A METHOD TO ALLOCATE DISTRIBUTOR AND OTHER AGENT PAYMENTS FOR TRANSMISSION EXPANSION

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ABSTRACT

The difficulty to assume on networks, when apply to colective use is that generates conflicts over property rights and payment obligations. This problem is the same when speaking of extension in the electric transmission: once we include into operation a new line and it will be used by distribution systems, generators and large users, even when it likes them or not. And this use is independent of the network utility that will report to the participants. Therefore, there is controversy about the most efficient way for their provision, which extends from laissez faire *to dictatorship. Along the way, we can stop any kind of consensus, based on the design of mechanisms, appropriate to reveal their preferences to the participants. The process involves an exchange of rights between actors of the electricity market to arrive at the final allocation. If, through an auction, we force these players to make offers trading, transaction costs are reduced and the flow can only be higher. And with greater fluidity in the exchange, it is always possible to achieve a more efficient allocation of property rights. To show the usefulness of this alternative, this paper presents a simplified model of mechanism design which analyzes the allocative efficiency of the proposed rule.*

INTRODUCTION

In modern capitalism, there is an ever increasing share of goods for collective use. The examples during the last years multiply everywhere: patents, Internet, highways, movie rentals, mobile radio spectrum, particularly for the new 3G technology, and so on. But this phenomenon is especially true in networks, whether for transmission or information and although the subject is generally addressed in studies of transmission due to the use of new sources and technologies. But in the distribution is no less the contribution of regulating policies of distribution companies in investment's decisions to expand the transmission system. Another aspect to analyze is about customers where also the distribution and transmission must provide high-voltage. The difficulty is that the networks being used collectively generate conflicts over property rights and payment obligations. Therefore, there is controversy about the best and most efficient way for provided energy, which extends from the consensus to the dictatorship. The problem with these assets is not only to be able to "measure", but the use made of them by each of the participants. The problem is that it is not possible to "control" the use on the network. For example, once put into operation a new electricity transmission line will be used by the participants like it or not, subject to the Kirchhoff´s laws. And this usage is independent of the network utility that will report to the participants. In the distribution studies are carried out Load Flow for determining the paths of active and reactive power and voltage when we modify the network configuration, and is also incorporate equipment called Static Var Compensator forcing the circulation of reactive power. It is in this point, where the target of the matter. The problems do not end there because, when solving these goods, it is impossible to distinguish between utilities who gets little use, despite intensive use, and that one that also making intensive use, pretends to have little use for meagerly involved in costs. For this reason, to distribute the costs collectively, some policymakers are inclined to be in the sense the use criteria, despite its allocative inefficiency, in order to avoid such behaviors free ride. In this paper we propose a plausible solution to all these problems by using the concept of transaction costs and the theory of auctions.

SOME RULES OF THE GAME AS A SOLUTION

When we think some solutions, it is possible to obtain consensus as a desirable institutional design against the dictatorship regulating rules. In that case, we must choose some method of allocation of rights to determine the proportions of cost for each participant and it can be initiated by the criterion of use. Of course, the allocation of rights is the same in regard to the payout ratio and making the right to vote, e.g. who has a 20% ownership must pay 20% of the work and have 20% of entitled to vote on the decision to perform the work. Whatever be the method, however the initial allocation of property rights will not match the preferences of the participants, to achieve allocative efficiency desired participants shall exchange such property rights. Rights, as mentioned, will also involve decision concern rights and obligation to pay on the new networks. Through these exchanges, rights end at the hands of those who most value them. These highlight aspects are logically applicable to high voltage networks and its participation in the networks utilities of medium and low voltage. Distribution owns the network in its entirety and investment clients repaid with energy use. The exchanges are a central concept in economics, from Walras (1874) [1] with his *tâtonnement*, Menger (1871) [2] with his terms for the exchange and Edgeworth (1881) [3] with his box, to the theory of modern auction, going on the road by Ronald Coase (1937) [4], who developed institutions particularly

