variety of services can be provided over new or acquired network capacity. Like the GBT Chairman’s note and the reference paper, the scope of commitments affects the value of market access commitments.
satellite networks; and resale and facilities-based networks\textsuperscript{16} (taking values from 0 to 1).
Market access and national treatment commitments are scored by the degree to which they promote or impede trade, as suggested by an OECD document published in 2001.\textsuperscript{17} For each of the four modes of supply, this document usefully separates the types of NTBs commonly found in schedules into three categories: those having little or no restrictive effect, accorded a score of 0.75; restrictive effect, accorded a score of 0.5; and prohibitive or highly restrictive effect, accorded a score of 0.25. To extend this scoring system, entries in the schedules that are unbound (signifying no binding) are accorded a score of 0.0,\textsuperscript{18} and full commitments (signifying the absence of limitations) are accorded a score of 1.0.

Proceeding through signatories’ schedules of commitments, scores are assigned to market access and national treatment commitments on voice telephone services for each of the four modes of supply, resulting in 8 scores ranging from 0 to 1. These scores are summed, and then multiplied\textsuperscript{19} by the product of the scores for scope, reference paper principles, and depth, resulting in a final score that ranges from 0 to 8 for the variable GATSPOLICY. Mathematically, GATSPOLICY is equal to:

\[ [\text{CBMA} + \text{CBNT} + \text{CAMA} + \text{CANT} + \text{CPMA} + \text{CBNT} + \text{MPMA} + \text{MPNT}] \times \text{SCOPE} \times \text{DEPTH} \times \text{REFERENCE PAPER}, \]

where:

- \text{CBMA} = \text{score for commitment on cross-border market access (taking values of 0 to 1)};
- \text{CBNT} = \text{score for commitment on cross-border national treatment (0 to 1)};
- \text{CAMA} = \text{score for commitment on consumption abroad market access (0 to 1)};
- \text{CANT} = \text{score for commitment on consumption abroad national treatment (0 to 1)};
- \text{CPMA} = \text{score for commitment on commercial presence market access (0 to 1)};
- \text{CPNT} = \text{score for commitment on commercial presence national treatment (0 to 1)};

\textsuperscript{16} If all 4 elements of the GBT Chairman’s note were satisfied for all commitments, the country received a score of 1; if 3, then a score of 0.75; if 2, then a score of 0.5; if 1, then a score of 0.25; and if none, then a score of 0.


\textsuperscript{18} The absence of a commitment does not necessarily indicate the presence of a barrier, but the absence does reduce the legal certainty and transparency ideally provided by schedules, and provides for full policy discretion.

\textsuperscript{19} It has been noted that multiplication of the scores is relatively rigid in that a score of zero for any one of the elements comprising the policy variable, in particular that reflecting consistency with the GBT Chairman’s note, results in an overall policy score of zero. In recognition of this, regressions were performed using policy variables that were formulated by adding scores for commitments, scope, the extent of consistency with the GBT Chairman’s note, and the extent of adherence to the reference paper. Little or no change in goodness-of-fit (adjusted R-squared) or statistical significance resulted.
MPMA = score for commitment on movement of persons market access (0 to 1); 
MPNT = score for commitment on movement of persons national treatment 
(0 to 1); 
SCOPE = score for scope of basic telecommunication services bound in schedule 
(0 to 1); 
DEPTH = score for extent of adherence to Chairman’s note (0 to 1); and 
REFERENCE PAPER = score for extent of adherence to the reference paper 
(0 to 1).

The variables MAPOLICY, which reflects only market access commitments for the 
four modes of supply, and NTPOLICY, which reflects only the national treatment 
commitments, are calculated in the same manner. For these variables, final scores 
range from 0 to 4.

It should be noted that the value of telecommunication mainlines (the measure 
on which we calculate market penetration) should be influenced by negotiated 
policy measures affecting a much broader array of telecommunications services. 
Greater access to satellite and mobile communications technologies will only in-
crease the need for and value of connecting wireline services. Of course, the extent 
to which these broadly defined policy measures affect our market penetration 
measure is an empirical question.

5. Econometric results

Specifications 1 through 4 (presented in Table 1) explain more than 84% of 
the variation in market penetration, and GDP per capita (Y), private ownership 
(PS and PSOECD), GATSPOLICY and MAPOLICY have statistically significant 
coefficients in all specifications. The estimated impact of GATSPOLICY is only 
weakly significant (in Specification 1), however it does have the predicted positive 
impact on telecom mainline penetration. The strongest result among the policy 
variables is obtained in Specification 2, in which only market access policy is 
analyzed.

