



Electronic tendering of pharmaceuticals and medical devices in Chile



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ARTICLE INFO

Article history:

Received 1 April 2015

Received in revised form 1 May 2015

Accepted 1 May 2015

Available online 9 July 2015

Keywords:

Procurement

Aggregation

Tendering

Number of bidders

Corruption

ABSTRACT

The present study investigates the effect of electronic tendering on the price paid by the public sector for pharmaceuticals and medical devices in Chile. This study uses two panel regression models to analyze a data set that covers 6888 tenders for these items between 2001 and 2006, which spans 2004, the year when use of the Chilecompra electronic platform becomes obligatory. Model 1 explains the winning bid in each tender relative to the historic price, whereas Model 2 explains the winning bid relative to the concurrent price paid by drugstore chains. The regressors include variables which in the theoretical literature are indirectly associated with purchase prices (tender volume, the number of bidders and the time between tenders) and a Chilecompra dummy variable which captures the direct effect of the platform. The novel hypothesis of this paper is that e-tendering engages the market mechanism more effectively than traditional tendering, because of reduced corruption and less supplier collusion, which results in a direct platform effect. The empirical results support the volume effect. Greater aggregation of purchases leads to 2.8% lower prices. The evidence does not support the other indirect channels. More bidders result in lower prices, but the number of bidders fails to increase after Chilecompra. More frequent tendering leads to lower prices for medical devices, but tender frequency decreases after the implementation of the platform. Finally, the empirical results confirm the direct platform effect. Electronic tendering over Chilecompra leads directly to a greater than 8% reduction in prices. These results contribute to the literature on the returns to IT investments.

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1. Introduction

Electronic procurement by corporations promises to save resources, accelerates cycle times and reduces errors. Aggregation of purchases, both within the organization and with other buyers and new tendering techniques promise to lower prices.

Governments can achieve these advantages more readily as they do not face the “penguin problem” that corporations encounter (Farrell & Saloner, 1987 as discussed in Coles & Edelman, 2011), whereby no penguin wants to be the first to dive from an ice flow for food for fear of predators. As the largest buyer in the economy, the government can force suppliers to join its marketplace, and does not have to coordinate with other buyers to achieve buying power. Academic studies do not agree on the size of price savings. Bandiera, Prat, and Valletti (2009) show massive waste in Italian public procurement which suggests a large need for performance improvement. The least efficient decile of public buyers in Italy pays 55% more than the most efficient decile for the same goods, controlling for product quality and purchase volume. If all public buyers match the performance of the most efficient decile, they can reduce public spending by 21%. Other studies are

less encouraging. Pavel and Sičáková-Beblová (2013) and Singer, Konstantinidis, Roubik, and Beffermann (2009) suggest much more modest price savings of 2.4% and 2.65%. McCue and Roman (2012) echo the more conservative sentiment.

The absence of reliable spending data for the period preceding the deployment of the electronic procurement platform limits the scope of much of this research. If purchase prices for different goods and services were available for a period before the introduction of the platform – the so called “baseline period”, one could calculate saving by comparing those prices to the prices obtained after the implementation of the platform, controlling for other variables that might affect prices.

The authors use a database of public purchases of pharmaceuticals (henceforth drugs) and medical devices in Chile between 2001 and 2006, which spans 2004, the year in which the Ministry of Finance makes use of its procurement platform, Chilecompra, obligatory for public agencies. The authors also have extensive data for other variables that can affect prices. Their model shows that e-Tendering over Chilecompra saves the government 8.3% in drug purchases and 9.1% in medical devices directly. The indirect effect of Chilecompra is to reduce purchase prices by 2.8% through greater aggregation and by 0.4% as a result of better rules.

The authors are also able to confirm two hypotheses of great interest in health economics. First, volume discounts exist for drugs and medical devices. Second, purchase prices are lower when buyers have substitution possibilities; the greater a buyer's substitution possibilities, the lower the purchase price. The next section discusses the particular

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context of the health care sector, followed by a discussion of the literature. The authors then explain the data, models and results, and finish with some concluding thoughts.

2. Health sector procurement

Procurement in the health sector is sensitive because health care costs have risen rapidly and is challenging because there are often only a few suppliers. Several countries have attempted to implement initiatives to aggregate purchases to counteract supplier power, which coincides in some cases with the introduction of procurement platforms.

In the United States, Group Purchasing Organizations (GPOs) aggregate the demand of several hundred hospitals in order to negotiate better prices. Managed care organizations, including health maintenance organizations (HMOs), provide health care to patients through a network of providers. These organizations use their purchase volume and, in the case of drugs, restrictive formularies, in order to obtain better prices. In other countries the government, as the largest provider of health care, can leverage its volume and use restrictive lists in order to gain price concessions. In the late 1970s, Chile's national system of health services creates Cenabast to purchase, manage inventories and distribute drugs and medical supplies for the public hospitals of Chile and other Ministry of Health programs. The use of Cenabast is not obligatory, but almost 100 public hospitals, responsible for 20% of public purchases, use it in 2002.

In 1999 the government establishes Chilecompra, an electronic platform for all its purchases, which in practice serves mainly as an outlet to publicize transactions after they happen. In 2004, new legislation makes it compulsory for all agencies, including Cenabast and all municipalities, to use Chilecompra for procurement. On the new platform buyers from different government bodies follow standardized guidelines to carry out the entire procurement process, from posting requirements to publicizing outcomes. As of 2005, firms that want to supply the government must participate in Chilecompra. This legislation leaves public hospitals with a choice between using Chilecompra directly and going through Cenabast. By 2006, 190 public hospitals, responsible for 50% of purchases, use Cenabast.