relevant. This situation allows us to introduce the concept of how the Distributor will pay for future networks of high voltage during it service´s life and the value of energy. The exchanges to which we refer are never banned when it comes to network, but we found that the friction is them reduced: it is transaction costs of Coase. Participants should know each other intimately for exchanges to be very fluid. Still could not be exchange. This is typical transaction costs, lack of information about the preferences of other participants, distance, low liquidity operations, difficulties in the execution of the obligations by written contracts, etc. One way to reduce transaction costs is the use of auctions and markets. So if, through an auction, we force participants to make trading´s offers, transaction costs are reduced and the flow can only be higher. And with greater fluidity in the exchange, it is always possible to achieve a more efficient allocation of the property rights. In this type of proposal there is a degree of coercion, because participants are required to take part in the auction. But coercion is minimal compared with compelling new works performed and paid, as in a dictatorship rules. Here, participants should issue only one offer, but with the freedom to choose the value you want for this offer, high or low, depending on the degree of interest they have in the new facility. In addition, reject the slightest restraint and abandon the absolute spontaneity implies that trade suffers, among other reasons because the transaction costs. Moreover, the existence of some transaction costs may lead to fall in the end lead to a dictatorship, in which one participant decides for all. We experienced that it is very difficult to find in reality benevolent dictators. This has also been taken by the theory of Public Choice, from *Buchanan and Tullock* (1962) [5] onwards. The problem is that if we chose a mechanism based in consensus, we face the strategic behavior of participants. They feign no interest afford not to work according to your intimate preferences, but trying to pay less. This will result in less work for the truly desirable. The goal is to find a mechanism that will make them reveal the truth about your preferences. The proposal is due to require that tenders for each participant in the auction of property rights are for a single value, both buy and to sell the rights. Thus the proposal also is incentive compatible in terms of mechanism design theory. This means that participants should they bid their true value. They are free to make offers they want, but the best, for themselves, is to reveal the truth. It also leaves raised the question of how to pay for future energy networks that are added after e.g. five years. In the next section we develop and show the efficiency of this proposal.

PROPOSED MECHANISM

The proposal show how does is established the mechanism of VN (MVN). It consists in requiring that bids for the purchase of rights must be equal in amount to the sale of them, to place participants in a attitude that prevents them from speculating on low prices shopping for fear of ending up selling for that low price, or speculating on higher prices of sale, for fear of ending up buying at high prices. If it is a line extending use to a cost-intensive and beyond the topics covered in this contribution units focuses on Utility-Client negotiation. To see how effective this mechanism is, it has to reveal the truth to the participants, i.e. to show that it is incentive compatible, we must verify that the revelation of truth by the participants constitute a Nash equilibrium (NE). It's about seeing if revealing the truth is the best answer I have on hand each participant at the actions of others. It is a utility optimization problem.

$$U = \Pi c\ Uc + \Pi v\ Uv \quad (1)$$

where

U: participant's expected utility

Πc: likely to buy

Uc: utility for purchasing

Πv: probability of selling

UV: utility to sell

The net utility will be

$$Uc = Vv - po \quad (2)$$

where

Vv: true value give to the participant righs, that he gives (intimate) to be auctioned

po: price offered by the participant to buy (operated if one accepts the purchase)

The profit from the sale will

$$Uv = po - Vv \quad (3)$$

po >> Vv

$$\Pi c = 1 \quad (4)$$

$$\Pi v = 0 \quad (5)$$

and po << Vv

$$\Pi c = 0 \quad (6)$$

$$\Pi v = 1 \quad (7)$$

where here

po: price offered by the participant to sell (operated if one accepts the sale) but, of course, po is the same as for the purchase, according to the MVN

$$\Pi c = 0{,}5 + k\ (po - Vv) \quad (8)$$

where k is the slope that we want to use to move from their inability to afford to buy and security

$$\Pi v = 0{,}5 - k\ (po - Vv) \quad (9)$$

where k is the slope that we want to use to pass now to sell security to the inability to sell. Thus we are left with the following expressions for the expected utility of each participant:

If po >> Vv

$$U = (1)\ (Vv - po) + (0)\ (po - Vv) = -\ (po - Vv) \quad (10)$$

If po << Vv

$$U = (0)\ (Vv - po) + (1)\ (po - Vv) = (po - Vv) \quad (11)$$

po near *Vv*

$$U = [\ 0{,}5 + k\ (po - Vv)]\ (Vv - po) + [\ 0{,}5 - k\ (po - Vv)]\ (po - Vv) = -\ [\ 0{,}5 + k\ (po - Vv)]\ (po - Vv) + [\ 0{,}5 - k\ (po - Vv)]\ (po - Vv) \quad (12)$$

We can become more compact expressions stating that

$$po - Vv = \delta \quad (13)$$

with what we would be as follows:

If po >> Vv

$$U = -\delta \quad (14)$$

If po << Vv

$$U = \delta \quad (15)$$

$$U = -(0{,}5 + k\,\delta)\,\delta + (0{,}5 - k\,\delta)\,\delta = -2k\,\delta^2 \quad (16)$$

po near *Vv*

If we now apply the first order condition (FOC) we see that for po>> Vv

$$\frac{dU}{d\delta} = -1 \quad (17)$$

It is certain that the participant ends up buying at a price po>> Vv and no limits to the loss, which will - .δ

for po <<Vv

$$\frac{dU}{d\delta} = 1 \quad (18)$$

It is certain that the participant ends up selling at a price po <<.δVv and no limits to the loss, which will be δ.

But if po is around Vv, then the FOC indicates that

$$\frac{dU}{d\delta} = -4k\,\delta = 0 \Rightarrow \delta = 0 \Rightarrow po = Vv \quad (19)$$

and

$$\frac{d^2U}{d^2\delta} = -4k < 0 \quad (20)$$

We have seen that the utility is maximum (U = 0, i.e. minimal loss) where po = Vv, but the participant is more responsive bid po = Vv, it is revealing its true value. We see that the proposed mechanism is incentive compatible, so that participants can offer the value you want, but what is best for them is to reveal the truth and offer their true value. It can be likened to a mechanism that leads to approach the crossing point of supply and demand.

In the next section we provide a numerical illustration.

A NUMERICAL ILLUSTRATION

In order to illustrate the nature of the procedure, and following Coase explanation exemplified with numbers, we present a case with some quantifications may merely illustrative.

Suppose a work whose cost is $ 100 and generates an income of $ 109. Therefore, its earnings are $ 9. Imagine, however, that there are 5 players involved and the benefits are different for each of them. To make easy the exercise, and conceptual content without removing the example, we consider that the costs are loaded evenly among the five players, i.e. 20% for each of them. Thus, the cost they will face each is $ 20. However, as already mentioned, the benefits are not equal for each of them. Let's try the following figures for each of the participants, nominated by letters and then placing the sums which means they work (cf. Table 1).

Table 1. Revenue differential for each participant

Actor	Income[$]
A	60
B	30
C	19
D	10
E	-10

If we add the cost share to each, we obtain the utility that reports to work each actor (cf. Table 2).

Table 2. Earnings differentials for each participant

Actor	Income [$]	Cost [$]	Profit [$]
A	60	20	40
B	30	20	10
C	19	20	-1
D	10	20	-10
E	-10	20	-30

It is instructive, then, to see how, although the work has added costs less than the added revenue, most of the actors, even a simple majority rule, has the option for the negative and the work would be unfulfilled. It is also true that, as total revenues are greater than total costs, the book not only surpasses the golden rule, but that stakeholders could compensate disregarding interest because they find enough money for it. However, the difficulty lies in transaction costs, mainly of information involved in the process, which is why the works are without consensus.

Thus, our proposal is to reduce transaction costs by establishing a market or exchange on which to negotiate their rights, which in this example are set initially at 20% for each. This can be useful to use the Internet for auction and a proxy. It would be an electronic agent as in the case of e-bay auction where each participant puts their true value, but the electronic agent is responsible for payment and minimize achieve win the auction. This is the proxy auctions mentioned by Milgrom (2004: 325) [6]. The secret should be guaranteed by a notary or in any way credible. In the background, it is also similar to the walrasian *tâtonnement* where actually declare the demand and supply curves and the auctioneer is responsible for finding balance. Therefore, if each utility to disclose its proxy and allow the proxy bid seeking to maximize their interests, the deals could be in the manner provided by Table 3.

