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The performance of public enterprises

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Abstract

The purpose of this paper is to argue in favour of public enterprises that would be accountable for their performance, that is the way they fulfil the missions assigned to them by the public authority. This requires a rigorous and regular performance assessment. If adopted earlier such an approach would have avoided unneeded and costly privatizations as well as being trapped by inefficient public- private partnership arrangements. Recent evidence on enterprise performance seems to point out that institutions matters more than ownership.

Keywords: privatization, performance, public enterprises, public-private partnership.

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1. Introduction

For a number of reasons public enterprises are not as widely studied in public economics as they were 50 years ago and yet there have not disappeared from the national scene. Public enterprises, public services and government agencies are still playing an important role in terms of employment, public finance and quality of services. In this paper we advocate dealing with public enterprises through the performance approach that measures to what extent the unit under study fulfils the objectives that are assigned to it by the State. Such an approach is needed to improve the functioning of public enterprises and to appraise whether or not privatization is desirable. We believe that such an approach would have avoided some unneeded privatizations and the costly use of public private partnerships.¹

The paper is organized as follows. In section 2, we discuss the appropriateness of the wave of privatizations experienced in both developing and developed countries. We then turn in section 3 to the performance approach and to the measure of technical efficiency. In section 4, we present a sample of efficiency studies, some of which compare the performance of the private and the public sector. We observe that much more than the issue of ownership, what matters is the extent of competition created by the regulatory environment. In section 5, we critically deal with the public-private partnership formula that has been widely used lately. A final section concludes.

2. Privatization of public enterprises: what a waste.

One could easily argue that our societies would probably have gained by avoiding the wave of privatization they have experienced in recent decades. Three motivations can explain this breaking wave. First, there was an ideological motivation. The neoliberal ideas that came about with the coming to power of Ronald Reagan in the United States and Margaret Thatcher in the UK led to believe that all that was public was ineffective. Second there was a series of political and institutional problems that prevented public companies from evolving to meet the needs of the moment. Finally, there was the urge of immediate revenue. It is worth noting that most of these privatizations have occurred without serious studies to gauge the

¹ Let us mention here two other approaches, which are also used in the literature with the same aim. On the one side, there is cost-benefit analysis, an ex-ante powerful tool to anticipate economic and financial returns rates of future investments (Florio et al. 2018). On the other side, there is performance management, a holistic view of public firms' performance which integrates the quality of actions and the quality of achievements or, in other words "*...the whole value chain from inputs over outputs and outcomes*" (Van Dooren et al. 2015, p. 4).

performance of public enterprises deemed inefficient without further litigation. In this chapter we particularly focus on this question of measuring the efficiency and performance of a public enterprise that we consider essential before any privatization decision. But first we will deal with the question of motivations.

There is little to say about the ideological reasons behind the wave of privatization. At that time, the political majority of citizens began to doubt the benefits of the welfare state. The values of equity and social cohesion that it embodied and the goals of redistribution and protection against the risks of life it pursued no longer convinced. It was easy to blame the welfare state for the slowing of growth and the persistence of social inequalities and to promise that the market could solve all the problems of the moment.

Another motivation was the idea that it was not possible to reform state owned enterprises for a variety of reasons and then that the only alternative was to privatize them. We will mention the most important of these reasons. First of all there is the fact that some public service missions entailed costs that could be avoided by a private company. Public sector workers enjoyed higher benefits than private sector workers. They had the status of civil servants and benefitted from an extremely favourable retirement system. By privatizing these public companies, costs would be reduced, but also the wellbeing of the employees of these companies. Lack of competition and politicization also had their cost. Public managers were often chosen for their membership to a particular party but not for their competence. What is unfortunate is that people who at the same time resisted any reforms and proclaimed to be strong advocates for the public sector caused some of these blockages. Some unions and left-wing parties have a partial responsibility, although it must be remembered that greed remains the main cause of many privatizations

In addition to these two motivations, there is also the urgent need of resources for indebted economies. Many governments have invoked the necessity of reducing public deficits to privatize particular companies. The Maastricht Treaty forced them to limit their deficit to 3% and their debt to 60% of GDP. To satisfy this requirement, these governments have preferred to sell what some have sometimes called their *family jewels* rather than reduce spending or increase taxes. This motivation does not hold water. Indeed, if the price of privatization is the present value of future profits, as it should be the case, the state has nothing to gain in privatizations. In the reality, what happened is different. Even though initially the new owners committed to maintain the requirements of a public service in the company they just acquired,

they often acted otherwise in the treatment of the workforce as well as in the quality of the products or services provided so as to increase their profit margin.

To sum up, it would seem that in developed countries a number of privatizations have been conducted with an exclusive focus on immediate financial returns without comprehensive performance study and ignorance of the various missions assigned to public enterprises. The same happened in developing economies but the reasons were different. In most countries, the government was unable to provide a minimum level of public services, e.g. water distribution and sewerage, transport facilities, electricity, communication, ..., and, overall, to undertake the investments to build the necessary infrastructures.

