Regulating Anti-Competitive Behavior in the Internet Market: An Applied Imputation Model for Developing Countries, the Case of Peru [*]

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[*] This paper is a simplified version of the analysis that the author undertook as part of the investigation on anti competitive behavior in the Internet market in which OSITEL was involved during the first half of 1997. An extended version of the analysis is contained in the report that OSIPTEL´s Regulatory Bureau prepared in September 1997 for the Commission in charge of solving the allegations of anti competitive practices in the Internet market: *Controversia entre Red Cientifica Peruana (RCP) y Telefonica del Peru (TdP) sobre Competencia Desleal e Incumplimiento del Contrato de Concesion*. The author is grateful to Padmanabhan Srinagesh for his comments and advice to undertake this empirical investigation, and Daniel Shimabukuro, who was in charge of developing the engineering model for an ISP. The views expressed in this paper are those of the author and do not necessarily represent the opinions of OSIPTEL.

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Abstract

In some developing countries like Peru the development of the telecommunication sector is based on promoting vertical integration of the incumbent operator, which is allowed to provide basic telephony services as well as value added services. After privatization took place in 1992, a legal monopoly for basic telephone services was ruled until 1998, while the incumbent could also enter into competitive services such as Internet. The purpose of this paper is to present one of the analytical tools that the Peruvian regulator used in a legal dispute in which the largest independent ISP accused the dominant vertical integrated firm of anti competitive behavior in the form of price discrimination for providing access to essential facilities that any Internet Service Provider has to employ for the provision of Internet services. The tool was to use an imputation test to determine whether the vertical integrated firm was charging to independent ISP the same prices as it was charging to itself and its affiliates firms for essential inputs such as telephone lines and dedicated circuits or leased lines. For that purpose it was developed a bottom up model of an efficient ISP, assuming the best technology available in the country to provide dial-up and dedicated access to Internet services. Based on the model it was estimated an average incremental cost for providing Internet services, which gave the regulator a good proxy of a price floor that Internet services should have in the market. Any price below the floor may be an indication of price discrimination or the potential presence of cross subsidies going on from the non competitive services to Internet services.

1. INTRODUCTION

In Peru, an important characteristic of its telecommunication legal framework is that it promotes vertical integration among firms. Since state-owned telecommunication enterprises were privatized and merged in 1993, there exists a vertical integrated incumbent firm, Telefonica del Peru (TdP), which is allowed to enter any telecommunication market, including the provision of Internet access services. In addition, as an important ingredient of the privatization process, TdP was awarded a monopoly franchise until 1998 over a set of basic telecommunication services including local and long distance telephony, dedicated circuits, among others. Prices of basic telephone services for the period 1994/98 were set up in advance of the privatization contest, so that the winner of it would have the obligation to comply with the values of the prices in a process known as the Rebalancing Program. Prices of dedicated circuits and other services were also regulated through price ceilings imposed by the regulatory authority.

In this context, the established Internet Service Providers (ISPs) had to construct their backbones by renting all the transmission capacity to TdP, which included dedicated circuits, telephone lines, hunting lines, etc. When TdP got into the Internet market in 1997, the largest ISP at that time filed out a complaint against TdP. The allegation was that TdP was acting in an anti competitive manner because, among other things, it was using part of its telephone infrastructure but not imputing to itself the same price charged to its competitors.[1] In order to asses the allegation of discriminatory pricing in inputs used to provide Internet service, we implemented an imputation test to assess whether TdP was charging to the independent ISP the same prices as it was charging to itself and its affiliates firms for noncompetitive inputs such as telephone lines and dedicated circuits. For that purpose a bottom up model for an efficient ISP was constructed, assuming the best technology available in the country at that time to provide dial-up and dedicated access to Internet services. Based on the model, an average incremental cost for providing Internet service was estimated, which gave us a good proxy of the price floor that it should have in

[1] The complete set of allegations included not only anti competitive pricing (cross subsidization, undue discount practices, etc) but also non-pricing issues (refusal to supply or connect services, unreasonable delay

the market. Any price below the floor may be an indication of price discrimination or alert a potential presence of cross subsidization from the noncompetitive services to Internet services.

The rest of the paper is organised as follow. The next two sections give an overview of the Internet market background and the key features of the Internet service provision in 1996/97, from which the anti competitive allegation emerged. Section 4 sets up the regulatory problem that this paper tries to address. Section 5 presents the cost model used for imputation purposes to determine the degree of price discrimination in the provision of essential services. Section 6 presents a variant of the model that seeks to mimic the costs that a TdP´s affiliate would incur to serve the same market as an independent ISP would do. Lastly, some concluding remarks are presented.

2. OVERVIEW OF PERUVIAN INTERNET MARKET

Internet service in Peru started in 1991. In 1996, before TdP entered the Internet market, there were two other ISPs offering Internet access: Red Cientifica Peruana (RCP) and International Business Machine (IBM). Both firms provided Internet access services through dial-up (using a modem plugged to an ordinary telephone line) and dedicated links (using dedicated circuits), but due to the legal temporary monopoly awarded to TdP, they were not allowed to deploy their own transmission links or local loops, so these inputs had to be rented from TdP.

The Peruvian Internet market may be considered small by international standards. In 1996 there were approximately 2,700 dial-up Internet users and over 100 dedicated users (see Table 1), which were largely business and institutions linked to ISP with low speed dedicated circuits. Since then, the Internet market has achieved impressive rates of growth. Thus the monthly rate of growth in the dial-up segment has been 8% between 1996-98. A similar growth rate has been reported for the dedicated users. TdP´s market shares have increased successfully in such a short period. Thus, TdP market share in the dial-up segment has reached 36%, while its share in the dedicated segment has been 57%.

