# Auction versus Negotiation in Public Procurement: Looking for New Empirical Evidence

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## Abstract

The growing literature on auctions (Bulow and Klemperer 1996, Milgrom 2004) emphasizes the efficiency properties of such attribution mechanisms as means to introduce competition and prevent corruption in public procurement. In practice, public procurement policy has deeply evolved since the 1980's and public authorities at the European and national levels now strongly support the use of auctions. Thus, for instance, in France in 2007, about 70% of the public contracts for construction projects have been awarded through auctions, while negotiated procedures have been used in approximately 30% of the cases.

However, recent empirical studies (Estache *et al.* 2009, Bajari *et al.* 2009) have highlighted the failures of auction procedures and identified conditions under which negotiation is more efficient. In particular, they show that auctions perform poorly when projects are complex. This raises the central question of the relative efficiency of auctions and negotiations.

In this paper, our aim is to contribute to this debate by providing an empirical analysis of how awarding mechanisms are chosen in public procurement in France. Indeed, this aspect precedes the more normative issue of understanding the relative efficiency of both types of award procedure. To this end, we examine a comprehensive database of 76,188 observations corresponding to the entire set of public procurement contracts awarded between 2005 and 2007 in the construction sector. In a first step, we analyze econometrically the determinants of the awarding procedure chosen by public buyers using a sample of 22,835 procurement contracts passed in 2007, with a special focus on the level of complexity of the construction projects. Our results confirm that auctions are the preferred award procedure when projects are simple, whereas negotiation is the favoured option for hard to describe projects, for which contractual renegotiations are expected. However, our results also show that this global effect hides very different behaviours depending on the level of expertise of buyers.

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# 1. Introduction

Public procurement refers to the public authorities' activities of purchasing goods, works and services. These purchases range from simple items such as pens and paper clips through to complex goods and construction works such as missiles, hospitals, prisons or power stations and are usually classified into three categories: (1) works contracts (building and civil engineering works), (2) supply contracts (purchase of furnishings, materials or supplies, leasing, rental or hire purchase of furnishings, materials or supplies), (3) service contracts (tangible or intangible services). Although its importance varies significantly among Member States, from 7.5% to 23.6% of GDP (16.6% for France)[1], public procurement represents 16.3% of the European GDP[2].

Because of the economic importance of public procurement, making procurement efficient can lead to significant savings for public authorities, and, consequently, for tax-payers. Procurement policy can also play an important role in addressing social and environmental problems and in developing the private sector in general and specific segments of the industry in particular (SME notably). Additionally, in the European context, an effective public procurement policy is fundamental to the success of the single Market. That is why a European procurement policy was defined in a Green Paper (1996) which gave rise to community rules on public procurement defined in Directives 2004/18/EC and 2004/17/EC[3].

As in the US (with the Federal Acquisition Regulations (FAR)), the rules regulating public procurement in Europe strongly advocate the use of auctions to award contracts and select final providers of goods and services to public entities. According to these regulations, contracts for public tenders should be attributed on the basis of objective criteria which ensure compliance with the principles of transparency, non-discrimination and equal treatment, while guaranteeing that tenders are assessed in conditions of effective competition. Such preference for competitive tendering over negotiated procedures in public sector procurements is justified by the assumption that auctions allow finding supply sources at the cheapest price and at acceptable quality. Auctions are also favoured because they are seen as a way to prevent corruption and ensure equal opportunity to potential suppliers. This last argument is especially important in Europe where the use of competitive tendering for public procurement is considered as an additional tool to build a common market. As a consequence, auctions have become the dominant award mechanism for public procurement contracts. Thus, in France, from 2005 to 2007, auctions were used to award 70% of the procurement contracts in the public works sector[4], while in Italy they are the chosen procedure in 80% of the cases (Guccio *et al.* 2008).

Interestingly, while public and private procurement share the same essential purpose of obtaining the lowest price without loss of quality, the practices of each sector are different. Thus, as documented by Bajari et al. (2009), "*from 1995 to 2000, almost half of private sector non-residential building construction projects in Northern California were procured using negotiations, while the rest were procured with some form of competitive bidding. Only eighteen percent were procured using unrestricted open competitive bidding, which is what*

[1] http://ec.europa.eu/internal_market/publicprocurement/docs/public-proc-market-final-report_en.pdf
[2] http://europa.eu/publicprocurement/index_fr.htm
[3] The "traditional" Directive 2004/18/EC covers the procedures for public work contracts, public supply contracts and public service contracts while the Directive 2004/17/EC applies for "special sectors" of water, energy, transport and postal services.
[4] More precisely our data show that in 2005, 2006 and 2007 auctions were used respectively for 76.83%, 70.16% and 71.02% of the public works contracts.

*FAR dictates for the public sector*" (ibid, p. 1). In other words, while auctions are the prescribed procedures and the most used ones for public procurement, in the private sector, where buyers are free to choose their purchasing method, competitive tendering is far from being their preferred option.

Yet, as shown by several recent empirical works (NAO 2001, Guasch 2004, Guasch et al. 2006, Estache et al. 2009), public procurement contracts awarded via competitive tendering are frequently renegotiated, which generates significant additional costs. Thus for instance, Guccio et al. (2009), in a study of public works procurement contracts in Italy in 2005, estimate that, for about a quarter of all works, adaptation costs consecutive to renegotiations increase the original costs by 10%. Furthermore, the main argument justifying the use of auctions for public procurement (that is the fact that such procedures prevent collusive practices and corruption) is severely called into question. Numerous theoretical developments indeed show that tendering procedures are not immune to corruption and/or collusion (Compte et al. 2005, Lambert-Mogiliansky and Sonin 2006).

These paradoxical observations are the starting point of our paper which aims at understanding what motivates public buyers to use different procurement mechanisms. The central issues we address are indeed: what are the determinants of the choice between auction and negotiation in public procurement? Is the level of complexity and uncertainty of the projects to be procured the key of the trade-off, as assumed in recent developments of the procurement literature? Or is the choice between alternative procurement mechanisms purely made randomly by public entities?

To deal with these issues, we focus on the public construction sector in France and examine an exhaustive dataset of 76,188 observations of public works contracts attributed at various levels of decisions (State, regional, departmental and city levels) between 2005 and 2007. Although still preliminary, the results of our econometric tests are quite encouraging. They reveal that projects' complexity is a key determinant of public buyers' choices regarding award procedures. More precisely, more complex projects are more likely to be awarded by negotiation than auctions. However, what our empirical work also reveals is that central buyers and local buyers do not behave in the same way. Local buyers' choices indeed seem to be influenced by other considerations than economic efficiency.

The paper is organized as follows. We first summarize the theoretical arguments developed in the procurement literature as regards the respective merits of auction and negotiation (section 2). This survey allows us to elaborate testable propositions on the conditions under which auctions are more efficient than negotiation procedures. The third section offers a presentation of the French public works sector and of the prevailing awarding practices. In section 4, we present and discuss the results of our econometric tests. At last, section 5 provides concluding remarks and ideas for future researches.