Before proceeding, it is interesting to note that the content of economic research was influenced by the privatization trend. Before it started in the seventies, there was a flourishing literature on the economics of public enterprise that is epitomized by the excellent book of Ray Rees (1973). In his book Rees emphasized the plurality of objectives attributed to public enterprises. Besides technical and allocative efficiency, there were the distributional objectives and the macroeconomic objectives. Among the latter, there was the mission of supporting employment. In the eighties, economists move to the theory of regulation. The best known example of this research was the path breaking textbook, *A Theory of Incentives in Procurement and Regulation* of Laffont and Tirole (1993). Applying the principal-agent theory to questions of regulation, it developed a synthetic approach, with a particular focus on the regulation of natural monopolies such as military contractors, utility companies, and transportation authorities. Even though some of the models discussed in this book as well as in the subsequent research can be used to manage public enterprises, economic research properly devoted to public enterprises faded away.

3. The performance approach

3.1. Plural objectives

Public enterprises or public services can be seen as production units (DMU) with one or several persons in charge that are defined as agents. These agents operate in a given institutional setting; they use a number of inputs and provide a number of outputs that

correspond to the objectives assigned to them by the public authority that is defined as the principal. The principal, that is the State taken as representing Society as a whole, has multiple objectives because of the many dimensions of social welfare. As a result the missions assigned to the agents are also multifold, so that the performance-assessing issue becomes more complex than that of private firms where the profit level is the sole criterion of performance. Multidimensional objectives are thus unavoidable when assessing public sector performance. Economists distinguish three main classes of objectives. The first is allocative and it comprises both technical (or productive) and price efficiency. The second one concerns macroeconomic consideration: growth and employment. The third one is one of equity. Equity is a notoriously slippery concept, implying that the incidence of any public activity on income distribution has to be taken into account.

Beyond the recognition that a multidimensional approach is essential, a number of difficulties arise that we will deal with briefly, each in its own turn. First, the objectives assigned to the public sector may not always be completely compatible with one another. One knows, for example, that peak load pricing for the railroads is desirable from an allocative viewpoint, but often distributively objectionable. Thus, when assessing the overall performance of any public activity, a delicate balance must be struck between equity and efficiency considerations. Second, measuring the degree to which those objectives are satisfied is quite a difficult task. It involves computing first an indicator of partial performance for each of them, and then proceeding to weight those indicators, which cannot be resolved without some basic value judgments. Third, the only objective the achievement of which does not impede with the others is technical efficiency. Producing too little or employing too many factors as compared to what is technically feasible cannot be justified in terms of any of the other objectives listed above (macroeconomic, allocative and redistributive). By contrast, hiring labor in (too large) quantities that are allocatively inefficient can be legitimated by macroeconomic considerations of employment policy.

In view of the above, we adopt the view that in a first and important stage the performance of public enterprises be measured and compared on the basis of productive efficiency only. Our reasons are twofold: on the one hand, the global performance evaluation problem, that is measuring how close a production unit comes to achieving all the objectives just listed is, in our opinion, too ambitious. Both data and techniques of analysis currently available make such an undertaking unachievable. On the other hand, since productive efficiency allows for

evaluations that are consistent with the manifold objectives of the production unit at stake, it definitively constitutes a step in the right direction.

3.2. The frontier method of measuring productive efficiency

Over the course of the last decades, a number of methods for measuring productive efficiency have been proposed. They all have in common the frontier concept which states that efficient units are those operating "on" the frontier of their respective production set, while inefficient firms operate "below" that frontier (i.e. in the interior of their production set). These methods also have in common their reliance on inference. Indeed, statistical data that report on the outputs achieved and the inputs used by a DMU do not provide the production set per se, no more than they yield the production frontier. Both must be inferred, namely constructed from the data, prior that any efficiency computation can be made. We thus obtained the well-chosen expression of "best-practice frontier" whereby Farrell (1957) originally designated the production frontier that he was the first to derive from statistical data.

To estimate best practice frontiers two main alternative methodologies are available: parametric ones, and non-parametric. The difference between them lies in the technique used to formally describe the frontier. In the first case a usual function with constant parameters – e.g. Cobb-Douglas, or translog – is specified a priori. Its parameters are estimated by statistical or other methods in such a way that the graph of the function best "envelops" the data "from above", that is, observations appearing to lie on or below this graph. Then, the efficiency of each observation is computed in terms of the distance between the observation and the graph of the estimated function, now considered to be the frontier of the production set. This distance is usually expressed in terms of the ratio between the achieved output and the output predicted by the function. Notice that the efficiency measure thus obtained may differ according to which functional form is specified a priori. Usage of this parametric method is mostly found in the econometric literature under the generic name of Stochastic Frontier Analysis (SFA).

