NOTES ON NETWORK ACCESS PRICING RULES FOR THE DEVELOPING ECONOMIES

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1- Introduction

The privatization, liberalization, deregulation movement is now being extended to developing and transition economies. The former public natural monopolies for public services in telecommunications, electricity, gas, transportation,... are reconsidered. Parts of these public firms are now viewed as potentially competitive, like long distance in telecommunications, generation in electricity or gas and consequently opened to competition while some elements are still considered as natural monopolies like the transmission grid in electricity, the tracks in railways and remain regulated eventually with new forms of regulation like incentive regulation.

The management of the interface between the competitive and regulated sectors is crucial for the success of liberalization. The conditions under which competitors can access the regulated sector which is an essential input for their activities determine the profitability of entry and therefore the level of competition in the sectors opened to competition as well as the efficiency of the utilization of the natural monopoly elements.

Despite its vital role for the success of liberalization viewed as a key institutional change for development no specific proposals of desirable access pricing rules for developing economics is currently available. The purpose of this paper is to start filling this gap. All along we will keep in mind some main features of developing countries which may call for specific rules: high cost of public funds, poor auditing and monitoring facilities, low transaction costs of corruption, weak counterpowers, weak ability to commit, inefficient tax systems.

2- About the Optimality of the Market Structure

The pricing of interconnection is highly dependent on the market structure. We will distinguish three different situations.

In case 1, there is vertical disintegration. The firm controlling the bottleneck (the natural monopoly) is not allowed to compete in the provision of services using the bottleneck as an input. In case 2, the firm controlling the bottleneck is one competitor among many providing services using the bottleneck as an input. Finally, in case 3 competition takes place between vertically integrated firms which each controls a bottleneck and provides services.

A first question to ask is whether the characteristics of developing countries favor one or the other market structure.

The comparison between cases 1 and 2 rests essentially on a comparison between the economies of scope that vertical integration makes possible, and the problems of favoritism it raises.

Since the economies of scope are likely to be independent of the characteristics of developing countries (at least for given technologies) while on the contrary favoritism is more difficult to fight in LDCs, there should be a bias toward vertical disintegration in these countries.

However, the comparison between case 2 and case 3 rests on a comparison of the fixed costs which will be associated with the competition in the provision of "bottleneck" like local telephony and the gains one may expect from this competition. The comparison here is difficult for the LDCs where the high cost of public funds makes more expensive both the duplication of fixed costs but also the information rents of a monopolistic provision of the bottleneck.

These comparisons are further complicated by the dynamics of the industry which may be moving toward case 3 as in the telecommunications industry. Then vertical disintegration may in fact slow down the emergence of competition among vertically integrated firms providing both local and long distance telephony. Advising vertical disintegration may then be particulary inappropriate.

However, for railroad gas or electricity, vertical disintegration of the track, the pipelines or the transmission grid from the transportation or the generation can be strongly advised if competition in services is introduced.

In all these cases one has the choice between a single regulated entity owning the tracks, the pipelines, or the grid, or between a shared ownership

of the bottleneck by the users who agree on rules for using it. The comparison is here between the inefficiency of regulation and the free rider problems of joint ownership. In a country where regulation is easily captured one may favor the second scenario.

Currently, the main difference between telecommunications and the other industries is that the local network which is a bottleneck for long distance is providing a service of its own for which consumers can compete.

For gas, electricity, railroad, consumers are not interested separately by the service provided by the bottleneck. A piece of the pipeline of the electricity grid and of the track that is of interest to the consumer will not be in general provided by different firms. This is not necessarily so in railways when there are several roughly equivalent itineraries, or more rarely in the gas industry.

Alternatively are could imagine that the last cupper line or fiber optic to the consumer be provided by a different company than the incumbent in local telephony and that this bottleneck be rented to different users including the local telephony companies.

3- Structural Separation and Pricing of Access to an Independently Owned Infrastructure

The utility owning the infrastructure sells wholesale services to other firms who market final services to the consumers.

a) Competitive Usage

The simplest case arises when the *n* final services are produced by competitive industries at some constant marginal cost. Then, it is as if the utility produced the final services itself at a unit cost equal to its own cost of providing access to the competitive downstream firms plus the latter's unit cost of producing the final services.

The Ramsey formulae can be applied to the prices charged for access to the utility's infrastructure and they can be decentralized through a price cap on access charges.

C_k = long run marginal cost of producers of the final service k

C_{Ok} = long run marginal cost of access to supply service k

$\hat{\eta}_k$ = price superelasticity of good k

Ramsey pricing entails: $\frac{P_k - C_{Ok} - C_k}{P_k} = \frac{\lambda}{1+\lambda}\frac{1}{\hat{\eta}_k} \qquad k = 1,\ldots,n$

where λ is the shadow price of the utility's budget constraint.

Induced Access Pricing Rules: $\frac{a_k - C_{Ok}}{P_k} = \frac{\lambda}{1+\lambda}\frac{1}{\hat{\eta}_k}$ or $k = 1,\ldots,n$.