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in supply, etc.). In this paper we concentrate only in the issue of discriminatory pricing in the use of inputs

Table 1 Peru´s Internet Market by Service Providers

	1996	1998
Dial-up (users)	*2,696*	*16,000*
RCP	2,071	7,800
TdP´s IAPs	0	5,700
IBM	625	2,500
Dedicated (number of circuits)	*102*	*560*
RCP	78	190
TdP	0	320
IBM	24	50

Source: RCP and own estimation

In terms of Internet tariffs and the total bill that a dial-up subscriber has to pay to get access through a PSTN, there are important features to be remarked by comparing Peru with the most competitive and OECD countries.

- The first thing to notice from column 1 in Table 2 is that Internet tariffs in Peru are among the lowest in the world. They are even lower than those in competitive or OECD countries.
- Second, in Peru the lowest Internet tariffs are charged by TdP´s Internet Access Providers (IAPs). Thus, at the end of 1997, TdP´s IAPs average tariffs were US$ 12 a month while RCP was charging US$ 18 a month.
- Third, telephone bills are more expensive in Peru than in competitive or OECD countries (see column [2]).
- Fourth, adding-up the Internet bill with the telephone bill that a dial-up subscriber has to pay, we notice that the total bill in Peru is the same as in competitive countries and lower than in OECD countries (see column [3]).
- Fifth, the Internet / telephone relative price, i.e. Internet bill / telephone bill, is much lower in Peru than in other countries (column [4]). This would suggest that there is an implicit incentive to consume more telephone traffic through Internet since the pricing scheme would act as a two-part tariff: the fixed tariff would be low but the usage tariff would be high at international standards.

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to provide Internet services.

Table 2 Internet access by PSTN (standard PSTN rates), US$ PPP*

	Internet Bill	Telephone Bill			Internet and Telephone	Internet/ Telephone
	[1]	(a)	(b)	[2]=(a)+(b)	[3]=[1]+[2]	[4]=[1]/[2]
Peru (December 1997)						
TdP´s IAP (average)	12	17	29	47	58	0.25
RCP	18	17	29	47	65	0.39
Rest of world (January 1995)**						
Competitive countries***	27	13	22	35	63	0.78
OECD countries	66	13	29	43	108	1.54

Notes:
* PPP Purchasing parity power. PSTN Public Switched Telecommunication Network.
[1] It is equal to monthly rental plus 1/36 of installation tariff.
(a) Fixed charge per month. It is made up of a residential rental plus 1/60 of the installation tariff.
(b) Usage charge. It is made up of 20 calls with a duration of one hour at standard rates.
**Source: OECD (1996).
*** US, Canada, New Zealand, Sweden, Australia, UK, Japan.
Own elaboration.

3. FEATURES OF THE INTERNET SERVICE PROVISION IN PERU, 1996/97

There are two main ways to access to Internet: (1) Through a dial-up/modem, using an ordinary telephone line connected to an ISP or IAP, plus a software, and (ii) Through a dedicated link giving a permanent access to an ISP. In this section we highlight the key features of the Internet services provided by TdP, its affiliates and rival ISP.

TdP´s Internet service provision

In 1997 TdP launched simultaneously two related services: Infovia and Unired.

- Infovia: whereby any person with telephone line, a modem and a free charge software given up by TdP may access to an intranet by dialing a three-digit number, 155. The only charge that a telephone user has to pay is the local measured telephone charge, independently on where she or he is located in the country (see Diagram 1). However, those who want to access to Internet have to subscribe the service through one of TdP´s affiliates or TdP´s Internet Access Provider (IAP), who were created for this purpose.

TdP´s IAPs have access to Infovia by renting a frame relay circuit from TdP. [2] Note that for a TdP´s IAP to have national coverage, it needs only a local link to the node closer to Infovia. If the demand of dial-up Internet access increases, TdP´s IAP will only have to request a wider local circuit band.

- Unired: It is the TdP´s dedicated Internet access service. This service is provided directly by TdP, which competes in this way not only with independent ISP but also with their related IAP´s. A TdP´s IAP has to rent a local dedicated circuit from TdP to have access to Internet. TdP charges to IAP for two services: (i) the dedicated circuit service and (ii) access to Internet service, i.e. Unired. [3]

Rival´s Internet service provision

- In order to have Internet access, an independent ISP´s dial-up user has to place a telephone call to the closest node of the firm. For example, a user in a province out of Lima in which there is no physical presence of the ISP (i.e. dial-up user C in Diagram 2) has to place a national long distance call to the closest city in which there is a node of the firm.
- A rival ISP will need commercial telephone lines in each node to receive phone calls, modems in each of these lines, terminal servers (T.S. in diagram Nº2) and transmission links to connect its nodes (in the case of the diagram, a national long distance link). Facing an increase in demand, a rival ISP should rent more lines, buy additional modems and if necessary, establish a new node.
- Besides the transmission links that must rent from TdP in order to connect its domestic nodes, a rival ISP must rent an international half long distance circuit to route its traffic overseas, plus the cost of placing its traffic into an international network of another country, i.e. United States.

[2] Currently there are three to four TdP´s IAPs who capture more than 80% of TdP´s dial-up market. TdP´s IAPs buy Infovia and Unired services from TdP, but they do not have their own infrastructure, using the one provided by Infovia (telephone lines, modems, etc).

[3] Access to Unired can take place through dedicated circuits, frame relay or X.25.