## 2. Auction versus negotiation: looking forward theoretical explanations?

Besides the traditional literature on auctions which emphasizes the efficiency properties of such attribution mechanisms as means to introduce competition and prevent corruption (Bulow and Klemperer 1996), a growing body of the procurement literature supports the promotion of alternative award procedures (more particularly negotiation) or at least questions the conditions under which auctions can efficiently be used. The arguments put to the front to qualify the efficiency of auctions echo the ones used by the proponents of the Transaction

Cost Economics' view in the now classical 'franchise bidding of natural monopolies' debate which opposed, in the 1970's, Demsetz (1968), on the one hand, to Williamson (1976) and Goldberg (1976, 1977), on the other hand. While Demsetz (1968) considered that competitive tendering was the ideal mechanism to regulate natural monopolies, Williamson (1976) and Goldberg (1976, 1977) highlighted the failures of auction procedures, arguing that in the presence of relationship-specific investments and high uncertainty the contractual disabilities of the parties mitigate the efficiency of the franchise bidding mechanism and militate for the use of alternative coordination devices, like utilities regulation[5].

In the broader context of public procurement, the trade-off between regulation and franchise bidding translates into a trade-off between negotiation and auction. The literature on procurement, in its recent developments, indeed views auction and negotiation as alternative ways to select a provider of goods and services, each one presenting its own advantages and limits (Manelli and Vincent 1995, Bajari et al. 2009). In a nutshell, while auctions are perceived to select the lowest cost bidders and prevent biased awarding of contracts, it may have some undesirable self-selection consequences and fail to respond optimally to ex post adaptation. On the contrary, negotiation may lead to corruption and favouritism but allow public authorities (buyers) and contractors to spend more time discussing the design of the contract and the characteristics of the service/project to deliver, therefore reducing the risk of ex post opportunistic haggling. Consequently, **negotiation is advocated when the service/project is complex that is when ex-ante design is hard to complete and ex post adaptations are expected, while competitive tendering is the recommended awarding mechanism for projects and services that are simpler to describe** (Mougeot and Naegelen 1988, Bajari et al. 2009).

More precisely, it is well established that auctions are an effective way of determining the lowest cost supplier where the price of the project/service being procured is the buyer's only concern. However, auctions work less well for complex project or services where a vector of prices is to be determined and/or where the buyer cares about other attributes of procurement like quality or reliability (Manelli and Vincent 1995). In such cases, the selection principles of the winning bidder are indeed difficult to determine and, although multidimensional auctions theoretically appear as a natural practical solution to deal with such circumstances, they are very often too complex to implement because of their lack of transparency and their greater vulnerability to corruption (Burguet and Che 2004, Estache et al. 2009).

Another risk incurred when auctions are used for complex projects is the increase of the bidding costs. Indeed, if the buyer fails to specify the subject matter of the bid with precision then uncertainties will result, costs of bidding will be increased, and applicants will be discouraged. The number of bidders being limited, the expected benefits of competitive tendering would consequently be affected. Or, as shown by Bajari et al. (2007), the number of bidders may not be limited but, because they anticipate future renegotiation due to contractual incompleteness, their bid may incorporate high risk premia for them to be able to recover potential adaptation costs.[6]

If the description of the service/project required is not sufficiently clear, competitive tendering may also lead to situations of adverse selection and end by the selection of the most opportunistic bidder (Bajari et al. 2009). If contractual design is incomplete and service is complex, auction may indeed lead to choosing the bidder who is the most aware of the contractual blanks he could exploit, that is to say the one who is able to determine where contracts will fail. Anticipating that he will be able to take advantage of situations that are

[5] See Priest (1993) or Crocker and Masten (1996) for a detailed review of the debate.

[6] In their study of highway construction and maintenance contracts in California, Bajari et al. (2007) estimate these risk premia to represent, in average, 10% of the value of the contract.

unforeseen in the contract by renegotiating the initial arrangement, this strategic candidate will not hesitate to propose an unrealistically low price. This type of bidding behaviour (low-balling strategy) jeopardizes allocative efficiency, which is the most important objective of tendering.

At last, a crucial problem to overcome with auctions in public procurement arises during the execution of the contracts. On the one hand, holding contractors to their promises may turn out to be difficult if the threats of sanction are not credible enough. On the other hand, because '*all complex contracts are unavoidably incomplete [. . .] parties will be confronted with the need to adapt to unanticipated disturbances by reason of gaps, errors, and omissions in the original contract*' (Williamson 2002, p. 174), and this may lead to costly post-contract renegotiations (Prager 1990). Because contracts leave a number of aspects to be resolved, renegotiations are likely to occur and pressure to adjust contract specification is to be expected. An important potential problem raised by critics of auctions is indeed the ability of winning bidders to engage in ex post opportunistic behaviour by reneging on the promises they made in order to win the contract (Guasch 2004).

The second important issue in auctions is the traditional concern of competition policy – preventing collusive, predatory and entry-deterring behaviour (Porter and Zona 1993; Klemperer 2002). As already pointed out by Demsetz (1968), an important condition for auctions to be an efficient mechanism is that the cost of colluding by bidding rivals must be prohibitively high, that is to say must exceed the cost of competing. If, on the contrary, the market is collusive, there are not enough independently acting bidders to assure that the winning price will differ significantly from the monopoly price. Hence, the benefits of auctioning are null. **A second determinant of the trade-off between auction and negotiation might then be the number of potential bidders or, in other words, market concentration.**

**A third determinant of the choice between auctions and negotiation identified in the literature is the need to develop trusting partnerships**. As highlighted by Williamson (1999) some transactions require the development of relational contracts, for which the reputation of the selling party and the stability of the relationship in the long run is crucial (e.g. in the nuclear industry). It may also be the case that the buyers aim at sustaining particular industrial policy's objectives (Mougeot and Naegelen 1988). In such situations, negotiation appears as the most appropriate mechanism.

At last, **the fourth main determinant of the choice between alternative award procedures might be the level of competencies and expertise of the buyer**. As developed above, award procedures are devices for transmitting information between contracting parties, hence the properties and the relative efficacy of alternative award procedures depend crucially on the complexity of the project to be procured (Goldberg 1977). Another consequence is that they may also depend on the buyer's experience and on her capacity to organize auctions (Amaral et al. 2009).

To sum up the propositions derived from the literature, the trade-off between auction and negotiation in public procurement is assumed to depend on (1) the level of complexity of the project to be procured, (2) the potential for competition, (3) the pre-existence of relational

contracts between buyers and sellers, and (4) the competencies of buyers regarding the organization of competitive tendering.

## 3. Public procurement in the construction sector in France

The use of auctions in public procurement in France is nothing but new. In 1350 already public works were attributed to the lowest bidder through candle auctions and this practice became dominant in the 17th century, under Colbert's administration. The use of competitive tendering (with the least price criterion) was extended to other sectors than public works during the Revolution period and, in 1836 and 1837, it became compulsory for the procurement of central and local administrations respectively. It is only since 1892 that other criteria than the lowest price have been introduced and that negotiation procedures have been authorized. However, the French Public Procurement Code ('Code des Marchés Publics'), adopted in 1964, although modified recently[7], stipulates that competition for the market should be favoured.