In the second case, that of the non-parametric methodology, what is specified a priori is not an explicit function but rather some formal properties that the points in the production set are assumed to satisfy: e.g. free disposal, convexity (implying either non increasing returns to

scale for the frontier, or some form of variable returns) or proportionality (implying constant returns). Data are then "enveloped", too, not by the graph of a function whose parameters are estimated, but instead by determining whether or not each observed point can be considered to be an element of the frontier, under the chosen assumption(s). This is done by solving an appropriately defined system of linear equations – one such system for each observation. The same system can then serve to associate each observation with a numerical efficiency score that measures again the distance between the observation and the frontier. Here as above, the efficiency measure obtained for each observation may differ according to which formal assumptions are specified a priori on the production set. Usage of nonparametric methodologies is generally prevalent in the management science and operational research literature. It tends also to prevail in public sector areas in which the concept of production function is not obvious. The two best-known non-parametric methods are the DEA for "data envelopment analysis" and FDH for "free disposal hull".

For both categories of methods, parametric and non-parametric, the data set can be either a cross-section of several productive units, or a time series of observations of the same unit. In the first case, direct application of any one of the above methods implicitly assumes that for all units the production set is the same. In the second case, it assumes that the production set remains unchanged over time or evolves at a given pace that reflects technical progress. Either one of these assumptions can be relaxed, provided information other than just input and output quantities can be included in the analysis. They may include environment characteristics specific to some subsets of cross-sectional observations, or time-related characteristics in the case of time-series observations. When time is involved, considerations relating to technical progress (or regress) are particularly relevant, because of the issue of sorting out efficiency gains (movements towards the frontier) from progress (frontier shifts). Both parametric and non-parametric methods have offered extensions in this direction, mainly the computation and the decomposition of Malmquist productivity indexes.

As both classes of methodologies do operate on exactly the same database, viz. input and output quantities, a given data set can always be subjected to both efficiency measurements (and furthermore, within each class, to different functional specifications or set theoretic assumptions).²

² For an overview and a detailed presentation of parametric and non-parametric methods, see Coelli et al. (2005) and Fried et al. (2008).

3.3. Pros and cons

We now turn to the merits of productive efficiency-based indicators of performance as compared to other indicators. As was pointed out above, productive efficiency does not prejudge whether and how other objectives are fulfilled. A second advantage of the productive efficiency approach is that it relies on physical data that is readily available in many instances, and basically more reliable than financial or accounting data. Third, unlike most partial indicators of performance, productive efficiency can encompass a large number of inputs and outputs, including qualitative aspects without having to go through disputable aggregation. Finally, since the concept of productive efficiency is both intuitive and unambiguous, its measurement generally finds a wide consensus.

Admittedly, production efficiency is only a partial indicator of performance. But compared to traditional indicators, it is by far a more robust method to apply to production units operating in changing market structure or alternative production settings. The idea that technical efficiency is achievable independently of the other objectives assigned to the production unit and particularly of allocative efficiency has been challenged on various counts. Here we only consider one of the most usual objections that pertain to the term of adjustment. The "short term" objection is quite intuitive and goes as follows: a production unit can be constrained to be technically inefficient if it is forced to employ too much of a factor of production, or to supply too little of a service without being able to quickly adjust its input-output vector so as to remain on the efficiency frontier. Take the example of a public railway company, whose demand just dropped by a lot, and assume that it is not allowed to lay-off or reassign any of its employees. It is obvious that in the short run, such a firm is doomed to be technically inefficient. After some time, however it should be able to reduce its idle labor force through attrition, or to use the idle workers to improve the quality or variety of its services. Besides this problem, there is the fact that when assessing the overall performance of a public enterprises, we have to make sure that it is technically efficient but also that it fulfils the other objectives that it is expected to achieve.

4. Efficiency studies.

We now turn to a survey of some efficiency studies. As in Pestieau and Tulkens (1993), we are interested by sectors in which operate simultaneously public and private firms and in studies in which the authors compare their performances, mainly technical efficiency, using benchmarking methodologies. Over the last 25 years, following the liberalization process which opened the provision of public services to the private sector in most countries around the world, a large number of papers have been written in which the authors estimate the effect of liberalization on firms' performance.

Given that in most cases the new entrants' firms benefitted from a natural monopoly position, the liberalization processes was accompanied by the creation of national and/or regional regulation agencies. The main role of these agencies is to fix rules which put firms in a situation comparable with real competition, known as *yardstick competition*.

Price-cap regulation was the methodology chose by regulation agencies in a majority of countries. For this purpose, they collect detailed data on firms' operations and, using frontier analysis methods, they compute benchmark analysis. In some cases, e.g. England and Wales and Scandinavian countries, the data is made publicly available and many researchers took this as an opportunity to study the sector trying to identify main driving factors of firms' efficiency.