Diagram N°1 TdP and its IAP

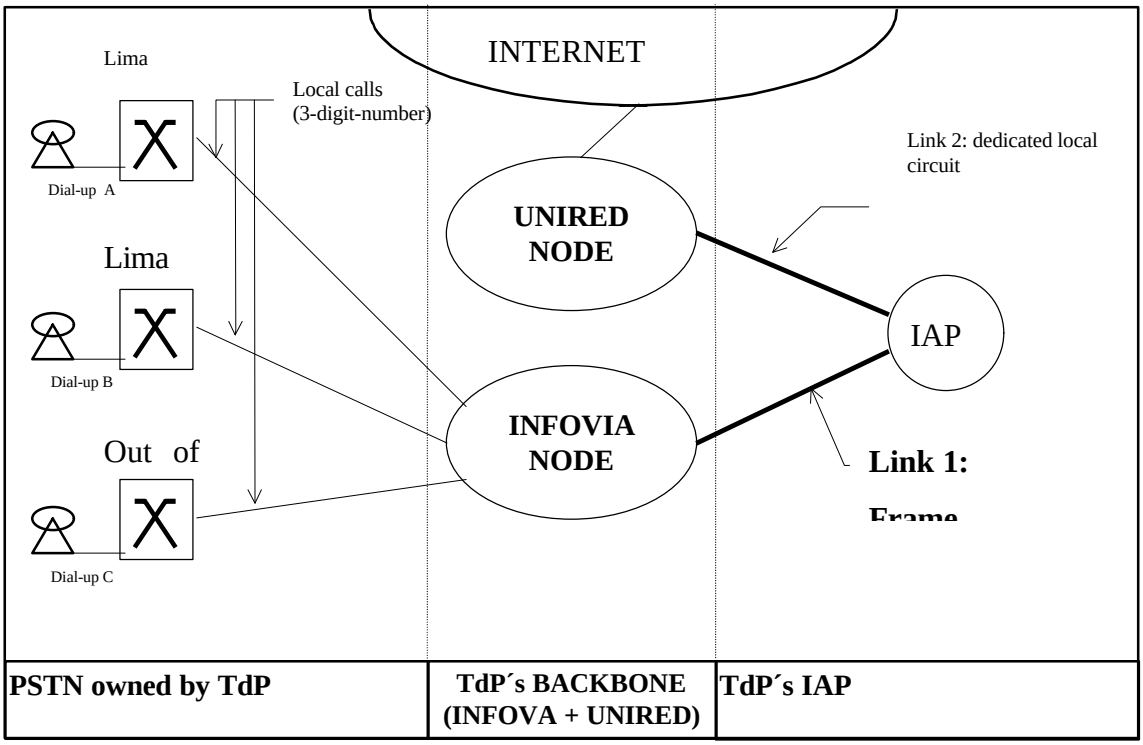
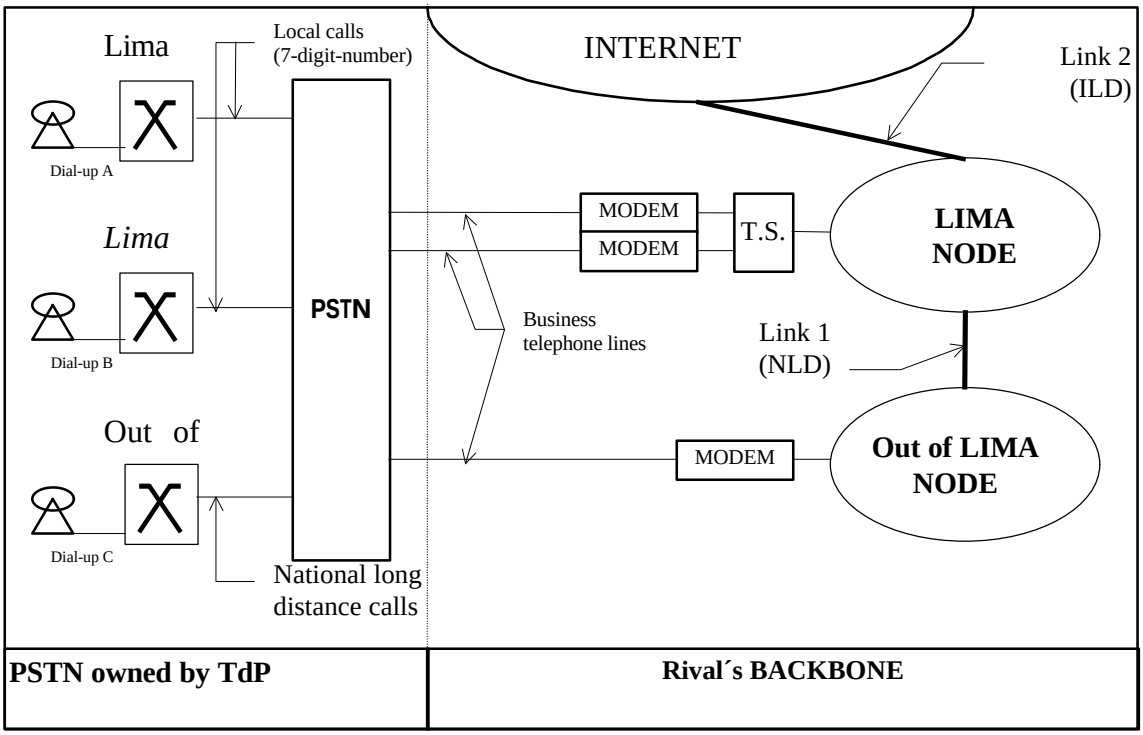


Diagram N°2 Rival ISP



4. SETTING UP OF THE REGULATORY PROBLEM

In order to provide Internet access with national coverage, an ISP needs to have a transmission network or backbone, which, in turn, uses two types of complementary infrastructure that we will call: noncompetitive inputs[4] and competitive inputs. The former are made of the transmission infrastructure required to provide the Internet access, such as dedicated circuits (switched and non switched) and telephone lines. Due to the legal temporary monopoly awarded to TdP over these services, these transmission facilities have to be rented from TdP. The competitive inputs correspond to the set of infrastructure and other inputs needed to produce Internet access service, but they are subject to free and effective competition, such as, routers, terminal servers, modems, computers, labor, etc.