This brief historical account illustrates that the search for the lowest cost of procurement is a fundamental objective of public authorities. It also emphasizes that the awarding criteria have evolved: competition remains crucial but besides the formal rule of the lowest price less objective rules of attribution have emerged, like the criterion of the most economically advantageous tender (MEAT) (or best economic value) or the negotiated market. Some purchases may even be exempt from competition for some technical or economic reasons.

Nowadays, the French 'Public Procurement Code' identifies nine possible awarding procedures, while the European Directives propose only 5 procedures. The 9 procedures are the following: 1) open competitive tender, 2) restricted competitive tender, 3) negotiation with publication and competition, 4) negotiation with publication but no competition, 5) negotiation without publication but with competition, 6) adapted procedure (MAPA)[8], 7) competitive dialogue[9], 8) contest[10] and 9) dynamic system purchase[11].

In our study, we will focus on the first five procedures that we will group into two categories: auction or competitive tender (both open and restricted procedures) and negotiation (with publication and without publication). This choice is justified by the fact that the 4 types of procedures we do not integrate in our analysis are marginally used. Our choice is also

[7] The last amendments to the Public Procurement Code ('Code des Marchés Publics') were made in 2009.

[8] The MAPA procedure is the "default" procedure that applies for work contracts whose value is between EUR 20 000 and EUR 5 150 000. It leaves significant freedom to the buyer to design the procedure's details according to the characteristics and the type of project, the number and localization of the potential supplier as well as the circumstances of the procurement. However, the buyer has to respect the basic principles of public procurement (i.e. free access to public command, equal treatment of the candidates and transparency of the procedures (CMP Art.1-II)). Among the possible procedures, the buyer can even choose one of the formalized procedures. In fact this is often the case. But once it is mentioned, it has to respect all the formalization of the procedure.

[9] A contracting authority may make use of the competitive dialogue for complex contracts if it is not able to define by itself and with sufficient precision the technical solutions to satisfy its needs or is not able to specify the legal and/or financial make-up of a project..

[10] A contest is the procedure with which the public authority, after call for competition and the assessment of a commission, chooses a plan or project before awarding it to one of the winners of the competition. It is particularly used in the areas of national and regional development, urban development, architecture, engineering and data processing.

[11] The dynamic purchasing system is a totally electronic procedure, to be used only for usual supplies. The public buyer awards a contract, after a call for competition, to the candidate that has previously been selected on the basis of an indicative offer.

explained by the fact that the two procedures we analyze (auction and negotiation) are the traditional polar mechanisms identified in the literature.

And indeed, an auction is a procedure with which the public authority selects the economically most advantageous offer on the basis of objective and non negotiable criteria previously made known to the applicants. Two types of auctions can be organized: open and restricted. In the case of restricted calls for tender, any supplier may request to participate but only candidates invited to do so may submit a tender. In the case of open calls for tender, there is no pre-selection of applicants; all eligible candidates can bid. Note that the French Law makes the use of auctions compulsory for works contracts above EUR 5,150,000 (VAT excl.).

Auction procedures therefore greatly differ from negotiated ones in which the public authority chooses a bidder after consultation with the applicants and after negotiation of the contract conditions with one or several of them. Negotiations can be done with or without prior publication in the authorized media and, if there is no publication, with or without call for competition.

Furthermore, our study focuses on works contracts which represent 35% of the procurement contracts in 2007[12]. A work is defined by the Directive as "*the outcome of building or civil engineering works taken as a whole*" – e.g. a hospital, theatre or bridge – "*that is sufficient of itself to fulfill an economic and technical function*", i.e. fully equipped and completed. The object of works contracts are either the execution or both the execution and design of works related to one of the activities (building and civil engineering, installation and building completion work) covered by Class 50 of NACE15[13]. The sectors considered cover the whole range from utility sectors to large building works (hospital, stadium, prison, etc.) but also more modest or simple works such as roads (see table 1 for details on the various categories of works).

[12] Services and supply contracts represent respectively 30% and 35% of the procurement contracts.

[13] http://ec.europa.eu/internal_market/publicprocurement/docs/guidelines/works_en.pdf. In CPM2006: Art. 1er-III.

Table 1
Classes of projects according to the Common Procurement Vocabulary and their distribution in 2007.
Source: Observatoire Economique des Marchés Publics

| CPV code | Class | N | % | Total amount (€) |
|---|---|---|---|---|
| 4500 | Construction work | 4,409 | 17.46% | 3,780,124,719 |
| 4510 | Site preparation work | 33 | 0.13% | 26,351,247 |
| 4511 | Building demolition and wrecking work and earth moving work | 1,954 | 7.74% | 906,944,644 |
| 4512 | Test drilling and boring work | 15 | 0.06% | 10,159,556 |
| 4520 | Works for complete or part construction and civil engineering work | 436 | 1.73% | 317,774,444 |
| 4521 | Building construction work | 3,472 | 13.75% | 2,629,807,453 |
| 4522 | Engineering works and construction works | 1,151 | 4.56% | 958,436,654 |
| 4523 | Construction work for pipelines, communication and power lines, for highways, roads, airfields and railways; flatwork | 4,617 | 18.28% | 4,239,857,957 |
| 4524 | Construction work for water projects | 238 | 0.94% | 370,159,599 |
| 4525 | Construction works for plants mining and manufacturing and for buildings relating to the oil and gas industry | 228 | 0.90% | 312,062,783 |
| 4526 | Roof works and other special trade construction works | 2,148 | 8.50% | 974,873,738 |
| 4530 | Building installation work | 105 | 0.42% | 67,019,516 |
| 4531 | Electrical installation work | 1,443 | 5.71% | 700,989,943 |
| 4532 | Insulation work | 97 | 0.38% | 22,344,904 |
| 4533 | Plumbing and sanitary works | 1,288 | 5.10% | 560,378,560 |
| 4534 | Fencing, railing and safety equipment installation work | 169 | 0.67% | 56,549,249 |
| 4535 | Mechanical installations | 10 | 0.04% | 4,275,337 |
| 4540 | Building completion work | 33 | 0.13% | 16,682,145 |
| 4541 | Plastering work | 192 | 0.76% | 87,897,361 |
| 4542 | Joinery and carpentry work | 1,445 | 5.72% | 403,167,025 |
| 4543 | Floor and wall covering work | 359 | 1.42% | 147,010,076 |
| 4544 | Painting and glazing work | 589 | 2.33% | 254,130,678 |
| 4545 | Other builidng completion work | 794 | 3.14% | 425,193,198 |
| 4550 | Hire of construction and civil engineering machinery and equipment with operator | 18 | 0.07% | 9,559,814 |
| 4551 | Hire of cranes with operator | 5 | 0.02% | 807,556 |
| 4552 | Hire of earthmoving equipment with operator | 11 | 0.04% | 2,542,300 |
| | | **25,259** | **100.00%** | **17,285,100,456** |

Works contracts have many interests for our study. First, they cover a wide diversity of projects, whose levels of complexity may be very different, as already pointed at by Chakravarty and MacLeod (2004) or Bajari et al. (2009) among others. Second, work contracts vary in a number of aspects: total amount, type of buyers, number of subcontractors, contract duration, number of potential suppliers, and most importantly type of awarding procedure.