Nevertheless, the number of public-private comparative efficiency studies varies across sectors. One of the reasons, besides data availability (which must be complete for a sufficient number of DMU), is data comparability.³ This is for instance the case of EU railways. Before liberalization it was relatively easy to use for comparative purposes the data on operations - staff, traffic, train movements, infrastructure, - on vertically and horizontally integrated national railways companies published yearly by the Worldwide Railway Organization (UIC). Today, in most EU countries the unbundling process, which mainly consisted on the vertical separation of infrastructure and operations activities and with the introduction of competition

³ As Pestieau (2009) and Lefebvre et al. (2018) pointed out there is a gap between model specifications used in the literature when compared with the ideal model. Ideally, the model should take into account final outcomes, those that justify the public nature of the firm or the activity, including quality dimensions. In practice, as the authors illustrate in their overview, this kind of data, as well as inputs quality, is often missing.

in operations, makes benchmark exercises more difficult and this is the reason why most studies we present hereafter are based on consolidated data at country level. This is not the case of sectors such as the water industry, waste collection and urban public transport, which, for historical and institutional reasons, are organized by local government (municipalities) with a great experience of contracting out. Therefore, many public and private firms operate simultaneously, for which comparable data is available. As a consequence, we shall focus our overview on them.

4.1 Railways

A bundle of papers analyses the impact of the de(regulation) process undertaken by EU countries in the early nineties, following the European Council Directive 91/440/EEC (European Economic Community, 1991). We are particularly interested on those papers that used frontier methodologies to identify efficiency drivers. As indicated before, these studies rely on a panel of consolidated railways' data at country level. To be more precise, authors' estimation strategy consists in the computation, in a first step, of technical efficiency scores for each country and year and, in a second step, to test the effect of reforms on efficiency scores.

Table 1 summarizes the main features of these studies – countries and period covered, output and input variables, methodology – and a quick overview of results. As we can see, the number of countries retained varies slightly but in most cases a majority of them belong to the European Union, with the remarkable exception of United Kingdom for which UIC data is not available after 2004.⁴ Unfortunately, the period covered also varies from one study to the other which makes comparisons difficult. On the contrary, there is a great homogeneity on model specifications, on the one hand on outputs – passenger-km and tons-km in most cases – and, on the other hand, on inputs – number of employees, rolling stock and trucks length (network) – in a majority of studies. Moreover, all the studies presented in Table 1 compute technical efficiency, using either DEA or SFA, or both, and in some cases the authors compute Malmquist indexes of total factor productivity growth.

⁴ Friebel et al. (2010) report that "... data for United Kingdom are not complete. In particular, as a result of the reform, there is not consisting information about staff of railroads firms for the period 1995 to 2003".

We are particularly interested on the results, which we summarize in the last column of Table 1. As indicated before, in all studies the authors estimate in a second step the effect of reforms on country railways performance. For this purpose, they include in the regression model several dummy variables representing the path of reforms. Given that the data corresponding for each country is a consolidation of all railways operators, the impact of reforms on efficiency and productivity growth cannot be attributed to a particular firm but to the reform themselves.

On the one hand, Driessen et al. (2006), Friebel et al. (2010) and Cantos et al. (2010, 2012) find that reforms, vertical separation and competitive entering enhanced railways efficiency while, on the other hand, Growitsh and Wetzel (2009) and Bougna and Crozet (2016) find either a positive effect, in the first case, or statistically non-significant results, in the second case. Finally, Asmild et al. (2009) find a positive robust efficiency effect resulting from firms' separation between labour and material costs accountings.

4.2 Water industry

Two surveys published in 2009 in Utilities Policy address the issue of water companies' performances: Abbot and Cohen (2009) and Walter et al. (2009). In both cases, the authors are interested not on performances *per se* but, as in Pestieau and Tulkens (1993), on the main drivers of performance, included ownership.

Abbot and Cohen (2009) overview more than sixty studies published mostly between 1991 and 2008 in which the authors deal mainly with United States and English and Wales water companies. After looking to all the results, near half of them corresponding to technical efficiency and the other half cost efficiency, the authors conclude that concerning ownership "...in the American case the results have been somewhat ambiguous..." (p. 238) and that in the case of England and Wales "...in most instances, the evidence shows limited effects on efficiency from privatization or even a decline in overall efficiency..." (p. 238). On the contrary, they show that: i) economies of scale matter, even if they are exhausted at certain level (100,000 to 1,000,000 costumers depending of studies); ii) also economies of scope matter, first in relation with vertical integration (water production and distribution), secondly in relation with vertical integration between water supply, sewerage and wastewater

treatment; and finally iii) while environmental regulation enhanced productivity in the case of England and Wales (e.g. Saal and Reid, 2004), price cap as well as rate of return regulation enhanced productivity and efficiency in the case of United States (Aubert and Reynaud, 2005).

Walter et al. (2009) overview a smaller number of studies, close to twenty, published from 2001 to 2008. These studies concern several regions of the world and deal either on technical efficiency (a majority) or cost efficiency. The authors arrive to the conclusion that "...the merits of public vs. private ownership cannot be clearly established and always should be evaluated within the institutional and regulatory contexts" (p. 231). Expectedly, as Abbot and Cohen (2009), they arrive also to the conclusion that economies of scale and scope matter, included the case of economies of scope obtained by Italian and Swiss firms delivering simultaneously water, electricity and gas.

