



# Procurement and predation: Dynamic sourcing from financially constrained suppliers



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## ABSTRACT

This paper studies the relationship between a financially constrained firm and a stronger opponent who is not cash-constrained when these firms repeatedly compete in a procurement context. We characterize and discuss the procurement agency's optimal strategy when faced with such asymmetric firms. We highlight a trade-off between the long-run benefits from competition and the short-run benefits from reduced costs. Finally, we show that to reduce costs in the short run, the financially weak firm should be favored in future procurement.

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## 1. Introduction

The procurement of goods and services such as transport services has an inherent dynamic aspect. When contracting for a service today, the procurer needs to take into account that there will also be a need to (re-)contract for a similar service in the future. This paper takes into account this dynamic aspect of procurement and studies the effects of financial constraints and bankruptcy risk on the optimal procurement contract.

In the case of public transport, a firm needs to make and maintain investments in competence and equipment before being eligible to bid for contracts. This generally keeps the number of bidders low. In late 2008, the Norwegian Health Authority was looking for contractors for medical transport in Finnmark, Norway. The number of bidders was very low and two out of three areas that were up for procurement went to Veolia, a strong player in the Norwegian transport sector, and the last area was contracted out to Loppa Legeskyssbåter, a small, local firm which, because of this contract, survived and ensured future

competition in the local market.<sup>1</sup> Furthermore, in 2011 in Tromsø in northern Norway, the regional provider, Cominor, lost the competition for bus routes to a large national provider. This loss accounted for about 50% of the production for Cominor and subsequently led to the firm exiting the local market in Tromsø.<sup>2</sup>

This paper focuses on procurement where the change in the number of competitors is a result of small or financially weak firms leaving the market because they cannot maintain the investment in competence and equipment without the support of external investors.<sup>3</sup> In the 2007 Observatory of EU Small and Medium-sized Enterprises (SMEs)<sup>4</sup>, 21% of SMEs indicated that accessing finance was a problem.<sup>5</sup> In a setting

<sup>1</sup> <http://www.altaposten.no/lokalt/nyheter/article203130.ece> and <http://www.helsefinnmark.no/pressemeldinger/ambulansekontrakt-til-loppa-legeskyssbaater-article60750-25745.html>. Furthermore, Loppa Legeskyssbåter was given a longer contracting period than Veolia in order to ensure "predictability in the competition" (<http://www.altaposten.no/lokalt/nyheter/article203131.ece>).

<sup>2</sup> <http://www.nr.no/nordnytt/cominor-tapte-anbudet-i-tromso-1.7619509> and <http://www.itromso.no/nyheter/trafikk/article451776.ece>.

<sup>3</sup> Which for simplicity will be called bankruptcy, but could potentially include exit only from the specific market in question.

<sup>4</sup> [http://ec.europa.eu/enterprise/enterprise\\_policy/analysis/observatory\\_en.htm](http://ec.europa.eu/enterprise/enterprise_policy/analysis/observatory_en.htm).

<sup>5</sup> Berger and Udell (2003) and references therein provide evidence of small firms having less access to financial markets than bigger firms.

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where a small firm faces bankruptcy risk because of its limited access to financial markets, future competition is more likely to be maintained when biasing the procurement design in favor of this firm. However, it is not clear what form such a bias should take and, because biasing is costly, whether this is even optimal. This paper analyzes how and when leveling the playing field between small and big firms in public procurement is optimal. It also contributes to the analysis of the optimality of the US Small Business Act which explicitly favors small firms, and the EU principle of equal treatment across bidders.<sup>6</sup>

In a two-period setting, the optimal first-period procurement contract exhibits a trade-off between reduced first-period costs by giving the big firm incentives to understate its cost in order to push the small firm out of the market (predation) and increased future competition by favoring the small firm. Second-period procurement always unambiguously favors the small firm by evaluating its cost more leniently than how it would evaluate the same cost announcement by the big firm. This paper further shows that when the procurement agency can either provide funding for the small firm or when the procurement agency can allow the investor to make his contract contingent on the actual realization of the future procurement contract, then the negative spillover effects from the small firm's financial contract disappear and the procurement agency should treat the two firms equally.

The small firm's financing problem makes use of Faure-Grimaud (2000) who shows that an optimal financial contract takes the form of debt contract in which a firm that is not capable of reimbursing a fixed amount faces a risk of bankruptcy. Here this result is applied to the case where profits are endogenously determined by an equilibrium procurement mechanism. That is, if the small firm doesn't perform well enough in the first period, it risks bankruptcy. This gives incentives to the big firm to understate its cost so that it can obtain a higher share of the initial market and increase the likelihood of becoming a monopoly provider in the second period. This paper looks at how to strategically design the procurement contract to balance the trade-off between reduced first-period payments by allowing the big firm to behave aggressively in order to push the small firm out of the market and increased future efficiency and competition by favoring the small firm.

In this paper, although in future procurements (second period), by construction, all active firms are symmetric in terms of financial weakness, the small firm should still receive a larger share of the contract than when the competition is between two financially equal firms. This is because favoring this firm in the second period allows the procurement agency to optimally exploit the big firm's first-period behavior. This paper therefore provides a dynamic optimality rationale for continued favoritism of small firms in auctions. In this sense it differs from previous literature (Branco, 1994; Vagstad, 1995; Rezende, 2009) where favoritism stems from the procurement agency having a preference for one of the bidders. Furthermore, this result arises because initial financial asymmetries affect how the procurement agency evaluates firms' bids. The model also allows for cost asymmetries and shows that when the small firm faces higher costs<sup>7</sup>, then the share of the contract that it gets might further be to its advantage (as in Myerson, 1981; McAfee and McMillan, 1989; Maskin and Riley, 2000).