Table 2 provides a snapshot of the procurement practices in the works sector of French public buyers in the recent years. In this table, we distinguish between the two main types of public buyers: the central buyers (ministries, museums, universities, hospitals and other bodies governed by public law, or associations formed by one or more of such authorities or bodies governed by public law) and the local buyers (regional, departmental, municipalities). This table reveals that auction procedures are more often used than negotiated procedures. It also

shows that public buyers have a great room of leeway in their choice of an award mechanism. The choice of an award procedure thus appears as a decision variable for public buyers.

Table 2
Distribution of award methods in the public works sector over the period 2005-2007
Source: Observatoire économique des marchés publics

| | Local buyers | | | Central buyers | | |
|---|---|---|---|---|---|---|
| *Procedures* | *N* | *%* | *Total amount (€)* | *N* | *%* | *Total amount (€)* |
| Open competitive tendering | 46,186 | 69.91% | 28,404,381,250 | 5,500 | 54.32% | 4,817,351,864 |
| Restricted competitive tendering | 1,706 | 2.58% | 1,817,822,742 | 715 | 7.06% | 833,633,759 |
| Contest | 268 | 0.41% | 137,555,025 | 10 | 0.10% | 6,138,796 |
| MAPA | 5,481 | 8.30% | 1,047,562,861 | 818 | 8.08% | 226,259,839 |
| Negotiation after publication and with competition | 10,803 | 16.35% | 4,954,765,763 | 2,737 | 27.03% | 2,635,153,703 |
| Negotiation without publication and with competition | 520 | 0.79% | 288,080,347 | 93 | 0.92% | 33,248,307 |
| Negotiation without publication nor competition | 744 | 1.13% | 531,632,937 | 157 | 1.55% | 129,929,524 |
| Others | 355 | 0.54% | 244,079,117 | 95 | 0.94% | 181,225,363 |
| **Total** | **66,063** | **100%** | **37,425,880,042** | **10,125** | **100%** | **8,862,941,155** |

Table 3 shows the absolute and relative frequencies of the various procedures used by public buyers from 2005 until 2007. In the table, we have also distinguished between central and local buyers. We show these statistics for some of the most widely used procedures in attributing procurement contracts, such as open competitive tendering, restricted competitive tendering, and various negotiation procedures. Notice that in the table, statistics are not computed for the procedure "negotiation without advertisement but with competition". This is due to a legal reform in procurement practices which has suppressed this procedure starting from September 1st 2006.[14]

[14] This reform was introduced by the decree no. 2006-975 issued on August 1st, 2006. Besides the suppression of a particular negotiation procedure to award procurement contracts, the decree aimed at the creation of new procedures, such as an electronic procurement. However, these new practices are quite marginal in 2007, which is why we have aggregated them in the category "Other" for the statistics.

Table 3
Distribution of award methods of public works contracts by type of buyer and year[15]
Source: Authors' computation

| Procedure | 2005 | | | 2006 | | | 2007 | | | Whole sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Local** | **Central** | **Total** | **Local** | **Central** | **Total** | **Local** | **Central** | **Total** | **Local** | **Central** | **Total** |
| Open competitive tendering | 18381 | 2163 | **20544** | 13504 | 1538 | **15042** | 14301 | 1799 | **16100** | 46186 | 5500 | **51686** |
| | *73.47%* | *70.14%* | ***73.11%*** | *68.05%* | *59.91%* | ***67.12%*** | *67.45%* | *40.21%* | ***62.7%*** | *69.91%* | *54.32%* | ***67.84%*** |
| Restricted competitive tendering | 763 | 283 | **1046** | 431 | 251 | **682** | 512 | 181 | **693** | 1706 | 715 | **2421** |
| | *3.05%* | *9.18%* | ***3.72%*** | *2.17%* | *9.78%* | ***3.04%*** | *2.41%* | *4.05%* | ***2.7%*** | *2.58%* | *7.06%* | ***3.18%*** |
| Negotiation after advertisement and competition | 3382 | 348 | **3730** | 3621 | 405 | **4026** | 3800 | 1984 | **5784** | 10803 | 2737 | **13540** |
| | *13.52%* | *11.28%* | ***13.27%*** | *18.25%* | *15.78%* | ***17.96%*** | *17.92%* | *44.35%* | ***22.53%*** | *16.35%* | *27.03%* | ***17.77%*** |
| Negotiation without advertisement but with competition | 296 | 43 | **339** | 224 | 50 | **274** | | | | 520 | 93 | **613** |
| | *1.18%* | *1.39%* | ***1.21%*** | *1.13%* | *1.95%* | ***1.22%*** | — | — | — | *0.79%* | *0.92%* | ***0.8%*** |
| Negotiation without advertisement nor competition | 93 | 19 | **112** | 131 | 38 | **169** | 520 | 100 | **620** | 744 | 157 | **901** |
| | *0.37%* | *0.62%* | ***0.4%*** | *0.66%* | *1.48%* | ***0.75%*** | *2.45%* | *2.24%* | ***2.41%*** | *1.13%* | *1.55%* | ***1.18%*** |
| Other | 2101 | 228 | **2330** | 1933 | 285 | **2218** | 2069 | 410 | **2479** | 6104 | 923 | **7027** |
| | *8.40%* | *7.39%* | ***8.29%*** | *9.74%* | *11.10%* | ***9.90%*** | *9.76%* | *9.16%* | ***9.65%*** | *9.24%* | *9.12%* | ***9.22%*** |
| **Total** | **25017** | **3084** | **28101** | **19844** | **2567** | **22411** | **21202** | **4474** | **25676** | **66063** | **10125** | **76188** |
| | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** | ***100%*** |

These data come from a database provided by the *Observatoire Economique des Marchés Publics* (Economic Observatory of Public Procurement) of the French Ministry of Finance. The database contains public work procurement activities which have been undertaken by local and central buyers during three consecutive years, from 2005 until 2007. As indicated in table 4, during this period, a total of 76,188 procurement contracts have been passed by 8,374 public buyers in France. 66,063 procurement contracts were passed by 7,824 local buyers (an average of slightly more than 8 contracts per local buyer) and 10,125 contracts were passed by 550 central buyers (an average of slightly more than 18 contracts per central buyer).

[15] Relative frequencies are computed with respect to the total number of procurement contracts.

Table 4
Distribution of public buyers and procurement activities in public works
Source: Authors' computation

| | 2005 | | 2006 | | 2007 | | Whole sample | |
|---|---|---|---|---|---|---|---|---|
| | Number | Number of procurement contracts | Number | Number of procurement contracts | Number | Number of procurement contracts | Number | Number of procurement contracts |
| Local buyers | 4,429 | 25,017 | 3,677 | 19,844 | 3,683 | 21,202 | 7,824 | 66,063 |
| Central buyers | 357 | 3,084 | 286 | 2,567 | 339 | 4,474 | 550 | 10,125 |
| Total | 4,786 | 28,101 | 3,963 | 22,411 | 4,022 | 25,676 | 8,374 | 76,188 |

As one may see from the tables, the bulk of procurement activities stems from local buyers (86.72% of total procurement activities). However, as mentioned above, central buyers are more active in procurement in public works on average (as shown by the average number of procurement contracts per central buyer). Among the various available procedures, open competitive tendering is the one that is the most widely used on the overall (67.84% of procurement contracts on the overall), followed by negotiation procedures which involve some competition and publication of the contract (17.77% of procurement contracts in our sample). Almost 86% of procurement contracts in our sample were granted using one of these two procedures.