We would like to also mention here two interesting meta-regression analysis. In both cases the authors are not interested directly on technical efficiency but on cost-efficiency. Bel et al. (2010) meta-regression includes data from nearly thirty previous studies published between 1960 and 2005.⁵ They test the effect of potential drivers of private vs. public cost difference and conclude that the analysis "... does not reveal a systematic relationship between cost savings and private production ..." (page 554), and that "... results indicate that the more competitive policy environment in the US reduces the likelihood of finding cost savings with private production" (page 573). Carvalho et al (2012) completed the Bel et al (2010) study looking to two other issues: economies of scale and economies of scope (multi-utilities). They arrive to the conclusion that "...although not statistically significant, publicly-owned utilities are more likely to have scale and scope diseconomies than when the ownership is mostly private" (page 46).

The studies mentioned here before give an overview of the literature on the water industry up to the first years of the 2000 decade. To be more complete, in Table 2 we summarize the results of recent studies which analyze water utilities operating in The Netherlands (De Witte and Saal, 2010), Portugal (Martins et al. 2012), France (Le Lannier and Porcher, 2013), England and Wales (Brea et al. 2017) and Spain (Suarez-Varela et al. 2017). These studies confirm the ambiguity of results concerning the effect of management on productivity. Le

⁵ Bel et al. (2010) combine in their meta-regression analysis the results of studies looking to water and waste services' costs.

Lannier and Porcher (2013) conclude that private operators are slightly less efficient than public operators and Martins et al. (2012) report non-significant differences associated with management. On the contrary, the later authors find, in the case of Portugal, that water costs are significantly affected by the hydrological region in which the firms operate. Brea et al. (2017) analysed the importance of an environmental issue, water losses which represent more than 20% of water supplied in the case of England and Wales. They show that efficiency scores are over evaluated when water losses are not taken into account in the analysis. The share of unmetered households is very high (near 70%) and firms have no incentives to change this situation, on the contrary, the authors estimate that the shadow price of a meter cube of leakage went down over the period. Furthermore, we report the results of an interesting study done by De Witte and Saal (2010). The authors show that Dutch public water utilities improved their productivity as a consequence of the publication of comparative results by the regulator, also known as “sunshine” regulation. In an international study, De Witte and Marques (2010), apply the same methodology to water utilities in several countries (the Netherlands, England and Wales, Australia, Portugal and Belgium). Their study shows that “... in absence of clear and structural incentives the average efficiency of the utilities even falls in comparison with utilities which are encouraged by incentives” (p. 217).

The last study reported in Table 5, Suárez-Varela et al. (2017), appeared in a recent special issue of *Water Resources Management* edited by Romano et al. (2017) and dedicated to water utilities management in Europe. In this study, the authors compare the performance of water services, 37 publicly and 33 privately managed, operating in 70 Spanish cities. Using a radial and a non-radial oriented DEA methodology and a meta-frontier approach, they reach the conclusion that there are not significant statistical differences between public and private operators, neither in terms of efficiency nor between the technologies. They find however differences when paying attention to non-radial efficiency measures. It appears that private firms are more labour efficient, while public firms are more efficient on operational costs. A result that is probably driven by a different allocation of resources in both cases.

4.3 Waste collection

In most countries, waste collection is like water provision one of main public services offered at the local level and for which economies of scale and scope matter. As highlighted by Pérez-López et al. (2015), over the last decade and particularly after the last crisis, municipalities

introduced new forms of organization and management looking for efficiency gains. These new management include creating agencies or mixed firms, contracting out and/or collaborating with other municipalities. The study presented by Pérez-López et al. (2015) is very comprehensive and illustrative. Using Spanish 1,058 municipalities (1,000-50,000 inhabitants) over the period 2001-2010, the authors estimate cost-efficiency scores in eight public services, including waste collection, water, transport, culture, etc., and in a second step identify the potential effect of management forms on them. For most public services, contracting out or inter-municipal firms are associated with lower efficiency. In the case of waste collection it appears that municipal agencies do better than mixed firms or inter-municipal firms, even if during the crisis the last performed better.⁶

Simões and Marques (2012) did a much extended overview of the literature on waste sector performances. Their survey covers more than 100 papers using mainly benchmark parametric and non-parametric methods to measure either technical or cost efficiency. The meta-frontier regression they estimate using the results of 36 studies, indicates that private provision does relatively better in less developed countries and, on the contrary, it does worst in richer countries. Also it shows that private firms do better just after privatization but the gap tends to disappear after some years.

In Table 3, for illustrative purposes, we report the results of three papers which in recent years addressed the issue of cost efficiency in waste collection and/or waste treatment. Simões et al. (2010) study the case of 29 urban waste treatment units in Portugal and arrive to the conclusion that public operators perform less well than private operators, but that among private firms those not regulated perform better than those regulated. De Jaeger et al. (2011) compared waste collection among 299 municipalities in Flanders, Belgium, observed in 2003. They conclude that municipalities which were members of, or subscribed to, a cooperation agreement to reduce solid waste at the highest ambitious level, were the most efficient. Finally, for the case of 256 Spanish municipalities observed over the period 2002-2014 by Pérez-López et al. (2017), it appears that firms' ownership matters but in relation with municipalities size. On the one hand, among municipalities with more than 5,000 inhabitants,

⁶ It is interesting to quote here Bish (1988), who advocates contracting out governmental services, particularly residential solid waste collection in Canada, as follows: *“The major reason for the important differences between public and private costs were that private firms employ small crews, used newer and larger trucks, and offered significantly greater number of incentives to employees to increase their productivity – in short – they were geared for greater productivity”*.

those which cooperate with private firms are less cost inefficient while, on the other hand, among smaller municipalities those which cooperate among them perform better.