There is a large literature in corporate finance studying the costs and benefits of outside financing. In particular, Brander and Lewis (1986) and Spiegel and Spulber (1994, 1997) study the strategic linkage between the output market and the financial structure of a firm. This paper abstracts completely from issues of strategic debt acquisition as studied in those papers, and concentrates on situations where one firm is truly *cash-constrained* and the effect on the optimal procurement contract of this cash constraint. In fact, contract theory and the

procurement literature have been surprisingly silent on this topic. One notable exception is Calveras et al. (2004) who analyze abnormally low bids in procurement tenders and show how they are a consequence of limited liability when firms face financial difficulties such as bankruptcy risk. The focus in this paper is less on the financially constrained firms' incentives and more on the financially strong firms' incentives to get rid of their weak competitors. Another strand of the contracting literature does not model financial constraints explicitly, but model these as deadweight loss on payments or as risk-aversion (Che and Gale, 1998; Lewis and Sappington, 1995; Martimort and Sand-Zantman, 2006; Arve and Martimort, 2014).

Budget constraints have been studied in the auction literature. However, except for Zheng (2001), most of the theoretical works on auctions with budget-constrained bidders (Che and Gale, 1996, 1998; Pai and Vohra, 2014) do not consider bankruptcy risk. Zheng (2001) analyzes a first-price auction with limited liability and default risk. He studies how a sponsor can improve his revenue in forward auctions by granting subsidies to the bidders. This paper does not focus on a particular auction format, but derives the optimal procurement contract with financially asymmetric firms.

The rest of the paper is organized as follows. The model is presented in Section 2. Section 3 solves the benchmark procurement contract when firms are not financially constrained. The main results are presented in Section 4. Finally, Section 5 briefly concludes and discusses the findings.

## 2. The model

### 2.1. Players and preferences

In period  $i$ ,  $i \in \{1, 2\}$ , the procurement agency wants to divide the production of an amount  $\bar{q}_i$  of a certain good between the two firms. It enjoys a gross surplus  $\bar{S}_i$  from the provision of such a service in period  $i$ .

There are two firms that have the ability to provide the good. However, there is a fixed cost  $D > 0$  to be paid before the first period.<sup>8</sup> Upon payment, this cost is sunk and nonrecoverable. Ex ante the firms differ in that the small firm does *not* have enough internal funds to self-finance  $D$ . This firm is therefore called the cash-constrained firm. The big firm does not need external financing to finance the fixed cost  $D$  and will for this reason be called the self-financed firm; i.e., the self-financed firm has a *deep pocket* and internal funds while the cash-constrained firm has a *shallow pocket* and needs an investor to finance it in order to participate in the procurement mechanism.<sup>9</sup>

In each period  $i$ , a firm  $k$ 's cost of procuring the required amount  $q$  of the good is  $C(\theta_{ik}, q) \equiv \theta_{ik}q + \frac{\mu}{2}q^2$  where  $\mu \geq 0$ .<sup>10</sup> The parameter  $\mu$  is industry specific and is therefore common to all firms. Its value is public knowledge. But  $\theta_{ik}$  is private information and independent across time and firms<sup>11</sup> and will sometimes be referred to as the firm's type. Furthermore, I allow costs to be drawn from different distributions characterized by the cumulative distribution functions  $F_k(\cdot)$  with support  $\Theta = [\underline{\theta}, \bar{\theta}]$ .<sup>12</sup> The associated density function is denoted  $f_k(\cdot)$ . Define  $\Delta\theta \equiv \bar{\theta} - \underline{\theta}$ . It is

<sup>8</sup>  $D$  is a participation cost. It can either be thought of as a cost to invest in the necessary equipment or prototypes to prove that a firm is competent for the task in question or it can be thought of as an administrative cost associated with the bids.

<sup>9</sup> As pointed out by one of the referees, if the self-financed firm is the incumbent and  $D$  is an entry cost, then  $D$  is already sunk for the self-financed firm and only the cash-constrained firm needs to pay and finance this cost.

<sup>10</sup> The results in this paper hold for a more general cost function  $C(\theta_{ik}, q)$  (see the working paper version of this article).

<sup>11</sup> Because firms differ in their organization, size and style, an economic shock can impact each firm in different ways. For instance, if one firm uses a lot of energy-intensive capital, it will be affected differently by a change in the cost of energy than a firm that relies less on energy-intensive capital. Therefore, depending on the general state of the economy, a firm that is more efficient today, is not necessarily more efficient tomorrow. It is therefore assumed that firms are impacted by idiosyncratic shocks between periods.

<sup>12</sup> In full generality the supports could also differ. However, to alleviate notations the support is the same for the two distributions.

<sup>6</sup> The US Small Business Act also includes minority- and women-owned businesses, companies located in disadvantaged areas and veteran-owned businesses. However, this paper focuses exclusively on small firms.

<sup>7</sup> Which might justify why the firm is small in the first place. I am grateful for a referee pointing this out.

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