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Public security in Brazil: Efficiency and technological gaps

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Abstract

This article analyzes the technical efficiency, the Total Factor Productivity (TFP) and the technological gap in public security services in Brazilian States. The order—m frontier is used for results estimation. The TFP variation is built by decomposing the Malmquist productivity index into technical efficiency, scale efficiency and technological variation. More than 50% of the federative units were considered technically inefficient. Out of the 27 federative units, 12 presented a positive total productivity while all others suffered total productivity losses. Productivity gains in public security are more related to scale aspects than to efficiency improvements and technological progress.

Keywords: Public security; Criminality; Productivity; Efficiency and technology

1. Introduction

In recent years, Brazil experienced some considerable improvements resulting from the growth in income and formal employment offer. According to IBGE (Brazilian Institute of Geography and Statistics) the employment rate of the economically active population increased from 89.5% in December 2002 to 95.0% in March 2014. The average income, according to PME/IBGE data, grew from R$ 2336.81 in December 2002 to R$ 3175.00 in March 2014. Due to these results, poverty indicators and income inequality have also experienced a decreasing tendency in recent years. According to IPEA (Institute of Applied Economic Research), the poverty index fell from 34.36% to only 15.96%.

However, crime rates show that despite the income growth and poverty reductions, Brazil has become a more violent country. According to the Brazilian Forum of Public Security (2013) the intentional homicides rate grew 7.8% between 2011 and 2012, reaching 24.3/100,000 inhabitants. The rape rate in 2012 reached 26.1 cases per each 100,000 women. That means 50,617 rape cases nationwide. The rate of this crime increased 23% in São Paulo between 2011 and 2012.

In Brazil, internal public security services are attributions of the Federation units. Each federation unit has its own police force constituted by military and civil agents. The first one is responsible for ostensive police services and crime repression; the second one, also called judiciary police, is responsible for investigation activities.

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Just like other public services, security must be guided by constitutional principles such as efficiency, which means to offer the best service possible with the smallest expense in resources. The security efficiency, besides granting economical services, implies the control of the negative effects of crime against people and assets, taking into account that crime containment results in an improvement of the social and financial environment.

There is plenty of literature aimed at the study of crime determinants. Chalfin and McCrary (2014) performed an economics research review on the effects of policing, punishment and security strategies on criminal acts. The evidence in favor of deterrence varies. While there is evidence that crime is sensitive to policing and the opportunities offered by the labor market, there is also evidence of a weak response to more severe punishment.

Q6 In Brazil, Santos and Kassouf (2008) discussed economics studies on national crime. The data quality refers to the high level of official data sub-recording and highlights the inverse causality problem amongst deterrence variables and crime rates. Most studies reviewed found evidence that income inequality and crime returns seem to be factors that boost crime levels.

More recently, studies on public safety technical efficiency have become an alternative approach to the crime problem. Instead of identifying violence determinants, they search for those units that are being relatively successful in fighting criminality. This allows for the identification of reference units so that their security policies can be used in studies on crime reduction strategies. Schull et al. (2014) performed an analysis of expenses with public safety in Brazilian states applying the Data Envelopment Analysis (DEA) estimation method. Pereira Filho et al. (2010) estimated the efficiency of public safety based on the stochastic costs frontier methodology.

In this sense, this article intends to analyze the technical efficiency of public security services in Brazilian states between 2008 and 2012. Additionally, we also estimate the technological gap per state and decompose the Total Factor Productivity (TFP) of public security into technical efficiency and technological variations.

In general, the methodology applied for the estimation of technical efficiency is qualified into parametric and non-parametric methods. Among the first ones, the most widely used is the stochastic frontier, which in general is applicable to single product technologies. The main criticism and the difficulty with this method is the imposition of a functional application for production function and the distributional hypothesis on model errors. When productive processes involve multiple products, non-parametric models are more adequate. Among the main non-parametric models we should mention the Data Envelopment Analysis (DEA) and the Free Disposal Hull (FDH). The former was first proposed by Charnes et al. (1978), based on the hypothesis that productive units present constant scale returns. Later on, Banker et al. (1984) developed the DEA hypothesis of variable scale returns. The second model, developed by Deprins et al. (1984), is based on a DEA model in which the production frontier results in non- convex variable scale returns based on the free disposal assumption.

However, it is worth highlighting that estimated technical efficiency results obtained through these two last methods may be biased in the presence of measurement errors or outliers.

Seeking to solve these problems, Cazals et al. (2002) developed an alternative way to robustly estimate technical efficiency. That's how the efficiency frontier method—*m* is born.

Therefore, considering that public security offers different services, besides the possibility of the existence of measurement errors or outliers, we estimate the efficiency of public security in Brazilian states through the order—*m* production frontier method.

In order to calculate technological gap levels, according to Wongchai et al. (2012), we apply the meta-frontier theory, defined as the envelopment of production functions for decision unit subgroups, as initially proposed by Hayami (1969) and Hayami and Ruttan (1970, 1971). The production functions envelopment is defined by the most efficient aspects of each specific technology, as explained by Ruttan et al. (1978).

The productivity measurement of public security services in Brazilian states shall be equal to the TFP calculated through the Malmquist index. The advantage of its use is to allow the total productivity index to be decomposed into the technical efficiency variation, the scale variation and the technological variation. To this effect, the analysis shall permit us to discover if state productivity gains were more due to technical efficiency effects, because of scale efficiency or as a result of technological variations.

Besides this introduction, this work is organized as follows: Section 2 introduces and discusses the methodology used to calculate technical efficiency levels, technological gaps, TPF and its decomposition for Brazilian states. Section 3 discusses the construction of a database and develops a descriptive analysis. Section 4 introduces and discusses result obtained from the methods described in Section 2. Section 5 deals with the final considerations.

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