



Innovative Applications of O.R.

Citizen coproduction and efficient public good provision: Theory and evidence from local public libraries

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ABSTRACT

In both public administration and economics, efficiency is brought forward as an important criterion for evaluating administrative actions. Clearly, its value as an assessment principle depends on our ability to adequately measure efficiency. This article argues that citizen's coproduction in public services requires a careful reassessment of how we approach the measurement of productive efficiency in public service delivery. Theoretically, we illustrate that using observable outcomes (e.g., library circulation, school results, health outcomes, fires extinguished, and crimes solved) as output indicators is inappropriate and leads to biased estimates of public service providers' productive efficiency. This bias arises because citizens co-determine final outputs, leaving them at least partly beyond the service providers' control. Empirically, we find supportive evidence of both the existence and importance of such 'demand-induced' bias.

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1. Introduction

Efficiency has been a central criterion for evaluating administrative actions since many years (Ostrom and Ostrom, 1971). A vast academic literature has subsequently developed aiming to understand the level and/or determinants of productive or technical efficiency – understood in terms of providing a maximum amount of output for a given level of inputs (Koopmans, 1951; Fried et al., 2008) – in (local) public good provision.¹ This attention is likely to increase further as (local) public service providers in many Western countries are facing *both* increasing demands (e.g., due to demographic change; Geys et al., 2008) and tightening budgets (e.g., due to governments' financial constraints). From such policy perspective, it is clear that understanding governments' performance allows for the detection of best practices and is a prerequisite for evaluating ways of performance improvement.

Yet, the value of efficiency as an assessment principle depends critically on our ability to adequately measure it. Two aspects are paramount in this respect. The first relates to the technical (or econometric) instruments required to estimate public service

providers' efficiency. While this literature goes back, at least, to the pioneering contribution of Farrell (1957), recent years have witnessed a fast development with respect to the toolbox of efficiency measurement. Parametric as well as semi-parametric and non-parametric techniques have developed rapidly, allowing researchers and practitioners to deal more appropriately with output complexity, exogenous contextual variables, and so on (recent contributions include Daouia and Simar, 2007; Balaguer-Coll et al., 2010; Thanassoulis et al., 2012; De Witte and Kortelainen, 2013). The second aspect is of a more operational nature, and concerns the need for "clear conceptual measures" of inputs and outputs (Ostrom and Ostrom, 1971, p. 204); Balaguer-Coll et al., 2010). In the extensive empirical literature on public sector productive efficiency, one common characteristic is the reliance on final outcomes – e.g., school results, health outcomes, library circulation, waste collected, taxes collected, water or energy delivered, crimes solved – as the main output measure. This article argues that this choice ignores a key characteristic of the production process for public services: namely, the central role of citizens as 'coproducers' of public services (e.g., Whitaker, 1980; Parks et al., 1981). Such citizen coproduction has – with the increasing financial constraints on (local) governments – received renewed academic and political interest in recent years (Pestoff, 2006; Meijer, 2011). Yet, while the academic literature on coproduction discusses both the determinants and consequences of such coproductive activities (see below), it does not highlight its critical importance for the measurement of public service providers' productive efficiency.

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¹ In the remainder of this paper, we will use the terms productive and technical efficiency interchangeably.

In combining the literatures dealing with the measurement of public sector efficiency and with citizens' coproduction in service provision, this article provides three main contributions. First, theoretically, we argue that citizens as *coproducers* of public services make that final outcomes are inappropriate output variables in efficiency studies. The reason is that final outputs – due to such coproduction – are at least partly beyond the control of the service provider. That is, schools can “*supply little education without inputs from students*”, police forces cannot maintain community safety without citizens reporting crimes or testifying in court (Parks et al., 1981, p. 1003) and tax collection is eased with citizens “*submitting tax returns*” (Alford, 2002, 39). As a consequence, estimates of public service providers' productive efficiency using such output measures may become biased. Briefly stated, low levels of citizen activity (e.g., low study investment by pupils or few requests for library books) imply relatively low levels of final outputs, which leads a high-input service provider to be designated as inefficient. Yet, it might be that this provider is very effective at translating basic inputs into service potential. If so, the use of final outputs as performance measures unduly punishes this service provider for the restricted nature of citizens' coproductive activity in this area.² This is *not* an argument to support the location of high-cost service providers in areas with low citizen participation, which constitutes a clear waste of public resources (i.e., *allocative* inefficiency). Rather, the argument is that, from a purely *productive* efficiency perspective, this service provider should not be described as an underperformer for an element beyond its control (i.e., citizens' coproduction or consumption decisions).