3. Literature and hypotheses

In this section the authors review four strands of literature to develop their hypotheses about the effects of e-Procurement, Aggregation, the Number of Bidders and Tender Frequency on the prices of drugs and medical devices in Chile. [Geoffrion and Krishnan \(2003\)](#) select the first three of these threads as important for eBusiness in their Management Science special issue.

3.1. The effect of e-Procurement

[De Boer, Harink, and Heijboer \(2002\)](#) define Electronic Procurement as the use of the Internet in the purchasing process. Both the public and private sectors use Electronic Procurement and it takes many forms, including EDI, electronic data interchange — an inter-organizational information system that uses structured data exchange protocols, e-MRO — a mechanism for ordering indirect items (materials, repairs and operations) from an online catalog, web-based ERP, enterprise resource planning, — web-based automated procurement workflows, e-Sourcing — ways of identifying new sources of supply using Internet technologies, E-Tendering — the process of inviting offers from suppliers and receiving their responses electronically, e-Reverse auctioning or e-Auction — using Internet technologies suppliers to bid down the price of the procured item until none of them is willing to go further, and e-Informing — use of internet technologies for gathering and distributing procurement information.

In their theoretical work, [De Boer et al. \(2002\)](#) predict that e-MRO will have a large impact on the cost of purchasing activities for inputs

that are not incorporated into the firm's product and that are “clickable” by internal clients out of a catalog, especially when current activities are inefficient. They also hypothesize a large impact on the purchase price of these items when maverick buying is a problem. Consistently, [Croom \(2000\)](#) considers e-MRO the “killer application” of Electronic Procurement. [Kaplan and Sawhney \(2000\)](#) envision an even greater benefit if several firms share a hub, where different suppliers post their catalogs. The main emphasis in e-MRO is to reduce complexity, not price making.

[De Boer et al. \(2002\)](#) hypothesize that both e-Sourcing and e-Tendering help firms reduce the cost of establishing specifications, choosing suppliers, negotiating conditions and contracting. These authors expect e-Auctions to have a direct effect on the cost of both operational and strategic inputs by allowing firms to “obtain lower prices by using the market mechanism”. In contrast, [De Boer et al. \(2002\)](#) expect that e-Tendering will have an impact on purchasing cost only indirectly, as firms are able to consider more alternatives over time. The benefit of expanding the supplier base also applies to e-Auctions.

In the public procurement literature, in contrast, a “tender”, whether electronic or not, includes not only the interaction with suppliers, but the actual selection of a winner, and therefore entails the use of the “market mechanism”. Auction Theory refers to tenders as “competitive tenders”. [McAfee and McMillan \(1987\)](#) define an auction as “a market institution with an explicit set of rules determining resource allocation and prices on the basis of bids from the market participants.”

In auction theory “competitive tenders” are sealed bid auctions. Their distinctive characteristic is that suppliers compete to win a project by submitting bids without knowing the bids of other suppliers. In the more familiar English auction, potential buyers place increasing bids for an item for sale in a dynamic fashion until none of them is willing to bid higher. The distinctive characteristic of English auctions, which Sotheby's uses to sell impressionist art and the Federal Communications Commission uses to sell telecommunications spectrum, is that bidders can react to the bids of their rivals. A reverse auction is an English auction used for procurement, in which potential suppliers bid down the price of an item requested by buyers. When such an auction takes place electronically it is a reverse e-Auction or sometimes simply an e-Auction, consistent with [De Boer et al. \(2002\)](#).

When the valuation or cost of one bidder bears no relation to that of its rivals (i.e. private values setting), several auction formats lead to the same outcome, supporting the idea that both e-Auctions and e-Tenders use the “market mechanism”. See [Klemperer \(1999\)](#) for a discussion of several equivalence results. E-Tenders in the corporate setting also use “the market mechanism”. [Snir and Hitt \(2003\)](#), in their study of competitive electronic tenders for IT, model these tenders as first price auctions. [Elmaghraby \(2007\)](#) indicates that supplier discomfort with e-Auctions leads major e-Procurement vendors to increasingly use e-Tenders instead. [Hannon \(2006\)](#) reports 24% of buyers using e-Tenders and 31% using e-Auctions. [De Boer et al. \(2002\)](#), based on the technology available at the time, claim that e-Auctions are suitable for commodities, or items that can be clearly specified, but correctly foresee the ability to run more complex auctions. [Elmaghraby \(2004\)](#) argues that e-Auctions for non commodities can take place by giving quality differences a monetary value, to be added to or subtracted from monetary bids. Such adjustments can help evaluate different delivery conditions and financial terms that affect the firm's total cost. [Snir and Hitt \(2003\)](#) discuss how to do this in e-Tendering for informational technology contracts. [Dimitri \(2013\)](#) discusses scoring in government e-Tendering.

Scholars and practitioners still disagree on the extent to which the market mechanism applies in procurement ([Schoenherr & Mabert, 2007](#)). On the one hand, suppliers that invest resources developing components that are specific to the buying firm, and which are vital to that firm's strategy, may no longer make these investments when they have to participate in e-Auctions ([Jap, 2003](#)). On the other hand, academic research helps resolve some of the challenges of designing

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