Alternatively, we can define the demand for access for good *k* (access *k*) as:

$$\tilde{D}_k(a_1,\ldots,a_n) = D_k(p_1,\ldots,p_n).$$

Then, it is easily seen that the price superelasticity of the demand for access *k* is

$$\tilde{\eta}_k = \frac{a_k}{p_k}\cdot\hat{\eta}_k .$$

Then, we obtain a classic Ramsey type of pricing:

$$\boxed{\frac{a_k - C_{Ok}}{a_k} = \frac{\lambda}{1+\lambda}\cdot\frac{1}{\tilde{\eta}_k}} \qquad k = 1,\ldots,n$$

Principle 1: *The excess of the access price over the marginal cost of access for good k relative to the access price for good k should be inversely proportional to its demand price superelasticity.*

The decentralization of Ramsey pricing by price caps enables the regulator to rely on the demand information of the regulated firm (even if we still have the difficult choice of weights in the price cap).

The demand information is naturally located with the users of the infrastructure. The utility can infer this demand information from the demand for access **as long as the users report truthfully the type of final good for which they use the infrastructure.**

Technical limits exist for the best possible use of Ramsey pricing, but also institutional limits due to the need to curb corruption activities. Optimal regulation may require no price discrimination and therefore may entail "political" cross-subsidization.

We can then issue our first warning for LDCs.

Warning 1: *In LDCs, for a very competitive usage of the infrastructure, Ramsey pricing of the infrastructure should be based on broad categories of usage which do not raise complex inspection issues and should be decentralized by price caps.*

Note that decentralization is only partial in the sense that the regulator will still have to make sure that the firms uses the correct classification of services into the different categories.

Ramsey pricing is often criticized for its informational requirements. Note that price cap regulation does not require the regulator to know the price elasticities. It uses the knowledge firms have of these elasticities. Of course, the calculation of the optimal weights in the price cap formula requires the same type of information (see below).

b) Market Power of Users

Consider the simple case where each user is a monopoly in one independent market. He will charge a monopoly price computed according to the usual formula

$$\frac{P_k - (a_k + C_{Ok})}{P_k} = \frac{1}{\eta_k}$$

where η_k is the price elasticity of good k.

Since Ramsey pricing requires

$$\frac{p_k - C_{Ok} - C_k}{P_k} = -\frac{\lambda}{1+\lambda}\frac{1}{\eta_k}$$

one should undo the monopolistic mark up of the user by a discount on the access price defined by:

$$\frac{a_k - C_{Ok}}{P_k} = -\frac{\lambda}{1+\lambda}\frac{1}{\eta_k}.$$

These marginal access charges can be supplemented by a fixed payment to form a two part tariff

$$a_k q_k + A_k$$

which ideally can extract the monopolist's profit. More generally one can use non linear pricing.

Principle 2: *With market power of users, the marginal access charges should subsidize access and excess profits of users should be recovered by fixed charges, and more generally by non linear pricing.*

Such a policy requires a lot of knowledge from the regulator and raises issues of favoritism in price discrimination. In the absence of long term contracts, there is a potential for expropriation of some large users' investments. The complexity and potential discretion involved, in countries

with little technical expertise and low transaction costs of collusion, lead use to:

Warning 2: *In LDCs the regulator should not attempt to undo the monopoly power of users of the infrastructure. Alternative policies should be used to foster the competitive use of the infrastructure.*

c) Additional Problems with Ramsey Pricing

- Regulatory capture

When the regulator designs the tariffs, the discretion surrounding the determination of elasticities raises the problem of capture (when a price cap is used the problem is transferred to the choice of weights).

Warning 3: *A non discretionary method for choosing weights in the price cap should be selected (for example last year quantities and an exogenous change in the level).*

- Risk of expropriation

Price cap regulation with reviews is viewed as the best and simplest way to strike a balance between rent extraction and incentives for cost minimization. However, in countries with little credibility one may argue that rate of return regulation offers a more reassuring environment.

First in addition to the traditional problems of rate of return regulation, the specificities of LDCs (lack of reliable accounting, lack of regulatory expertise) favor price cap regulation. The drawback of giving up too much rent is weaken by the urgent need to attract capital.

Second, rate of return regulation is not necessarily more effective in committing to a fair treatment when the government has little credibility to fulfill its promises.

4- One Way Access with Vertical Integration

We consider now the case of a vertically integrated utility (the incumbent) which provides access to the infrastructure and which also sells a service using the infrastructure. The problem is to price access for other providers of services using the infrastructure.

a) Competitive users

We first consider the case of competitive users with constant marginal cost providing a service which is an imperfect substitute of the service provided by the incumbent.

Let good 1 refer to the service offered by the incumbent with:

C_{O1} long run marginal cost of access for good 1

C_1 long run marginal cost of producing good 1.

Let good 2 refer to the service offered by the competitors with

C_{O2} LRMC of access for good 2

C_2 LRMC of production.