4.4 Urban public transport

The last sector on which we are interested is urban public transport. It is another key sector, in which public and private firms operate and it has retained the attention in the efficiency literature. The main reason for that is that in most cases firms depend of public transfers (subsidies) and are submitted to regulatory rules, included concession renewals. In an overview study of efficiency analysis studies published up to the end of the last century, De Borger et al. (2002) conclude that even if "... the evidence provided by frontier studies in favor of private sector provision should be weighted against the fact that almost none of these studies controls for the degree of competition and the nature of government regulation in the sector" (p. 32).

In more recent years, several studies addressed these issue and we summarize the results of some of them in Table 3. Gagnepain and Ivaldi (2002), Roy and Yvrande-Billon (2007) and Gautier and Yvrande-Billon (2013) study the public urban networks in France. On the one hand, Gagnepain and Ivaldi (2002) estimate a SFA cost function taking into account the issue of potential efficiency endogeneity. Their results show that companies regulated under fix-price regulation were more cost efficient. On the other hand, Roy and Billon (2007) and Billon and Gautier (2013) analyse a more recent period and estimated SFA cost efficiency using a traditional translog model. Their results show that in average private operators were less inefficient than semi-public operators "...partially explained by the fact that this type of firm is sheltered from competition" (P. 23). Moreover they find that firms operating under gross-cost regulation performed better than those under net-cost regulation.⁷

Dalen and Gómez-Lobo (2003) and De Borger et al. (2008) studies the performances of local bus companies in Norway. For this purpose they used different approaches, parametric and non-parametric, respectively, on the periods covered, 1987-1997 and 1991, respectively, and on model specifications. Dalen and Gómez-Lobo (2003) estimated that companies under

⁷ Under the gross-cost contract, the firm receives an ex-ante fixed transfer amount expected to cover total costs. Therefore, any cost variation affects directly firms' profits. Under the net-cost contract the operator collects traffic revenues and receives an ex-ante fixed subsidy from the local authorities. In this case the firm is responsible for both, production and commercial risks.

yardstick (price-cap) regulation perform better than firms under subsidy-cap regulation or with a negotiated contract, while De Borger et al. (2008) report no significant effect due to the type of contract. Finally, for the case of Italy, Piacenza (2006) analysed the case of 44 local public transport operators over the period 1993-1999. The results show that firms operating under fix-price regulation are in average less cost inefficient than firms under cost-plus regulation.

5. The PPP, another delusion.

Following the disgrace of public enterprises a number of governments turned to a new formula, namely the public-private partnership (PPP hereafter). PPP is a contractual arrangement between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. In some types of PPP, the cost of using the service is borne exclusively by the users of the service and not by the taxpayer. In other types, capital investment is made by the private sector on the basis of a contract with government to provide agreed services and the cost of providing the service is borne wholly or in part by the government. One finds PPPs in a wide array of areas: jails, courts, highways ...

The main motivation for PPPs is that they enable the public sector to harness the expertise and efficiencies that the private sector can bring to the delivery of certain facilities and services traditionally procured and delivered by the public sector. Another motivation is that PPPs may be structured so that the public sector body seeking to make a capital investment does not incur any borrowing.

The World Bank and other international organizations after promoting privatizations have pushed for PPPs as the preferred mechanism to finance infrastructure projects. However, the PPP model is being energetically pursued without robust evidence of its performance – including its impact on public finances and its ability to fulfil the public interest goals they were committed to fulfil. Frequently, PPPs have contributed to a lowering of labour standards by creating precarious jobs and denying workers' rights. They have shown little concern for the environment. This has led many countries to progressively abandon this type of arrangement, starting with the United Kingdom that was the first proponent of PPP.

Recently Roehrich et al. (2014) analysed over 1400 publications on PPPs from a wide range of disciplines over a 20-year time period. They find that despite the scale and significance of the phenomenon, there is relatively limited conceptualization and in-depth empirical investigation. Their study illustrates that further empirical research needs to explore evidence gaps. In their view, future research should develop a richer understanding of the circumstances for creating alliances between private and public actors; it should also explore the impact of incentive mechanisms and risk management procedures on health service performance throughout the extended project life-cycle. Future work can investigate the causes behind PPP failures across different sectors and countries to draw out guidance on when (in terms of sector and service delivery specifics) and to what extent PPP arrangements should be favoured.