An interesting observation is also that central and local buyers tend to adopt different procedures to grant procurement contracts. While open competitive tendering is the major procedure used to grant procurement contracts, local buyers tend to rely more heavily on this procedure than central ones (69.92% vs. 54.32% on the overall). Our data also indicate that there is a higher propensity for the latter to rely on negotiations (27.03% of contracts by central buyers vs 16.35% by local buyers) and restricted competitive tendering to grant procurement contracts (7.06% of contracts by central buyers vs 2.58% of contracts by local buyers). This difference in the choice of procedure made by central and local buyers is not rejected by a khi-2 test of independence between the level of administration and the type of procedure.[16] It would therefore seem that central and local buyers choose differently the type of procedure they use to grant procurement contracts.

It is also worthwhile to notice that over our observational period, there is a decrease in the use of competitive tendering procedures on the overall. Indeed, while this procedure accounts for 73.11% of total procurement contracts in 2005, this ratio falls to 62.7% in 2007. Table 5 shows how the use of various procedures generally and for different levels of administrative bodies evolves over our observational period. As one may notice from this table, there seems to be a drift on the overall by public buyers in France from competitive tendering procedures towards less competitive ones in granting procurement contracts. Indeed, one may note that on the whole, the use of both open competitive tendering and restricted competitive tendering has decreased over the observational period (-1.4% for the formal between 2005 and 2007, and -2.7% for the latter for the same period), even if they remain the dominant means by which public buyers in France award procurement contracts. On the other hand, there is a growth towards using negotiation based procedures.

[16] The Pearson's khi-2 statistics for the null hypothesis that procedure choices are independently distributed across central and local buyers is $1.5\times10^3$(p value = 0.000).

It is also clear from table 5 that the decrease in open competitive tendering throughout our period of observation is driven by the central buyers. Indeed, between 2005 and 2007, the percentage of procurement contracts awarded through an open tendering procedure decreases by 43% in central buyers, while the decrease is only 8% in local buyers. At the same time, local buyers seem to have increased the use of negotiation procedures without publication nor competition over negotiation procedures with publication and competition. In contrast, central buyers have a tendency to turn to both types of negotiation procedures indifferently.

Table 5
Evolution of the various types of procedures used by public buyers
Source: Authors' computatio)

| | 2005-2006 | 2006-2007 | 2005-2007 |
|---|---|---|---|
| **Whole sample** | | | |
| Open competitive tendering | -0.08 | -0.07 | -0.14 |
| Restricted competitive tendering | -0.18 | -0.11 | -0.27 |
| Negotiation after advertisement and competition | 0.35 | 0.25 | 0.70 |
| Negotiation without publication but with competition | 0.01 | - | - |
| Negotiation without publication nor competition | 0.88 | 2.21 | 5.03 |
| | | | |
| **Central buyers** | | | |
| Open competitive tendering | -0.15 | -0.33 | -0.43 |
| Restricted competitive tendering | 0.07 | -0.59 | -0.56 |
| Negotiation after advertisement and competition | 0.40 | 1.81 | 2.93 |
| Negotiation without publication but with competition | 0.40 | - | - |
| Negotiation without publication nor competition | 1.39 | 0.51 | 2.61 |
| | | | |
| **Local buyers** | | | |
| Open competitive tendering | -0.07 | -0.01 | -0.08 |
| Restricted competitive tendering | -0.29 | 0.11 | -0.21 |
| Negotiation after publication and competition | 0.35 | -0.02 | 0.33 |
| Negotiation without publication but with competition | -0.04 | - | - |
| Negotiation without publication nor competition | 0.78 | 2.71 | 5.62 |
| | | | |
| | | | |

In what follows, we will focus our attention on the major procedures used by public buyers to award procurement contracts, i.e. we will restrict our attention to open competitive tendering, restricted competitive tendering, and the various negotiations procedures. Furthermore, we will aggregate the various negotiation procedures into one category as a first-step approximation in our analysis and to account for the suppression of a specific kind of negotiation procedure due to the new law on procurement practices in 2006.

Table 6 shows the mean value of procurement contracts awarded through either competitive tendering or negotiations. During our observational period, the average value of procurement contracts passed amounts to 607,560€. The average procurement contract passed by central buyers has a higher value than the average one passed by local buyers. Notice as well that the minimal value of a procurement contract is always 90,000€. This is because French legislation requires public buyers to register those procurement activities that have a value of at least 90,000€.

Table 6
Descriptive statistics on the value of public works contracts in euros
Source: Authors' computation

| | 2005-2007 | | |
|---|---|---|---|
| | **Competitive tendering** | **Negotiations** | **Total** |
| **Whole Sample** | | | |
| N | 54,107 | 15,054 | 76,188 |
| Total amount | 35,873,189,892 | 8,572,810,412 | 46,288,819,374 |
| Mean | 663,005 | 569,471 | 607,561 |
| Std Dev | 2,594,754 | 2,557,881 | 2,496,755 |
| Min | 90,000 | 90,000 | 90,000 |
| Max | 329,000,000 | 112,000,000 | 320,000,000 |
| **Central administrations** | | | |
| N | 6,215 | 2,987 | 10,125 |
| Total amount | 5,650,985,643 | 2,798,331,522 | 8,862,941,025 |
| Mean | 909,250 | 936,837 | 875,352 |
| Std Dev | 4,933,415 | 3,772,192 | 4,461,806 |
| Min | 90,000 | 90,000 | 90,000 |
| Max | 329,000,000 | 112,000,000 | 329,000,000 |
| **Local administrations** | | | |
| N | 47,892 | 12,067 | 66,063 |
| Total amount | 30,222,203,497 | 5,774,479,432 | 37,425,878,634 |
| Mean | 631,049 | 478,535 | 566,518 |
| Std Dev | 2,107,033 | 2,144,617 | 2,031,176 |
| Min | 90,000 | 90,000 | 90,000 |
| Max | 139,000,000 | 107,000,000 | 139,000,000 |

In terms of value, one may see that, on the overall, the average contract awarded through competitive bidding procedures has a higher value than the average contract awarded through negotiation procedures. This observation certainly contrasts with the findings of Bajari et al. (2009) whose results suggest that higher value contracts should be awarded through negotiation procedures. A more careful look at the statistics shows that there is again a divergence between central buyers and local ones. From table 6, one can see that the average procurement contract awarded through negotiations by central buyers is higher, while the reverse is true when it comes to local buyers.

# 4. Tests and Results

In this article, our goal is to investigate the determinants of mechanisms chosen by public buyers to award procurement contracts. In particular, we wish to test whether complexity is one of the factors that lead a public administration to use negotiation procedures to award procurement contracts. To this end, we intend to do regression analyses on French public procurement contracts for public works as a first step to uncover the correlation between the choice of award procedure and some variables at our disposal, especially some measure of complexity. As we have already mentioned, complexity has been advanced as one of the main factor to why competitive tendering may not yield the best outcome.