Competitive problems may arise because TdP controls and owns noncompetitive inputs, which are inputs to be sold to itself and rival firms, to produce a downstream competitive service (Internet access). RCP basic allegation was that TdP's dominant position in basic telecommunication markets would allow it to compete unfairly by extending market power into the Internet access market. The kind of undue behavior on TdP side may entail for instance "raising rivals' cost" intents, by which TdP would seek to increase tariffed prices of essential inputs, lowering the price of the final service, etc, even at the extent that it also hurts to its downstream affiliates because as a whole TdP is maximizing profits and this behavior enable it to cross subsidizing services.

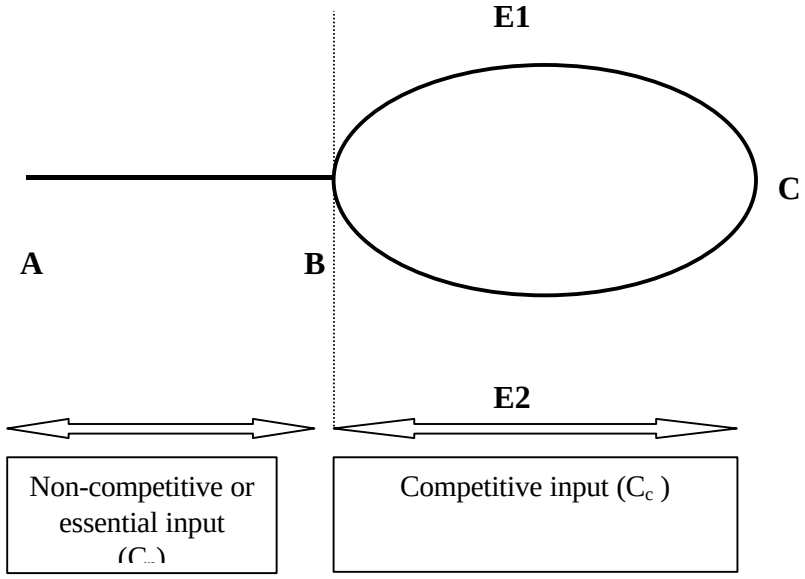
In order to asses the allegation of discriminatory pricing in inputs used to provide Internet service, an imputation test was used to assess whether TdP was charging to independent ISPs the same prices as it was charging to itself and its affiliates firms for noncompetitive inputs, such as telephone lines and dedicated circuits. For that purpose, a bottom up model of an efficient ISP was constructed, assuming the best technology available in the country to provide dial-up and dedicated access to Internet services. Based on the model, an average incremental cost for providing Internet services was calculated, which gave a good proxy of the price floor that Internet services should have in the market. Any price below the floor might be an indication of price discrimination or the potential presence

[4] Other names used in the specialized literature are "essential facilities" or "bottleneck inputs".

of cross subsidization from the noncompetitive services to Internet services. By the neutrality and non discriminatory principles contemplated in the Telecommunication Law, TdP ought to charge itself the same tariffs that it charges its competitors. The determination whether the price imputed to itself by TdP were the same that it charged to its competitors was what it was called the imputation test.[5]

In Diagram 3, the technology of producing Internet access service is depicted in a simple and schematic way. The monopolist, TdP, owns a set of noncompetitive inputs, represented by the segment AB, needed to produce the "through service" called Internet access service. Any ISP must use the noncompetitive inputs, which are provided only by TdP. The same firm, TdP, jointly with its IAPs, also provide service from point B to point C. The competitive inputs used by TdP and its IAPs are represented by the stretch B-E1-C. Alternatively, the competitive inputs for a rival ISP is represented by the stretch B-E2-C

Diagram 3 A schematic view of a ISP backbone



[5] The application of the imputation concept is similar as the determination of the "transfer price" in the sale of goods and services transferred between units or business centers in a determined firm. For an exposition of imputation policies in the context of telecommunications regulation, see Larson, Alexander C. and Steve G. Parsons (1993).

Given that the production process demands two set of inputs, production costs may be grouped into two categories: costs of noncompetitive input, which mainly corresponds to transmission costs, called C_n ; and costs of competitive inputs, that includes the rest of the costs related to the provision of the service, denominated C_c. Given a revenue P for the access service to Internet, the following inter- temporal restriction (i.e., during the useful life of the service) should hold:

(1) $$P \geq C_n + C_c$$

That is to say that the revenue from the service should cover at least production costs. The left-hand side information was easy to obtain since it was in the public domain. The problem was basically to get reasonable numbers of the right-hand variables. Tariffs for noncompetitive inputs (dedicated circuits, telephone lines) were also publicly available since OSIPTEL regulates tariff of these services.[6] We still needed to have quantities of used inputs. TdP presented to OSITEL cost information for its Infovia and Unired services within tariff approval proceedings, but compelling reasons made us decide that it was needed to contrast that information with the one it may be obtained from own calculations.[7] Thus, we decided to construct a bottom-up cost model for a hypothetical ISP-IAP firm, in order to estimate the incremental costs of producing the access service to Internet.

Once production costs were obtained, broken down into noncompetitive and competitive costs, these values were compared and then imputed to the costs figures presented by TdP and checked whether restriction (1) hold. [8] Thus total cost gave an estimate of the floor price for the Internet access service. And, if after the imputation of the estimated cost to TdP, it resulted that its revenue is lower than the cost, then there would

[6] The use of tariffs instead of costs is explained because of the provision of access services to Internet would be using network services that could be dedicated to provide other services that themselves could generate additional income for TdP.