Second, using a rich dataset of municipal public libraries, our empirical contribution lies in evaluating the existence and importance of the bias deriving from ignoring citizens' role in the provision of public services. We find that high (low) levels of citizen participation in a given area generate high (low) estimates of productive efficiency when the selection of output variables ignores the extent of citizen coproduction. This relation vanishes when accounting for citizen's involvement in public good provision. These findings provide substantial support for our theoretical proposition that ignoring citizen coproduction generates biased inferences on public service providers' technical efficiency, and confirm that careful consideration of the production process and concomitant selection of output variables is crucial to make accurate inferences.

Third, from a methodological perspective, we contribute to the literature by employing a specially tailored non-parametric efficiency model (relying on recent work by Baden et al. (forthcoming), and its extension to discrete models by De Witte and Kortelainen, 2013). The model is rooted in the Free Disposal Hull (FDH) approach (Farrell, 1957; Deprins et al., 1984), which does not assume any *a priori* distribution on the production frontier. This is crucial as information on the production function is often lacking (Yatchew, 1998). The model also avoids two earlier drawbacks of FDH. First, it allows for outlying observations through the order-*m* technique of Cazals et al. (2002). Second, it captures heterogeneity among public service providers by immediately incorporating the exogenous environment into the estimate of the efficiency scores (thus avoiding a 'separability' condition which assumes that service providers' operating environment does not influence the level of the basic inputs and service potential). The results illustrate how this novel non-parametric methodology can help mitigate demand-induced bias.

Our results have important practical implications since properly characterizing and measuring performance is the first step towards discovering ways of improving performance. That is, evaluating whether public rather than private sector provision is more efficient (e.g., Andrews et al., 2011), or how, say, fiscal decentralization (e.g., Barankay and Lockwood, 2007), corruption (e.g., Dal Bó and Rossi, 2007), government ideology and/or fragmentation (e.g., De Witte and Geys, 2011) or citizen engagement (e.g., Borge et al., 2008; Geys et al., 2010) affect the (in)efficiency of public service providers can only succeed if the measurement of efficiency itself proceeds appropriately. Given the increasing efficiency-requirements on public policy-makers (see above) and the ensuing need to uncover pathways to improved performance, the benefit of increased knowledge on such measurement issues – as provided in the current article – is beyond doubt.

In the next section, we provide a more detailed theoretical discussion of our main argument. Then, in Section 3, we present an empirical evaluation using data on Flemish local public libraries. Section 4 concludes.

2. Theoretical background

2.1. The concept of citizen coproduction

Reflecting the sharp distinction in economic theory between consumers and producers, the traditional view of public service provision is one where “*the citizen reverts to a consumer and evaluator role, while government performs*” (Sharp, 1980, p. 108). Although such clear role-division is arguably appropriate for the manufacturing sector of the economy (e.g., televisions, sofas, iPads), a similarly sharp distinction between consumers and producers is harder to maintain for (public) services. Indeed, for most services, it holds that “*without the productive activities of consumers nothing of value will result*” (Parks et al., 1981, p. 1002). Such effects are obvious in, for instance, the education sector. Bandiera et al. (2010, p. 1379) indeed estimate that “*underlying ability or motivation to succeed are the single most important determinant of academic achievement*” and “*account for around 56% of the overall variation in test scores*”. The same also holds, however, in numerous other settings. For instance, patients should respect doctors' and nurses' orders if their health is to improve, one cannot get a decent haircut without sitting still in the barber's chair, and active engagement of the (long-term) unemployed underlies successful unemployment assistance programs.

In the late 1970s and early 1980s, public administration scholars developed the concept of citizen coproduction to capture this direct involvement of citizens in the design and delivery of public services (Ostrom and Ostrom, 1971; Sharp, 1980). It constituted an explicit attempt to move away from a “*relieving logic*” (a top-down view where citizens merely consume services) towards an “*enabling logic*” (a bottom-up view in which providers enable beneficiaries to coproduce the service) (Neumann, 1984). Most basically, the concept thereby highlights the “*conjoint responsibility of lay citizens and professional government agents for the delivery of public services*” (Sharp, 1980, p. 105). In other words, citizens – whether as individuals or as (in)formal groups – are seen as part of the public service production function, an issue we return to in more detail below.

In the ensuing coproduction literature, much attention has gone to the reaction of government officials to citizens' active involvement. This shows that government officials often fear the disruption of routines, their professional expertise and autonomy, and “*balk at sharing their turf with citizen volunteers*” (Sharp, 1980, p. 117). More recent work has also analyzed the conditions (un)favorable to coproduction. For instance, Van Ryzin (2011) points

² Throughout the article, we will often refer to citizens' co-productive activities as 'demand' or 'citizen participation'. The term 'demand' is thereby used in a broader sense than the mere passive desire for a good or service, and implies active involvement (as reflected in, for example, study hours, book borrowing requests, fire prevention activities or tax form submission).

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