Table 3. Descending order for offers to purchases and increasing order for offers to sales

Buyer	Peek Buyer [$]	Peek Seller [$]	Seller
A	40	1	C
E	30	10	B
D	10	10	D
B	10	30	E
C	1	40	A

A question remains as to deepen the case of adding a subsidy and it does not take into account other aspects related to renewable energy customers and locked The presence of the proxy would allow participants to reveal their preferences most intimate confidence, since they would not be revealed unless it is absolutely necessary in

the interests of each participant. The figures we see in Table 3 arise from what each actor would be willing to pay. In the case of actor A, would be willing to pay up to $ 40 to increase its voting rights to a proportion that would approve the work permit. It's the most you would be willing to pay because it is the utility that reports the work. Pay a higher amount will no longer accrue any benefit, but would bring losses. Of course, $ 40 is the maximum, and is an amount that leaves you with no benefits. What I want is to pay less than $ 40. Actor E is found in a more compromised situation. If the work is done he lost $ 30. This is the result of the injustice of the initial distribution of rights, load it with payments on a work do not want. As already stated, our goal is not to restore justice because we have no a fairer method than the areas of influence when you look at what is paid from the point of view of distributors. But what we want to avoid is that a work leave positive net benefits is not realized. Thus, the actor I could pay up to $ 30, at most, to avoid performing the work, causing him to lose just $ 30. Of course, if it can pay less than $ 30 would be better, because then avoid the loss of $ 30 with an investment of an amount less than $ 30. But its real value is $ 30. Then we have the actor D, which is qualitatively identical to E, but with a lower amount, only $ 10. Something similar happens with the actor B, which in this case is qualitatively identical to A, but quantitatively smaller, with a value of $ 10. Finally, there is the actor C, again, qualitatively as well as E and D players, but quantitatively even smaller: its value is $ 1. To more accurately reflect the situation it could be a little more realistic and think that there should be some minimum margin between bids and theoretical value to justify the transaction. In this case the figures would be as in Table 4.

Table 4. Offers with margins between purchase and sale

Buyer	Peek Buyer [$]	Peek Seller [$]	Seller
A	39	2	C
E	29	11	D
B	9	11	B
D	9	31	E
C	0	41	A

Following the mechanism, the proxy should set the price so as to meet the best buyers and sellers, but without requiring the maximum contribution, unless strictly necessary. It would be a mechanism like that of Vickrey (1961) [7], and the actor A would get the most participation, but without pay all its benefits. Buyer's payment should be a maximum of $ 29 while charging the vendors C and D should be at least $ 11 each. As in this case the buyer $ 29 A are greater than the sum of payment to vendors C and D totaling $ 22, then you can set the payment to an intermediate value of $ 25.5, with $ 12.75 for each vendor. All this would be by proxy, so transparent the procedure and encourage participants to declare their true value. On the other hand, to declare the true value is almost inevitable by the aforementioned mechanism (MVN) to take bids for each actor as their own offers for sale. So that the work would exceed 51% of approval without difficulties and allow the selfless compensation deal after payments due to them by the initial allocation of rights.

CONCLUSIONS

In this study we tested an approach to the problem of collective assets and in particular the way in which utilities (distributors) and other agents tried to solve the electricity transmission expansion. Conceptual scaffolding Ronald Coase and transaction costs enabled us to explain the difficulties in achieving consensus when deciding on an extension. The theory and practice of auctions worked, then, to propose a novel mechanism for the exchange of property rights, voter turn out and obligation to pay and a percentage to distribute in the internal works of the distributor. A numerical illustration, finally, allowed a more comprehensive understanding of the proposal. As we have seen, with appropriate rules of the game, something that North (1990) [8] are neither more nor less than institutions, can move stably in a more efficient provision of goods for collective use, thus avoiding the difficulties of the dictatorship as the pure consensus. This is a case where evidence of the power of institutions in economic performance.

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