[7] Given that the analysis was focused on non- competitive input costs, we based our calculations on competitive input costs from TdP figures presented to OSIPTEL.

[8] The assumption behind the imputation costs in this case is that it is assumed that the hypothetical entering firm is at least equally efficient as TdP both in the essential resource stretch as in the competitive resource.

have had signs of discriminatory treatment in the economic conditions of access to essential resources and it might indicate the existence of cross subsidization from regulated services to the services under competition.[9]

5. A COST MODEL FOR AN INDEPENDENT ISP

This section presents the methodological steps followed to construct a cost model for an access and backbone Internet Service Provider, which provides basically web browsing services. As it was mentioned before, the model looks for estimating the long run incremental costs that an entrant would incur to provide Internet access service in the Peruvian market, as an independent provider, i.e. no becoming a TdP affiliate. The increment used in the model should be interpreted as the entire marketable output of providing a new service. The costs have been grouped into two categories: noncompetitive and competitive costs. The former is made of transmission costs that a firm has to incur to provide the final service. These costs have been valued using official tariffs for the respective services. The competitive costs are made of the remaining costs that the firm had to incur in order to provide the access service to Internet, such as, personnel, terminal servers, routers, hardware and software, etc.

Demand

The first step was to estimate the total market that the ISP would attend over a five-year planning horizon. The model was built to consider two types of users: dial-up and dedicated subscribers. For each one it was assumed a given rate of growth over time: an annual increase of 6,000 dial-up subscribers and 120 dedicated subscribers. It was further

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[9] In the context of the price of the access service to the local network, Vogelsang and Mitchell (1997), p.130, discuss the case of a local operator that can provide local access for its competitive service of long distance at a lower price than it charges a competitor of long distance and still not show cross subsidies. The imputation practice serves to determine the floor price that the local access provider should charge itself. If the local access provider charges itself a price below such floor, the authors argue that evidence of a cross subsidy exists from the regulated service - access to the local network- to the competitive service- long distance-.

assumed that consumption by user was 12 megabits a month, and for each dedicated subscriber there were 28 users. Table 3 shows the demand profile over the five years of forecast, both in number of subscriber and megabits by each year.

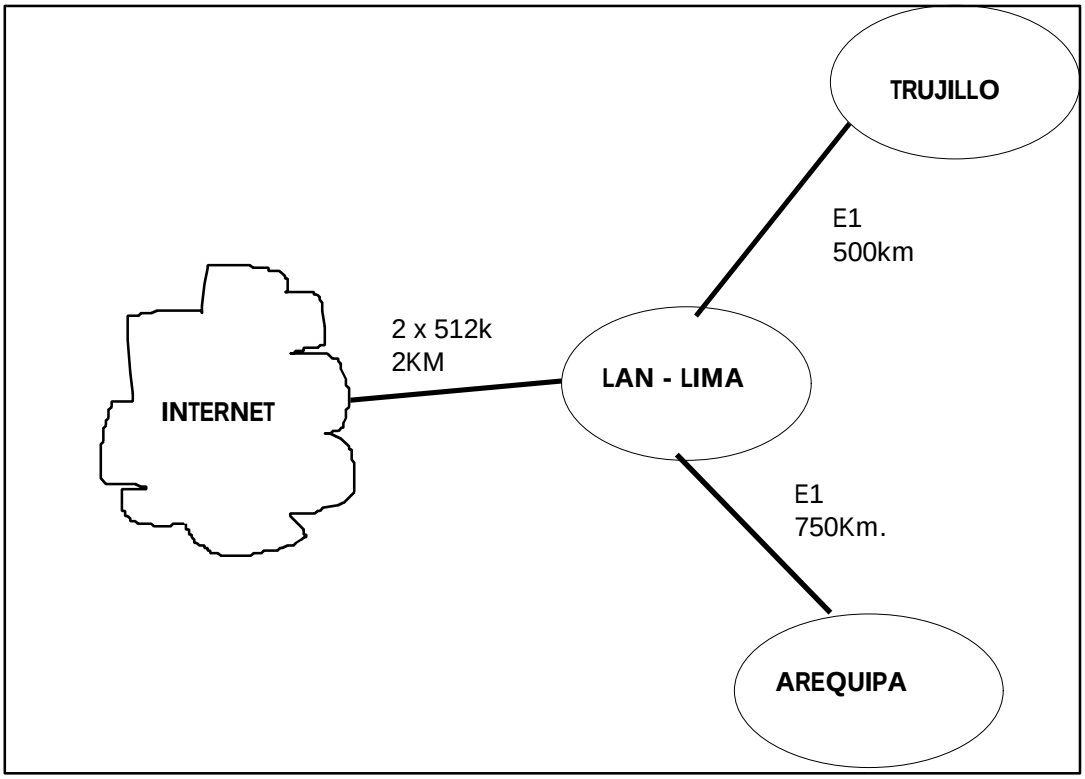
Table 3. Demand

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Subscribers (end of year)					
Dial-up	3,000	9,000	15,000	21,000	27,000
Dedicated	80	200	320	440	560
Consumption (´000 megabites)	755	2,102	3,450	4,798	6,146
Dial-up	432	1,296	2,160	3,024	3,888
Dedicated	323	806	1,290	1,774	2,258
Accumulated consumption	***17,251***				

Topology and technical dimensioning of the network

Once the market was estimated, we proceeded to determine the network configuration for the firm. Diagram Nº 4 summarizes the technical design employed. It has been assumed that the backbone is composed of four main nodes located in three main cities of Peru: Lima (Central Coast of Peru), Arequipa (Southern Coast) and Trujillo (Northern Coast). With the demand information, the next step was to construct a traffic matrix for these nodes and then to estimate the required transmission capacity to carry the traffic out.