For simplicity and as a first step in our analysis, we will only focus on procurement activities in 2007. This is because of the legal reform introduced in 2006, which may have changed procurement behaviour of public buyers. We prefer to focus on award procedures chosen by public buyers, abstracting from potential dynamics effects introduced by such a reform in our preliminary analysis. Moreover, statistical classification of the nature of procurement contracts has also undergone a change in 2006[17], leading to a need to harmonize information over the three years available in our sample.

Furthermore, we will also only distinguish between competitive tendering and negotiation procedures in the following empirical analysis. More specifically, we will neither distinguish between open competitive tendering and restricted competitive tendering, nor treat the various forms of negotiation procedures differently. Our independent variable in the empirical analysis is therefore a dichotomous variable $y_{ij}$ which takes the value 1 if competitive tendering procedure is chosen by a public buyer for a procurement contract. When a negotiation procedure is chosen, the variable takes the value 0. Focusing only on these two types of award mechanisms and accounting for missing values brings our sample to a total of 22,835 observations for the year 2007. In order to explore the impact of various determinants on the choice of a public buyer between competitive tendering procedures and negotiation based procedures, a simple probit model will be estimated.

## *3.1 Determinants of award mechanism: our variables*

A main determinant of the choice of award procedure advanced by the literature is complexity. As a first step towards measuring complexity of a procurement contract, we will use a proxy based on the nature of public work involved by a contract, relying on the new classification introduced by the European Union and taking effect in 2007, i.e. the Common Procurement Vocabulary (CPV). The latest version of CPV (2007) distinguishes 834 different types of public works, ranging from the construction of various public buildings (schools, canteens, museums etc.) to construction of various infrastructures (oil pipelines, water pipelines, highways, gas terminals etc.).[18] As a proxy for complexity of public works involved in a procurement contract, we have constructed a dummy variable *complex* taking the value 1 when the public works involve the construction of infrastructure and specialized works involving some civil engineering, as opposed to more generic works like installation of a door or a window, or the construction of office spaces.[19] The rationale behind our proxy is that when a construction project is dedicated to some special uses, it is likely to involved more "jobs" and more specialized knowledge in order to get the construction right. Moreover, it is likely that such specific constructions involve a higher degree of coordination between different parties. This may lead to a higher level of complexity. Such a criterion leads us to identify 236 types of public works as potentially complex among all public works in the classification. The list of public works which we consider to be potentially complex is given in the appendix. For procurement contracts awarded through competitive tendering procedures and negotiation procedures in 2007, 3,754 projects out of 22,835 in our sample are potentially complex projects.

[17] In 2006, the European Union introduced a new nomenclature to classify different types of procurement contracts called the Common Procurement Vocabulary for procurement contracts in 2007.

[18] The complete nomenclature can be consulted at *http://ec.europa.eu/internal_market/publicprocurement/e-procurement_fr.htm*.

[19] Obviously, such a proxy for complexity is far from satisfying. This is why in the near future, we intend to consult specialists (architects or civil engineers) in order to classify the complexity of various types of public works in this nomenclature and in order to have a better measure of complexity involved in a procurement contract.

In addition to the variable *complex*, we will also consider the duration of the procurement contract (*duration*), the number of sub-contractors involved in a project (*nb_sub*), and the value of the contract in logarithm (*lvalue*), as supplementary proxies for complexity of a project. A longer contract might indicate more complex jobs involved in delivering the project, and hence perhaps a greater complexity. In a similar way, a more expensive project may also indicate a higher degree of complexity.[20] The number of sub-contractors involved in a project may also indicate a more complex project. Indeed, a higher number of sub-contractors may indicate that specialized knowledge or skills are necessary to complete a project. Moreover, the higher the number of sub-contractors involved, the stronger the need for coordination among participants of a project. This variable may therefore proxy for project's complexity. Irrespectively of whether these variables are good proxies for complexity, they should be taken into account in our regression analysis, at least as control variables measuring some characteristics of the underlying project. The recent literature stresses that a higher level of complexity should lead to favour negotiation procedures, *ceteris paribus*. Therefore, we would expect a negative correlation between these variables approximating for complexity and the choice of using a competitive tendering procedure.

Competitive tendering procedures have the advantage of allowing a procuring body to benefit from competitive pressures in the procurement process. Hence, a public buyer pursuing economic efficiency should be more inclined to choose a competitive tendering procedure over negotiations when she expects a higher level of competition, *ceteris paribus*. While we are unable to measure directly a buyer's perception of potential competition prior to the choice of procedure, we believe that a reasonable proxy for potential competition is the number of proposals received by a public buyer for a given procurement contract, *nb_prop*. The underlying assumption here is that a public buyer is correct on the average in her expectations of the level of competition. We will therefore include this variable in our estimation to control for the potential benefits of competitive tendering procedures.

The French legal framework requires public buyers to use competitive tendering procedures when the value of a contract exceeds 5,150,000€. In spite of this legal obligation, out of the 453 contracts for which this legal threshold is met, 86 contracts were attributed through a negotiation procedure in 2007. It would therefore seem that there is some slackness in implementing the law. As such, we will include in our regression a dummy variable *threshold* taking the value 1 if the value of a contract exceeds the legal threshold that requires the use of competitive tendering.

The characteristics of a public buyer may also determine her choice of an award procedure. As we have argued, central buyers may have more expertise and more dedicated resources in dealing with procurement. This would give them an advantage over local buyers, and may lead them to choose differently between the various award procedures available to them. To control for this possibility, we will include a dummy variable in our regression, *central*, when a procuring body is a central buyer.

In a similar way, past experiences may be helpful to a public buyer in learning and accumulating knowledge on the pros and cons of various procedures. A public buyer having a large experience in procurement may therefore behave very differently from those who have little experience in procurement. To control for this dimension, we have constructed a variable, *exp*, which is the number of procurement contracts in public works that a public buyer has passed from 2005 to 2007. We will include this variable and its square value in our regression to account for possible learning effects that affect the choice of award procedures.

[20] Note that Bajari et al. (2009) also use the value of a contract as a proxy for complexity. However, their sample consists of construction works which are more homogeneous than our sample. In their case, this variable is likely to be a better proxy for complexity than in our case.

Finally, we try to account for possible effects of repeated interactions between a given administrative body and a private provider. This is done through the variable *repeat*, which measures the number of contracts that a given buyer has passed with a particular provider from 2005 until 2007. Recent developments in the contract literature has pointed out that repeated interactions between contracting parties may facilitate *ex post* coordination and adaptations when the need arise, thus decreasing *ex post* transaction costs. Repeated interactions may therefore enhance the quality of a contractual relationship between a public buyer and a supplier. This would suggest that a public buyer who wants to exploit the benefits of such relational and reputational mechanism would be more inclined to choose negotiation based procedures. If this is the case, we may expect that the probability of choosing a competitive tendering procedure decreases when the number of repeated interactions increases.

Table 7 resumes the various variables used in our regression. Some simple statistics are also presented in the table. Due to missing information for some of the variables used, our final sample consists of 22,835 observations.