Hall (2015) provides wide evidence from international experience and studies of PPPs and summarizes their main findings as follows:

- The cost of capital is always cheaper without a PPP, for high income and developing countries alike.
- The cost of construction is higher under a PPP, because the financiers require a turnkey contract, which is about 25 per cent more expensive.
- The private sector is not more efficient in operation, and the public sector has the advantage of greater flexibility.
- The transactions costs of tendering and monitoring PPPs add 10-20 per cent to their costs.
- The public sector faces real risks from PPPs including incomplete contracts, the likelihood of renegotiations, and the potential public liabilities in case of bankruptcy or default by the private company.
- There are negative impacts on public services, the environment and workers, from cost-cutting or from distorted selection of projects to suit the need for profitability in PPPs.

To sum up even though PPPs are often promoted as a solution for countries under fiscal constraints, the evidence suggests rather that they worsen fiscal problems. PPPs have failed to deliver value for money, have created outcomes heavily skewed in favour of private interests, and are built upon overly optimistic models and assumptions that have borne little resemblance to reality.

6. Conclusion

The main message of this paper is that we need more and better studies of the performance of public enterprises for a number of good reasons. First, such studies should precede any attempts of privatizing or nationalizing an enterprise. So doing we would not make decisions that would be regretted later. Second, these studies can provide clues to improve the performance of any public enterprise hastily deemed inefficient. In particular, if well conducted they should identify the sources of performance slacks and ways to overcome them. Finally, they ought to be conducted before entering PPP arrangements. Our recommendation is that for any project governments should select the best financing mechanism, including the public borrowing option, on the basis of a comprehensive and transparent analysis of the true costs and benefits over the lifetime of the project, and the risk comparison of each option. Such an approach would avoid governments to be trapped in costly and inefficient arrangements.

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Table 1: European Railways

| Study | Sample | Period | Outputs | Inputs | Method | Effects on efficiency (testing reforms) |
|--|---|-----------|--|---|---|--|
| Driessen, Lijesen and Mulder (2006) | 10 EU countries + Japan, Norway and Switzerland | 1990-2001 | - Passenger-km - Tons-km | - Employees (#) - Rolling stock (#) - Network (km) | DEA | Competitive entering enhances technical efficiency. More autonomy without competitive entering and/or regulatory pressure has no effect on efficiency. |
| Asmild, Holvad, Hougaard and Kronborg (2009) | 21 EU countries + Norway & Switzerland | 1995-2001 | - Passenger train-km - Freight train-km | - Staff costs - Material costs - Network length (km) | DEA Multi-directional | Positive robust result of separation between labour and material costs accountings |
| Growitsch and Wetzel (2009) | 54 railways companies in 27 European countries: integrated vs. virtually integrated firms | 2000-2004 | - Passenger-km - Tons-km - Train-km | - Model I: Employees (#), Rolling stock (#) & Network (km) - Model II: OPEX (PPS) & Network (km) | DEA (bootstrap) | Efficiency advantages for integrated companies (economies of scope): slight difference with Model I (physical measures), but more consistent differences with Model II (OPEX). |
| Friebel, Ivaldi and Vibes (2010) | 12 EU countries | 1980-2003 | - Weighted sum of passenger-km and tons-km | - Employees (#) - Network (km) | SFA and linear structural relations (LISREL) | Reforms increased railroad efficiency. But gradual reforms has stronger effect than package (shock) reforms. |
| Cantos, Pastor and Serrano (2010) | 14 EU countries + Norway & Switzerland | 1985-2005 | - Passenger-km - Tons-km | - Employees (#) - Coaches (#) - Wagons (#) - Network (km) | DEA & Productivity change (Malmquist) | Positive effect of reforms on efficiency and productivity. Particularly when vertical separation is combined with new entrants in the freight sector. |
| Cantos, Pastor and Serrano (2012) | 23 EU countries + Norway & Switzerland | 2001-2008 | - Passenger-km - Tons-km | - Employees (#) - Rolling stock (#) - Network (km) | DEA & SFA (Output distance function)) | Confirms results in Cantos et al. (2010) and shows that introducing franchising in the passenger sector has a positive effect on efficiency as well. |
| Bougna and Crozet (2016) | 17 EU countries | 1997-2011 | - Passenger-km - Tons-km | - Employees (#) - Coaches (#) - Wagons (#) - Network (km) | SFA (Input distance function) and productivity growth | Statistically non-significant results for vertical separation and for openness to competition. |