There is no fixed cost in the production of services.

Let *a* be the access price to be charged to competitors.

Ramsey pricing of access leads to:

$$a = C_{O2} + \frac{\lambda}{1+\lambda}\frac{P_2}{\hat{\eta}_2}$$

with $P_2 = a + C_2$ from perfect competition.

Alternatively we can write:

$$a = C_{O2} + \delta[p_1 - C_{O1} - C_1] + \frac{\lambda}{1+\lambda}\frac{P_2}{\eta_2} \qquad (1)$$

$\delta = -\dfrac{\partial q_1 / \partial p_2}{\partial q_2 / \partial p_2}$ displacement ratio (change in incumbent retail sales divided by the change in its sales to rivals as the access price varies).

CASE a: Competitors are providing new products that are not (or cannot) be provided by incumbent $\Leftrightarrow$ $\delta = 0$.

In this case global price cap appears particularly promising. It takes here the following form

$$\bar{q}_1 p_1 + \bar{q}_2 a \leq \Pi$$

where $\bar{q}_1$ and $\bar{q}_2$ are the equilibrium quantities of goods 1 and 2.

Principle 3: *If the services provided by users of access to the incumbent do not compete seriously with the services sold by the incumbent, a global price cap should be favored, or more generally regulation of such access should be treated just like regulation of an end-user service.*

Then, the owner of the infrastructure has good incentives to favor interconnection which will increase its business.

However, there may be problems if there are congestions and pricing is not flexible enough to allocate the infrastructure with prices. If rationing occurs then favoritism of the incumbent may happen.

CASE b: We consider now the case where competitive users offer services which are very close substitutes of the services provided by the incumbent.

Formula (1) shows that the access price should be higher than in case a in order to avoid inefficient business stealing and balance the budget of the incumbent.

Principle 4: *When entry leads to business stealing, the access price should be higher than the marginal cost corrected by the Ramsey own elasticity term.*

A regulation which does not allow this "competitive" response of the incumbent will create incentives for exclusionary behavior.

A good policy would be to allow an access pricing rule generous for the incumbent and to focus regulatory resources on implementing quick and high quality interconnection. One possibility is to use the efficient component pricing rule (ECPR).

$$a = P_1 - C_1$$

If accounting is not available for calculating the incumbent's cost C_1 one may, in the competitive context considered here, use the marginal cost of the entrants unless the incumbent can demonstrate that his cost is lower.

Warning 4: *When the competitive entrants offer services which are highly substitutable with the incumbent's services, the ECPR rule supplemented by active regulatory oversight to favor non discriminatory interconnection can be used. Alternatively one can use a global price cap supplemented by maximal access prices defined by ECPR.*

b) A Non Competitive Entrant

When entry is durably non competitive, regulation of prices of services must be envisionned.

5- Two-Way Access

When network competition develops, reciprocal access charges between networks must be determined. This situation of network duplication is not very common in the LDCs we are considering but it may arise in telecommunications and in railways.

When the final prices are regulated one can let the networks negotiate interconnection charges and use the regulatory resources to facilitate interconnection and the reaching of agreements especially when the networks are asymmetric in size.

When the final prices are unregulated, reciprocal access prices should be regulated.

Two dangers must be avoided.

The first one is the collusion of networks for agreeing on high reciprocal access charges which induce monopolistic final prices.

Principle 5: *When symmetric networks compete in linear prices, the optimal access charges should be below marginal cost of access to undo the monopolistic competition of networks on final prices.*

Given that we can expect weak competition of networks, we favor the bill and keep doctrine because of its simplicity

Warning 5: *For symmetric network competing in linear prices we favor the bill and keep doctrine of zero access charges.*

Indeed for such situations, the access payments wash out whatever the access price and a low access price encourages competition in the final prices.

A danger is that networks choose not to be interconnected. Again regulatory resources should focus on ensuring good interconnection.

Theory shows that, if networks compete in non linear tariffs the collusion effect disappears and access should be priced at marginal cost. The bill and keep doctrine leads to marginal prices which are too low and to fixed charges too high with high levels of exclusion for consumers. However such a situation is likely to be uncommon in LDCs.

A more difficult situation occurs when networks are quite asymmetric in their marginal costs of access (fixed and mobile networks) and in size.

When networks are of mature sizes, regulatory resources are likely to be on the high side, and negotiated access tariffs under the threat of competition policy is a reasonable option.

The most difficult case corresponding to the second danger is when a small network tries to enter. Then the incumbent network is likely to use access charges to blokade entry.

First one must be sure that network competition does not interfere with network development in areas of interest.

If network competition, in an urban area say, is still desired it must be because large unsatisfied demand exists and the networks may develop without interconnection (telecom in Columbia) and there will come a point when the regulator can mandate negotiated access prices with a fall back option using international benchmarking.

Warning 6: *In the cases where network competition is desirable, mandated negotiations under the threat of arbitration by an international body is an interesting option.*