Table 7
Description and sample statistics of variables used in our empirical analysis

| Variable | Description | N | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| competitive | Takes value 1 if a competitive tendering procedure is chosen | 22835 | 0.72 | 0.45 | 0 | 1 |
| complex | Takes value 1 if the nature of public works is complex (see appendix) | 22835 | 0.16 | 0.37 | 0 | 1 |
| duration | The duration of the contract (in months) | 22835 | 14.28 | 15 | 0 | 630 |
| lvalue | The value of a contract (in logarithm) | 22835 | 12.66 | 1.01 | 11.41 | 18.53 |
| nb_sub | The number of sub-contractors involved in the project | 22835 | 0.1 | 0.47 | 0 | 16 |
| nb_prop | The number of proposals received for procurement project | 22835 | 3.78 | 9.92 | 0 | 504 |
| threshold | Takes value 1 if the value of the contract exceeds the legal threshold that makes the use of competitive tendering compulsory | 22835 | 0.02 | 0.14 | 0 | 1 |
| central | Takes value 1 for a central administration | 22835 | 0.18 | 0.38 | 0 | 1 |
| central*complex | Interaction term for central and complex | 22835 | 0.02 | 0.13 | 0 | 1 |
| central*lvalue | Interaction term for central and lvalue | 22835 | 2.29 | 4.97 | 0 | 18.53 |
| central*nb_sub | Interaction term for central and nb_sub | 22835 | 0.01 | 0.19 | 0 | 16 |
| central*duration | Interaction terme for central and duration | 22835 | 3.07 | 9.54 | 0 | 180 |
| exp | The number of public works procurement project undertaken by an administration between 2005 and 2007 | 22835 | 232.49 | 429.88 | 1 | 1640 |
| exp2 | The square of exp | 22835 | 238840.2 | 694757.1 | 1 | 2689600 |
| repeat | The number of procurement contracts that an administration has or has had with a same provider | 22835 | 3.15 | 5.21 | 1 | 65 |

## *3.2 Results*

Table 8 shows the results of our probit regressions on our sample of 22,835 procurement contracts in 2007. Our dependent variable is *competitive*, which takes the value 1 if a competitive tendering procedure has been chosen. In this table, we show 6 different specifications using a combination of various independent variables. In specification (1), we regress the choice of procedure using only variables that may proxy for complexity of the work involved in a contract. In these regressions, we have also controlled for potential fixed

effects due to the nature of the public work involved at the class level as defined by CPV.[21] This is done through introducing dummy variables for each class. Specifications (2) to (4) take progressively into account the legal threshold, potential benefits of competition, as well as the competency of various buyers. In specifications (5) and (6), we introduce interaction variables between various proxies for complexity and the variable *central*. Indeed, our statistical analysis above seems to suggest that central buyers may behave differently from local ones. These interaction terms allow us to explore in further details how determinants of award procedures may differ between local and central buyers.

Table 8

Probit estimates on the choice of a competitive tendering procedure on the whole sample.
(*Standard error within brackets. *** significant at 1%, ** significant at 5%, * significant at 10%.*)

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| complex | -0.0804** | -0.0994*** | -0.0975*** | -0.0982*** | -0.1419*** | -0.1452*** |
| | (0.035) | (0.035) | (0.035) | (0.035) | (0.037) | (0.037) |
| duration | 0.0005 | 0.0027*** | 0.0029*** | 0.0028*** | 0.0028*** | 0.0036*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| lvalue | 0.0334*** | 0.0621*** | 0.0528*** | 0.0534*** | 0.0542*** | 0.0748*** |
| | (0.011) | (0.012) | (0.012) | (0.012) | (0.012) | (0.013) |
| nb_sub | 0.1632*** | 0.1211*** | 0.0935*** | 0.0939*** | 0.0942*** | 0.0783*** |
| | (0.024) | (0.024) | (0.024) | (0.024) | (0.024) | (0.025) |
| central | -0.5640*** | -0.1322*** | 0.0598* | 0.0583* | 0.0056 | 1.6891*** |
| | (0.025) | (0.030) | (0.032) | (0.032) | (0.034) | (0.365) |
| nb_prop | — | 0.0050*** | 0.0043*** | 0.0043*** | 0.0043*** | 0.0043*** |
| | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| central*complex | — | — | — | — | 0.3946*** | 0.4136*** |
| | | | | | (0.093) | (0.093) |
| central*lvalue | — | — | — | — | — | -0.1295*** |
| | | | | | | (0.029) |
| central*nb_sub | — | — | — | — | — | 0.1445* |
| | | | | | | (0.084) |
| central*duration | — | — | — | — | — | -0.0046** |
| | | | | | | (0.002) |
| threshold | — | 0.0998 | 0.0840 | 0.0825 | 0.0813 | 0.1199 |
| | | (0.088) | (0.092) | (0.092) | (0.092) | (0.095) |
| exp | — | -0.0008*** | 0.0019*** | 0.0019*** | 0.0019*** | 0.0018*** |
| | | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| exp2 | — | — | -0.0000*** | -0.0000*** | -0.0000*** | -0.0000*** |
| | | | (0.000) | (0.000) | (0.000) | (0.000) |
| repeat | — | — | — | -0.0018 | -0.0019 | -0.0018 |
| | | | | (0.003) | (0.003) | (0.003) |
| constant | -0.3067** | -0.4062*** | -0.3376** | -0.3404** | -0.3439** | -0.6009*** |
| | (0.132) | (0.148) | (0.151) | (0.151) | (0.151) | (0.162) |
| Dummy variables for the nature of public works | yes | yes | yes | yes | yes | yes |
| **N** | **22835** | **22835** | **22835** | **22835** | **22835** | **22835** |
| **Pseudo R²** | **0.0952** | **0.1242** | **0.1591** | **0.1591** | **0.1598** | **0.1611** |

On the overall, estimates across different specifications are quite consistent, except for the variable *central* which turns out to impact differently on the choice of an award procedure, depending on the specification used. Based on this observation, we may suspect that our specifications are unable to capture adequately the heterogeneity of behaviour between central and local buyers. This lead us to split our sample into two sub-categories in order to explore in greater depth the determinants of award procedures (table 9).

If we look at the estimates of *complex* in table 8, they show that complexity is an important determinant in the choice of an award procedure as the recent literature suggests. Our

[21] This corresponds to the first 4 codes in the nomenclature. It identifies the class of a procurement contract. In our case, this allows us to control for the nature of the public work in question. There are 25 classes of public works in our sample. We tried to control for the nature of public works at a lower/finer level, but this did not substantially improve our results.

estimates across various specifications show that complex projects are likely to lead buyers to favour negotiation procedures instead of competitive tendering procedures. This effect is significant and negative across different specifications. However, our other proxies for complexity, namely the number of sub-contractors involved, the duration of the contract and the (log) value of a contract, show an opposite effect. Estimates show that a higher value of these variables (potentially indicating a higher degree of complexity) increases the probability that a competitive tendering procedure is chosen. It also seems that central and local buyers account for these variables differently in their consideration for an award procedure, as the various interaction terms show. Estimates from specification (6) show that when compared with local buyers, central buyers tend to favour the use of negotiations when the value of a contract increases and when duration increases, while they tend to favour the use of auctions when the number of sub-contractors increases and when the nature of public works is complex. We will further discuss on how central buyers' choices differ from local ones in the following.