Diagram 4 Network topology



Costs categories

Noncompetitive costs

As we mentioned before noncompetitive costs are the transmission costs incurred by the firm in order to transport Internet traffic. Besides dedicated circuits, these cost include commercial telephone lines, which also have to be rented from TdP. The derived demand of transmission inputs is depicted in the bottom part of Table 4. Given the demand evolution, the derived transmission links demand at the fifth year was as follows: two (2) E1 for Lima-Arequipa, one (1) E1 for Lima-Trujillo and ten (10) links of 512 kb (equivalent to almost 3 E1) for the international link.[10] The demand for commercial telephone lines starts at 150 at the beginning up to 1,350 at the end of the project. With the final regulated two-part tariffs ruling at that time for these rented services we obtained the transmission costs for the firm, which are shown in the upper part of Table 6.

[10] The reason why it was considered 512 kb dedicated circuits, instead of E1, for international transmission was because at that time these were the maximum capacity circuits for international links.

Competitive costs

- Capital equipment. It is an important part of the noncompetitive costs. The detailed list of items is contained in Table 5. An overall US$ 2 million was estimated on investment in capital equipment. It comprises routers, terminal servers, modems, software, etc.
- Operating costs. It includes wages, building rent, energy, materials, other expenses. The labor demand requirements are presented in upper part of Table 4.
- Other costs. It includes categories such as bad debts, income tax, labor share on profits, and other expenses.

All of these cost were valued at market prices face by the firm. As it is shown, noncompetitive costs account around 45% of total cost. [11]

Incremental cost for a rival ISP

The net present value for the noncompetitive and competitive costs was estimated using a discount interest rate of 15%. Dividing each category of cost (noncompetitive and competitive, Table 6) by the total accumulated consumption (Table 3), it was obtained the incremental cost for the Internet access services. This is shown in column 1 of Table 7. The incremental cost of noncompetitive input was US$ 0,272 per megabit, while the cost of the competitive input was US$ 0,228 per megabit. The floor price that it was intended to be found was the minimum price that allows the firm just to recover its total costs over the lifetime of the business plan. According with our calculation that price, with none reasonable profit considered, was US$ 7,3 a month (US$ 0,61*12 Mb) for a dial-up subscriber and US$ 205 a month (28*US$ 7,3) for a dedicated subscriber.

There is an issue that should be taken into account when analyzing these results: the subscriber mix of dial-up and dedicated users that has been assumed. Thus that ratio is approximately 36% along the period. An exercise that would be interesting to perform, but that is beyond the scope of this paper, is to estimate the stand alone cost of providing just dial -up access, the stand alone costs of providing just dedicated access, and then to compare them with the cost of providing both services together. Preliminary results would

[11] For US, Srinagesh (1995), p. 256, reports that IP transport accounts for 25% to 40% of a typical ISPs total costs.

suggest the existence of economies for the joint production of dial -up and dedicated access.[12]

Comparison with TdP´s cost

In 1996 TdP submitted to OSIPTEL revenue and cost information supporting its request of tariff approval for its Infovia and Unired services. TdP´s cost information is presented in columns (2) to (4) in Table 7, under the same format we have grouped costs in our bottom-up model. As it can be seen in column 4, TdP´s implicit incremental cost of transmission was US$0,031 per megabit, i.e. it barely represents 11% of the cost given by our model. When we replaced the TdP´s noncompetitive incremental cost by our own estimate, we found out that TdP was pricing its Infovia and Unired services below the level required to cover their long run costs. Specifically we estimated that the revenue shortfall was 48% in the case of Infovia and 38% in the case of Unired. This was considered as a strong indication that TdP was not imputing to itself and its IAP´s the same price as it did to rival ISP.

[12] For instance, the derived input demands to face an increase in final demand coming from dedicated subscribers may differ from the ones coming from dial-up subscribers. In the former case, the firm would only need to implement a new exit in its router (maybe installing an additional card). In the latter case, instead, the firm in order to maintain its quality parameters would need to get new commercial lines, new modems and terminal servers.

Table 4 Labor and transmission input demands

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Labor demand (persons)		11	16	19	20	23
Professional		4	7	8	8	10
Technicians		7	9	11	12	13
Dedicated Circuits						
Each period						
Lima-Arequipa (E1)		1	0	1	0	0
Lima-Trujillo (E1)		1	0	0	0	0
International (512Kb)		2	2	2	2	2
Commercial lines	150	300	300	300	300	0
Accumulated						
Lima-Arequipa (E1)		1	1	2	2	2
Lima-Trujillo (E1)		1	1	1	1	1
International (512Kb)		2	4	6	8	10
Commercial lines	150	450	750	1050	1350	1350

Table 5 Capital equipment estimation (in thousands of US$)

	Unit cost	Year 0		Year 1		Year 2		Year 3		Year 4	
	(in US$) ´000	Q	Cost	Q	Cost	Q	Cost	Q	Cost	Q	Cost
Hardware											
Router	35	3	105	0		0		0		0	
Server	35	8	280	0		0		0		0	
Work Station	3	25	75	0		0		0		0	
Switch – Hub	5	3	15	0		0		0		0	
Modems (*)	0.2	150	30	300	60	300	60	300	60	300	60
Terminal Servers	6	3	18	6	36	6	36	6	36	6	36
Printers	2	4	8	0		0		0		0	
Scanner	2	5	10	0		0		0		0	
CD-ROM	0.4	5	2	0		0		0		0	
Digital Camera	1.5	5	8	0		0		0		0	
Tape Backups	1.5	4	6	0		0		0		0	
Instruments	260	1	260	0		0		0		0	
Spare parts	25	1	25	0		0		0		0	
Other	25 0	1	25	0		0		0		0	
Software	600		600	0		0		0		0	
Solaris 2.4											
CISCO Works											
SunNet Manager											
Graphics											
Programs											
Officemate											
Training	**200**	0.5	100	0.5	100	0		0		0	
TOTAL			**1,567**		**196**		**96**		**96**		**96**
NET PRESENT VALUE			**1,987**								

