Review of *"The Causes and effects of Imperfect Unbundling of Transmission and Generation in the European Union: Theoretical and Empirical Investigations"*, by Silvester van Koten

Thomas-Olivier Léautier
Toulouse School of Economics

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1 General comments

Overall, I find the thesis very interesting. Vertical separation of electric power transmission from generation is clearly an important topic, that has been discussed in the United States for more than ten years, and is currently the subject of a very heated debate in the European Union. Central to this debate is the difference between ownership and legal unbundling. The economic investigation of the impact of these two forms of unbundling presented in the first two articles is therefore extremely important, and timely.

The third article tackles the issue from a different perspective: it investigates which factors lead a country to adopt one form of unbundling versus another. Of course, this is also a critically important issue, on which economic analysis should aim to shed light.

The thesis benefits from a solid grounding in the reality and the practice of restructuring in Europe, which is always positive.

However, I find the thesis fall slightly short of its potential.

The contribution in the first article is very limited. The second price auction appears to have been solved elsewhere. The first price auction is not solved analytically. The analysis is limited to uniform distributions. Therefore, even though the policy implications of the results are important – and well explained – I do not believe this article is ready for publication. I have included some suggestions for improvements in the detailed analysis.

The second article is good. I have some doubts on the practical acceptability of the objective function assumed for the manager, but this is solid work. The policy implications are very clear, important, and timely. I believe this article can be published in a good field journal.

The topic of the third article is truly exciting. However, I worry some variables are missing in the specification, namely the structure of the industry by country prior to restructuring (state owned vs. publicly owned, monopoly or oligopoly, etc.). Since these variables are likely to be correlated with other explanatory variables, I suspect we may face an omitted variable bias. I believe the authors should resolve the potential missing variable bias before submitting for publication. Then, it should

find its way in a good journal.

2 Detailed comments

2.1 Bidding behavior when one bidder and the auctioneer are vertically integrated

This article studies a game where two generators are bidding for limited transmission capacity, and one of them receives, through his ownership in the line, a portion of the auction revenues. γ is the share of the line owned by the privileged generator, and also the share of auction revenues she receives. $\gamma = 0$ means no ownership, both generators are perfectly symmetric. $\gamma = 1$ means one generators fully owns the line. One expects distortions caused by line ownership to be increasing in γ.

Indeed, the analysis "shows" that "welfare" decreases as γ increases. ("Welfare" here is the sum of industry profits, not the usual definition). The intuition is that the "inefficient" generator is called to produce more often than its "fair share", due to the advantage conferred by ownership of the transmission line. This result is important for the current policy debate.

The article studies two auction settings: first-price and second-price auction. It would have been interesting to know which approach is most often used in practice. The bidders' values for the capacity are assumed to be independently and identically distributed on $[0, 1]$, which is standard in the auction literature. All results are limited to the case where the values are uniformly distributed. *Validating the results using a more general distribution constitutes a natural extension.*

The article indicates that the second-price auction has been solved previously. The contribution of the article therefore appears to be limited to the comparative statics and the policy implications. All of them describe the impact of an increase in ownership of the line by one generator. It would therefore be more accurate to preface the (long) list of comparative statics (pg 18) by: "as γ increases".

The second-price auction is not solved analytically except for the two boundary cases ($\gamma = 0$ and $\gamma = 1$), rather it is solved numerically.

The analytical contribution is therefore limited. Furthermore, I am not a specialist of differential equations, but it seems that the first-order conditions are similar to those of chapter 2, for which a closed-form solution is available. *The article should either push harder for a closed-form solution, or give an intuition as to the difference between the first-order conditions.*

The comparative statics are not rigorously proved. Specifically, the article compares the various values for $\gamma = 0$ and $\gamma = 1$ but does not show monotonicity in-between. I do expect the effect to be monotonic, but it should be proved. *The implicit function theorem should do it for most results.*

Finally, a word on exposition. The article produces a long list of properties, and leaves the proofs to the appendix. Meanwhile, the appendix is organized in propositions, which are not found in the main text. *I believe it would be more effective to create one or two propositions with the main results (welfare impact?), and possibly the proofs, and include additional results as needed in the Appendix. This also applies to the second article.*

The conclusion nicely summarizes the main results and the implications for policy makers.

2.2 Legally separated joint ownership of bidder and auctioneer

This article considers the same problem as the previous one, but adds a constraint: the transmission line and the generating unit are owned by the same holding company, but legally separated. This implies that compensation for the manager of the generation unit, responsible for bidding on the transmission line, can only be based on revenues and costs metrics from the generation unit. The manager of the generation unit therefore does not fully internalize the auction revenues. Yet, the article identifies and quantifies welfare-reducing distortions (compared to full unbundling). This is an important result, with broad policy implications, in particular in the aeroplane debate: one would expect legal separation

to be sufficient to provide the appropriate incentives. Yet, this article shows this is not always the case.

The article assumes that the compensation of the generation manager is a linear combination of revenues and bidding costs of the generation unit (with weight a). The article shows that the holding company optimally selects $a < 1$. The compensation scheme therefore under-represent the bidding cost in the generation manager's compensation: in effect, he receives a "kickback" equal to the share $(1-a)$ of his bidding costs. The main weakness of the article is that it is unclear whether such compensation schemes would be allowed in practice. Assuming they are, the analysis proceeds. As before, the bidders' values for the capacity are assumed to be independently, identically, and uniformly distributed on $[0, 1]$. *As previously, one would like to extend the analysis to a general cost distribution.*

The article first solves the equilibrium bidding strategies of second-price auction, derives the comparative statics, and determines the optimal weight a as a function of the ownership share in the line γ. Finally, the article shows that the welfare loss (for the optimal weight a) is increasing in γ, and quantifies the loss.

The article then turns to the first-price auction. The analysis is a little more involved, but the article provides closed-form solutions for the bidding strategies. The article then examines different cases, corresponding to different contractual commitment by the holding company.

The article then concludes that legal separation is welfare decreasing compared to ownership unbundling. This conclusion should be qualified: it holds if "kickbacks" are allowed – or cannot be precluded – in the compensation scheme.

2.3 The unbundling regime for electricity utilities in the EU: a case of legislative and regulatory capture?

This article examines an intriguing hypothesis: regulatory capture contributes to the decisions of EU countries concerning the timing and ex-

tent of vertical separation of transmission assets. EU15 countries and New Member States (NMS) are all subject to the unbundling requirements from the European Commission. Yet, they have chosen different forms of separation, and different timing for adoption. This provides the natural experiment studied by the article. In practice, the articles regresses the state of unbundling over a series of explanatory variables, including variables meant to measure corruption.

I find the idea extremely interesting, and clever. The diversity of responses from EU25 countries is indeed intriguing, and economic analysis should attempt to shed light on this.

The article is clear on the data sources, and the techniques of statistical analysis appear robust.

My main concern, however, are missing variables. In addition to corruption and GDP, the structure of the industry pre-restructuring should also matter: was the electricity industry owned by the state? or by the private sector? was there a national monopoly? regional monopolies? if so, how large were these companies? was there one or multiple jurisdictions responsible for the restructuring? One would also expect "political" variables to also matter: was the country formerly communist? was the restructuring of the power industry part of a wide privatization/restructuring program? was the restructuring ideological (e.g., England and Wales), economic (e.g., the USA), or imposed by the Commission (e.g., France). Since these variables are correlated with some of the regressors, we could face a missing variable bias.