In this specification, GDP per capita, which explains most of the variation in 
network penetration, is statistically significant at the 1% level, and indicates that 
if GDP per capita increased by 1%, then market penetration would increase by 
0.11 mainlines per hundred. Estimated coefficients for private ownership of 
incumbent telecommunication carriers suggest that such holdings affect lesser 
developed countries and developed countries differently. Looking across all 67 
countries in the sample, the coefficient of PS, which is statistically significant at the 
1% level, indicates that an increase in private sector ownership of 1 percentage 
point would reduce market penetration by 0.12 mainlines per hundred. Perhaps 
the best explanation of this is that, once private investors begin to exercise some 
operational control, they are apt to require that additions to basic telecommuni-
cation infrastructure generate returns that justify construction expenditures. This
could reduce mainlines, at least initially. Alternative explanations are that private participation in many developed and developing countries’ basic telecommunication markets has only recently been permitted, and so the benefits of private participation have not yet taken hold, or that the coefficient is simply picking up lower pre-existing penetration rates that are sometimes associated with government-owned and -operated incumbents.

However, the estimated coefficient of the interaction term PSOECD suggests that enhanced private participation in developed economies may increase market penetration. This effect may reflect longer standing private participation (and better established telecom infrastructures) in these markets. The net effect of the variables PS and PSOECD suggests that the net effect of private holdings in OECD countries is positive, with a 1 percentage point increase in private holdings, driving network penetration up by 0.06 mainlines per hundred.

In Specifications 3 and 4 – in which national treatment policy is examined (both by itself and jointly with market access policy) – NTPOLICY does not have a significant impact. Several factors seem important in this respect. Note, however,
that by scheduling convention, where a measure was identified as being a limitation on both market access and national treatment, countries were directed to capture the measures in the market access column alone, increasing the amount of information about barriers in the market access column, while reducing such information in national treatment column.

The estimated coefficient of PD is statistically significant only at the 10% level (and only in Specifications 2 and 4), though the coefficient itself is near zero, and the variable REFORM did not prove statistically significant. With respect to the former, a possible explanation is that a fair number of developing economies with low market penetration rates have high population densities. For instance, Bangladesh, India, and El Salvador rank among the ten most densely populated countries in this sample. With respect to the latter, the principal difficulty may be one of measurement. It is difficult to define specifically what constitutes reform, and to differentiate between genuine reforms and ‘paper’ reforms.

Given these econometric results, it is possible to simulate the implied quantity effects of impediments to trade in voice telephone services. Because the market access policy variable appears to be most robust, quantity impacts are computed by multiplying the estimated coefficient of MAPOLICY by the difference between the highest possible score for the variable (i.e., 4) and the market access policy scores computed for each country, which range in value from 0 to 4.

Quantity impacts for all 67 markets are presented in Table 2. The quantity impacts show that the adoption of fully liberal market access policies would increase market penetration rates in relatively restrictive countries, such as Bangladesh and Brazil, by a great deal, specifically by 11.2 mainlines per hundred. In less restrictive countries, where market access policies are nearly fully liberalized, as in many OECD markets, market penetration would increase by a relatively small amount if market access policies were fully liberalized.

6. Policy implications and future research directions

We have found that the market access and national treatment commitments scheduled by WTO members under the GATS, when complemented by commitments to pro-competitive regulatory principles, may be formulated into meaningful policy variables. These policy variables, especially those dealing with market access, have been shown to be statistically significant in explaining market penetration in basic telecommunication services, along with variables reflecting income and private sector ownership. Our work complements earlier research on the liberalizing impact of domestic policy changes by its focus on negotiated results; recognizing that these may often confirm status quo conditions and previously determined reform programs, we believe they usefully serve as benchmarks for future negotiations. Comparison with quantity impacts estimated on the basis of Doha Round commitments will allow for measurement of the progress achieved through negotiations.
Table 2. Quantity impacts: Predicted change in mainlines and percentage change in mainlines due to full liberalization, 2000

<table>
<thead>
<tr>
<th>Country</th>
<th>Change in mainlines</th>
<th>Percent change in mainlines</th>
<th>Country</th>
<th>Change in mainlines</th>
<th>Percent change in mainlines</th>
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<td>Japan</td>
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Source: Compiled by the US International Trade Commission.

Evolving developments in voice telephone services could provide a future opportunity to refine this analysis by factoring in the policy commitments to packet- and circuit-switched data transmission, since it is now believed that data transmission volumes approximately match voice transmissions. Use of such variables would provide for more comprehensive analysis, perhaps yielding insights relevant
to electronic commerce. It would also be worthwhile to explore cellular communications more thoroughly as this communication appears to be a significant complement to, and especially in developing countries a substitute for, wireline networks. Incorporation of cellular communications would provide a forward-looking dimension to the analysis, providing a useful baseline from which to measure the effects of liberalizing emerging communication technologies. Finally, further refinements to this methodology might be considered after conclusion of the ongoing round of GATS negotiations.

References