Table 2: Water industry

| Study | Sample | Period | Outputs | Inputs | Method | Effects on efficiency (testing reforms) |
|-------------------------------|--|-----------|--|---|--|---|
| De Witte and Saal (2010) | Dutch drinking water utilities: 19 utilities in 1992 to 10 in 2006 | 1992-2006 | - Water production - Domestic costumers - Non-domestic costumers | Costs: capital, labour and other | Input oriented profit decomposition Order-m DEA controlling for heterogeneity | The 1997 reform introduced soft regulation based on firms' results publication (sunshine regulation). Firms, all of them public, increased their productivity |
| De Witte and Marques (2010) | Water utilities: the Netherlands (13), England and Wales 23), Australia (17), Portugal (44) and Belgium (25) | 2005 | - Volume of delivered water - Connections | - Employees (full-time equiv.) - Length of mains | DEA and second stage analysis with environment variables (double bootstrap) | The results show the positive effect of incentive schemes on efficiency |
| Martins et al. (2012) | 256 municipalities Portugal | 2002 | - Water delivered - Water losses | - Total cost included depreciation | SFA cost frontier | Hydrological regions have significant effect on water costs. Non-significant differences associated with management |
| Le Lannier and Porcher (2013) | 172 French utilities | 2009 | - Water billed - Costumers - Network length | - Total cost (proxied by revenues) | Mixed DEA and SFA, controlling for environment | Private management slightly less efficient than public management |
| Brea et al. (2017) | England and Wales 13 Water only utilities (WoCs) and 22 Water and sewerage utilities (WaCs) | 1996-2010 | - Water delivered - Connected properties - Water supplied area | - Capital - OPEX - Leakage | Input distance function, SFA Bayesian approach | Estimated efficiency scores are substantially higher when water losses are not included in the model. The estimated shadow price of lost water declined over the period. |
| Suárez-Varela et al. (2017) | 70 Spanish municipalities (> 50,000 inhabitants): 33 public managed and 37 privately managed. | 2013 | Variable inputs: - Water delivered - Population served Fixed input: - Distribution network | - Labour - Other operational costs | Directional DEA distance functions, meta-frontier approach (public vs. private technology) | Radial measures: Non-significant statistical differences between public and private utilities. Directional measures: Superiority of private firms' technology in labour management but superiority of public firms' technology in operational costs. |

Table 3: Waste collection

| Study | Sample | Period | Outputs | Inputs | Method | Effects on efficiency (testing reforms) |
|---------------------------|--------------------------------------|-----------|---|---|---|---|
| Simões et al. (2010) | 29 urban waste treatment Portugal | 2007 | - Treated solid waste (ton) - Recycled waste (ton) | - OPEX - CAPEX | DEA Bootstrap & operational environment | Private better performer than public. Non regulated doing better than regulated firms |
| De Jaeger et al. (2011) | 299 municipalities Flanders, Belgium | 2003 | - packaging waste - paper and cardboard - glass - other separately collected - residual waste | - Total costs, waste collection and treatment | DEA Bootstrap & background conditions | Municipalities which are members (or voluntary subscribe) of a cooperation agreement to reduce municipal solid waste at the highest ambition level, are more cost efficient |
| Pérez-López et al. (2017) | 256 municipalities Spain | 2002-2014 | - Waste (ton) - Quality (adequacy, availability and cleanliness of containers, periodicity) | - Total cost (OPEX + CAPEX) | Time invariant DEA | Results vary as a function of municipalities' size. Better results for cooperation with private firms in larger municipalities (> 5,000 inh.) and better results for municipalities cooperation for small municipalities (< 5000) |

Table 4: Urban public transport

| Study | Sample | Period | Outputs | Inputs | Method | Effects on efficiency (testing reforms) |
|-----------------------------------|---|-----------|---|---|---|--|
| Gagnepain and Ivaldi (2002) | 59 urban (> 100,000 inh.) operators France | 1985-1993 | - Seat-km offered | - Total cost - Fixed capital: # vehicles - Prices: labour, materials and soft capital | SFA Cost efficiency, with inefficiency modelled as endogenous | The lowest levels of cost inefficiency and cost distortions correspond to firms under fix-price incentive regulation |
| Dalen and Gómez-Lobo (2003) | 142 bus companies Norway | 1987-1997 | - Vehicles-km (urban) - Vehicles-km (inter-city) | - Total cost - Fixed capital: # vehicles - Prices: driver, administrative and fuel | SFA Cost efficiency | Bus companies under yardstick competition (price-cap) perform better than firms under a negotiated contract or subsidy-cap regulation |
| Piacenza (2006) | 44 local public transport operators Italy | 1993-1999 | - Seat-km offered | - Variable cost - Fixed capital: # vehicles - Prices: labour, energy - Other: commercial speed | SFA Cost efficiency | Firms operation under fix-price regulation perform better than firms under cost-plus regulation |
| De Borger et al. (2008) | 154 subsidized local bus services Norway | 1991 | Three alternative models: - Seat-km offered - Passenger-km - Vehicles-km | - Drivers cost - Fuel cost - Other costs | DEA Cost efficiency Bootstrap | No significant effect of type of contract |
| Roy and Yvrande-Billon (2007) | 135 urban networks (> 30,000 inh) France | 1995-2002 | - Vehicles-km | - Employees (#) - Energy - Other costs | SFA Technical efficiency | Private firms more efficient than public and semi-public operators |
| Gautier and Yvrande-Billon (2013) | 111 urban networks (> 30,000 inh.) France | 1995-2002 | - Vehicles-km | - Variable cost - Fixed capital: # vehicles - Prices: labour, material and overheads | SFA Cost efficiency | Private operators less inefficient than semi-public operators. Operators under gross-cost regulation more efficient than those under cost-net regulation |