(*) The assumed ratio subscribers by modem is 20.
Note: Q is quantity

Table 6 Costs estimation (in thousands of US$)

Noncompetitive costs						
	Year 0	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Installation tariffs	111	191	196	191	191	72
Dedicated circuits: Lima-Arequipa	5	0	5	0	0	9
Dedicated circuits: Lima-Trujillo	5	0	0	0	0	5
Dedicated circuits: International	12	12	12	12	12	58
Commercial telephone lines	90	179	179	179	179	0
Monthly rentals	0	609	909	1350	1649	1891
Dedicated circuits: Lima-Arequipa	0	140	140	280	280	280
Dedicated circuits: Lima-Trujillo	0	140	140	140	140	140
Dedicated circuits: International	0	242	484	726	967	1209
Commercial telephone lines	0	87	145	203	261	261
Total noncompetitive costs	**111**	**800**	**1105**	**1541**	**1841**	**1964**
Competitive costs						
Investment	1767	196	96	96	96	0
Capital equipment	1567	196	96	96	96	0
Installation	200	0	0	0	0	0
Operating costs	0	378	492	546	558	630
Wages	0	204	318	372	384	456
Rent of building	0	72	72	72	72	72
Energy	0	30	30	30	30	30
Materials	0	72	72	72	72	72
Administrative	0	378	492	546	558	630
Bad debts (1% of revenues)	0	7	20	32	45	57
Income tax (30% of gross profits)	0	0	83	299	569	821
Labor sharing (10% of operating profit)	0	0	28	90	190	274
Other expenses	0	180	180	180	180	180
Total competitive costs	**1767**	**761**	**899**	**1243**	**1637**	**1961**
TOTAL COST	**1877**	**1562**	**2005**	**2783**	**3478**	**3925**
Ratio: noncompetitive / total	**6%**	**51%**	**55%**	**55%**	**53%**	**50%**

Table 7 Incremental cost estimates (US$ by megabit)

	Bottom-up model	TdP´s Infovia	TdP´s Unired	Weighted Average	Comparison %
	(1)	(2)	(3)	(4)=(2)+(3)	(5)=(4)/(1)
Total (a)+(b)	0.610	0.419	0.277	0.387	63%
(a) Noncompetitive cost	0.272	0.018	0.073	0.031	11%
(b) Competitive cost	0.338	0.401	0.204	0.356	105%

Notes:
(1) Results from the bottom-up cost model. Source: Tables A-1 and A-4.
(2) Elaborated from data submitted by TdP.
(3) Elaborated from data submitted by TdP.
(4) Column 2 (77%) plus Column 3 (23%).

6. COST FOR A TDP´S IAP

What would it be the incremental cost for a TdP´s IAP in order to serve the same market as the rival ISP in the baseline scenario? We also addressed this question in our analysis. For this purpose we recalculated the model by varying the estimates of transmission cost and capital investment. The remaining costs were kept as in the baseline scenario (see Tables 8 to 10).

Noncompetitive costs

A TdP´s IAP needs to rent only Infovia and Unired services. It does not need to rent national or international long distance dedicated circuits nor commercial telephone lines. In our estimation the IAP would only need to rent one (1) E1 connected to Infovia and one (1) E1 connected to Unired during the first two years. In the third year it would be needed to rent an additional E1 for each Infovia and Unired (Table 8).

Competitive costs

Competitive costs were also lower in this case because basically an IAP requires less infrastructure than a rival ISP.

- Capital investment. It is highly reduced for an IAP since most of its infrastructure is shared by TdP.[13] Thus the total capital investment would be US$ 241,000, which represents just 10% of the total investment for a rival ISP (Table 9).
- Other costs. By assumption, they remain the same as before (Table 10).

Column (2) of Table 11 shows the incremental cost for an TdP´s IAP estimated in this alternative scenario. The incremental cost of the noncompetitive input was US$ 0.054 per megabit, a little bit higher than TdP´s cost information, but definitely still 80% below of our estimation for a rival ISP.

This results suggested to us that TdP had been favoring unlawfully its affiliates firms in the access service to Internet, by charging them lower rates for noncompetitive inputs than

[13] For instance, TdP would keep IAP´s routers in its exchanges. This advantage is only enjoyed by TdP's IAPs but not by the competitors.

those charge to their rivals. In other words, TdP would have been illegally increasing costs of their rivals in the market of access to Internet, in order to undermine competition. The potential harmful effect of this practice is to take competition out of the market and so extend its dominant position to the competitive markets of access to Internet. In the same way, the results signed some evidence that TdP would be implementing cross subsidies in favor of final services of access to Internet by financing resources out of regulated business such as dedicated circuits and basic telephone.[14]

[14] If a subsidy exists, we consider that our estimates could be underestimating the true magnitude of it, because the assumptions made in the calculations have been very conservative regarding the costs and rather relaxed regarding income.

Table 8 Labor and transmission input demands

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Labor demand (persons)		11	16	19	20	23
Professional		4	7	8	8	10
Technicians		7	9	11	12	13
Dedicated Circuits						
Each period						
Unired via dedicated circuit (E1)		1	0	1	0	0
Infovia via frame relay (E1)		1	0	1	0	0
Accumulated						
Unired via dedicated circuit (E1)		1	1	2	2	2
Infovia via frame relay (E1)		1	1	2	2	2

Table 9 Capital equipment estimation (in thousands of US$)

	Unit cost	Q	Year 0 Cost
Hardware			
Router	35.0	1	35
Server	35.0	2	70
Work Station	3.0	10	30
Switch – Hub	5.0	1	5
Modems (back-up)	0.2	4	1
Terminal Servers	6.0	1	6
Printers	2.0	2	4
Scanner	2.0	1	2
CD-ROM	0.4	5	2
Digital Camera	1.5	2	3
Tape Backups	1.5	2	3
Instruments	260.0	0	0
Spare parts	25.0	0	0
Other	25.0	0	0
Software	50.0		50
Solaris 2.4			0
CISCO Works			0
SunNet Manager			0
Graphics			0
Programs			0
Officemate			0
Training	30.0	1	30
Total			**241**

Note: Q is quantity

Table 10 Costs estimation (in thousands of US$)

Noncompetitive costs						
	Year 0	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Installation tariffs	2	0	2	0	0	0
Unired via dedicated circuit	1	0	1	0	0	0
Infovia via frame relay	1	0	1	0	0	0
Monthly rentals	0	183	183	366	366	366
Unired via dedicated circuit	0	97	97	194	194	194
Infovia via frame relay	0	86	86	172	172	172
Total noncompetitive costs	**2**	**183**	**185**	**366**	**366**	**366**
Competitive costs						
Investment	261	0	0	0	0	0
Capital equipment	241	0	0	0	0	0
Installation	20	0	0	0	0	0
Operating costs	0	378	492	546	558	630
Wages	0	204	318	372	384	456
Rent of building	0	72	72	72	72	72
Energy	0	30	30	30	30	30
Materials	0	72	72	72	72	72
Administrative	0	378	492	546	558	630
Bad debts (1% of revenues)	0	7	20	32	45	57
Income tax (30% of gross profits)	0	0	83	299	569	821
Labor sharing (10% of operating profit)	0	0	28	90	190	274
Other expenses	0	180	180	180	180	180
Total competitive costs	**261**	**565**	**803**	**1147**	**1541**	**1961**
TOTAL COST	**263**	**748**	**989**	**1513**	**1907**	**2327**
Ratio: noncompetitive / total	**1%**	**24%**	**19%**	**24%**	**19%**	**16%**

Table 11 Incremental cost estimates (US$ by megabit)

	Bottom-up model	TdP´IAP	Comparison %
	(1)	(2)	(3)=(2)/(1)
Total (a)+(b)	0.610	0.284	47%
(a) Noncompetitive cost	0.272	0.054	20%
(b) Competitive cost	0.338	0.230	68%

Notes:
(1) Results from the bottom-up cost model. Source: Tables A-1 and A-4.
(2) Results from the bottom-up cost model. Source: Tables A-1 and A-8.

6. CONCLUDING REMARKS

The presence of a vertically integrated telecommunication firm who is at the same time a dominant firm in most of the markets and has no barriers to provide any telecommunication service raises not only theoretical but also practical and regulatory concerns like the ones presented in this paper. TdP, the Peruvian incumbent provider who entered to the Internet market in 1997, sells at the same time noncompetitive or essential services to its downstream competitors in the Internet access market. There were allegations of TdP´s anti competitive behavior coming from established Internet Service Providers. One of these allegations was that TdP was imposing price discrimination in essential services to their rivals in the downstream market. Of course, TdP always denied such allegations. When OSIPTEL´s intervention was requested, it decided to undertake several areas of investigations at the same time. One of these avenues was to analyze whether there were signs of price discrimination by implementing an imputation test.

The imputation test presented in this paper relied basically on public information of tariffs and in the development of an economic - engineering model for an efficient firm providing access service to Internet. From the results found in this investigation, it could be concluded that TdP performed discriminatory practices against competitors in the Internet market. It was found evidence about the discriminatory treatment of TdP in the provision of noncompetitive inputs, affecting negatively competitive conditions in the Internet access market. Our empirical estimation indicated that for noncompetitive inputs the price differential between the price that TdP was imputing itself and the one it charged to its competitors was 80% to 90%. Furthermore, when our noncompetitive cost estimate was imputed to TdP cost figures, it resulted that there was a revenue shortfall of 45% on TdP´s Internet services. However, a definitive assessment about the presence of discriminatory pricing and cross subsidies on the part of TdP could not be performed because there was not a complete disclosure of the information about TdP´s accurate cots and network topology among other things. OSIPTEL requested such information to TdP, but it refused to provide it.

Our analysis was very simple and tried to capture the most salient features of the Peruvian Internet service provision in 1996-97. However, some shortcomings were present in our analysis. Some costs incurred by dial-up subscribers have not been incorporated into the price discrimination estimation. For instance, when a user dials the three-digit number to access Internet through Infovia, he pays the local measured telephone tariff irrespective of where he is located around the country. In contrast, the average subscriber of one of the rival ISP will end up paying more for the Internet access because a subscriber in a given province in which the independent ISP has no presence will pay a long distance call instead of a local call.[15] In order to avoid such discrimination, subscribers of a rival ISP should have the same right to access to a three-digit number and pay it as a local call. We consider that by including in the analysis the three-digit discrimination pricing would have enlarged the degree of total discrimination we have found with our simple model. Similarly, in the case of dedicated subscribers, there are some cost incurred by them that have not been taken into account in our estimates. Thus, a dedicated subscriber of an independent ISP or TdP has to contract the dedicated circuit service in addition, of course, of the Internet access service. However, the former is charged for two-end port monthly rental for the dedicated circuit service, but if the same subscriber gets Internet access through TdP client, he has to pay only one-end port monthly rental for the dedicated circuit. Including this feature in our estimation would have amplified the degree of discrimination found in this paper.

[15] Assuming that only one node of Infovia exists, and it is located in Lima, all the users calls from the provinces would be using the national long distance network and therefore these calls would be long distance.

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