Interestingly, the legal threshold does not show up to be significant in our regression. It would seem that on the average, the law that obliges the use of award procedures does not constrain behaviour.

True to our expectations, the probability of choosing a competitive tendering procedure increases with the number of propositions. As we have argued, this variable may be considered as a proxy for potential competition for a procurement contract. If this is the case, one would expect that benefits of using a competitive tendering procedure would be higher when potential competition is higher. Our estimates do not reject this interpretation of the effect of *nb_prop* on the choice of an award procedure.

Experience in procurement also seems to affect the choice of an award procedure. As one may see from table 8, the number of procurement contracts formerly passed by a buyer has a significant impact on the choice of an award procedure. Moreover, comparing specification (2) and (3), experience does seem to have a strong concave impact of the choice of a procedure (adding the squared term of *exp* in our regression increases the pseudo-$R^2$ substantially). The estimates suggest that a larger experience in procurement (of public works) increases the probability that a competitive tendering procedure is chosen albeit at a decreasing rate, *ceteris paribus*. This result also suggests that an important issue over the choice of award procedure in particular, and more generally in conducting procurement activities, concerns the buyers' competency.

Lastly, while the estimated effect of repeated interactions between a buyer and a firm has the expected sign, this effect is not significant. It would therefore seem that relational or reputational mechanisms do not play a significant role, at least in public procurement of public works.

Let us now try to check whether local and central buyers behave differently in their choice of award procedures. To this end, we split our sample into two sub-samples: one for local buyers and the other for central ones. For this purpose, we estimate separate Probit models for each type of buyers, using a specification akin to (4) (we will drop the variable *central*). The results of these estimates are given in table 9.

Table 9 shows how determinants of award choices may vary between local buyers and central ones. Before commenting on these determinants, it is interesting to note that our probit specification allows us to better account for central buyers' choices in award procedures than choices by local buyers. Indeed, the pseudo-$R^2$ for our regression on central buyers is about

one half, while it is only 0.03 in the other case. This may be due to a greater heterogeneity of local buyers which is not captured in our specification and which may be important to explain their choice of an award procedure. Indeed, one may expect some differences in terms of expertise or competency between central and local buyers. This would lead to very different behaviour. Such a difference in terms of expertise may lead central buyers to choose award procedures according to different criteria, yielding different choices. One of such criteria may be a desire to avoid issues pertaining to corruption. One may for instance argue that local buyers are more risk adverse to suspicions of corruption. This would lead them to favour competitive tendering procedures in order to minimize the risks of judiciary investigation.

In spite of this difference, it is interesting to compare the various determinants of award procedure between local and central buyers. Our estimates show that experience, as measured by the variable *exp*, is an important determinant to explain the choice of an award procedure for local and central buyers alike. Estimates on this variable for both regressions show that there is a concave effect of experience on the choice of competitive tendering procedure – buyers with a higher level of experience tend to favour competitive tendering procedures.

Table 9
Probit estimates on the choice of a competitive tendering procedure
according to local vs central buyers.
(*Standard error within brackets. *** significant at 1%, ** significant at 5%, * significant at 10%.*)

| | **Central administrations** | **Local Administrations** |
|---|---|---|
| complex | 0.1193<br>(0.119) | -0.1238***<br>(0.037) |
| duration | 0.0016<br>(0.002) | 0.0044***<br>(0.001) |
| lvalue | -0.0716**<br>(0.033) | 0.0792***<br>(0.013) |
| nb_sub | 0.1789**<br>(0.084) | 0.0699***<br>(0.025) |
| nb_prop | 0.0573***<br>(0.008) | 0.0030***<br>(0.001) |
| threshold | 0.3843*<br>(0.210) | 0.0312<br>(0.107) |
| exp | 0.0034***<br>(0.000) | 0.0008***<br>(0.000) |
| exp2 | -0.0000***<br>(0.000) | -0.0000***<br>(0.000) |
| repeat | -0.0120*<br>(0.007) | 0.0111***<br>(0.003) |
| Constant | 0.2826<br>(0.418) | -0.5032***<br>(0.165) |
| Dummy variables for the nature of public works | yes | yes |
| N | 4027 | 18799 |
| Pseudo $R^2$ | 0.4985 | 0.0330 |

While being different in magnitude across different layers of administrations, estimates of *nb_prop* and *nb_sub* do have the same sign and are significant in both regressions. Hence, whether it comes to local buyers or central ones, a higher level of potential competition increases the probability of choosing a competitive procedure, *ceteris paribus*. However, contrary to what we expected, the number of sub-contractor also increases the probability that competitive tendering procedures are chosen by local and central buyers.

Some factors are determinant in the choice of an award procedure by local buyers, but not for central ones. This is the case for our proxy of complexity, *complex*. Estimates show that complex public works lead local buyers to favour the use of negotiation procedures, but do not have a significant impact for central buyers. Likewise, while local buyers favour the use of competitive tendering procedure for longer contracts, central buyers seem to be indifferent

with respect to this dimension in their choice of an award procedure. On the other hand, the behaviour of central buyers seemed to be constrained by legal obligation while this is not the case for local buyers. This can be seen from the estimates for threshold – central buyers tend to choose competitive tendering procedure when the value of a contract exceeds the legal threshold, while local buyers seem to indifferent to this threshold.

Some of the factors that we have considered in our regression seem to have an opposite effect in the choice by central and local buyers. There are two such variables, *lvalue* and *repeat*. As one may see from table 9, a contract with a higher value decreases the probability that a central buyer chooses a competitive tendering procedure, while it increases the same probability for a local buyer. The former case is consistent with the interpretation of the value of a contract as a proxy for complexity, and consistent with the view that for complex contracts, negotiation procedures should be favoured.

Our estimates also show that more frequent interactions between a central buyer and a given supplier also decrease the probability that competition based procedures are chosen. On the contrary, frequent interaction leads a local buyer to favour the use of auctions procedures. It would therefore seem that while reputational concerns or relational mechanisms play a role in determining the choice of an award procedure, such a role differs for central buyers and local ones. The result obtained for central buyers are consistent with the view of relational contracting.

As mentioned above, one plausible explanation for these observed differences may lay in the fact that local buyers pursue different objectives than central ones when deciding an award procedure. The observed difference may suggest that the choice of central buyers may be more guided by economic rationality: indeed, it would seem that on the overall, decisions by central buyers are more aligned with considerations that the theoretical economic literature has put forward. In this sense, they seem to pursue an objective of minimizing costs of renegotiation in particular, and transaction costs in general. Choices made by local buyers, on the other hand, do not seem to be guided by the same considerations. Other factors may be more important to them when it comes to decide on award procedures. As an expert has suggested to us, one of such factors may be the desire to avoid suspicions of corruption. This may be seen not only from the differences in our estimates, but also from the fact that central buyers have a better fit in our regression.

In a nutshell, the preliminary analysis above shows that economic rationale guides the choice of award procedures used by public buyers to award works contracts. There are however some divergences in terms of how the factors we consider impact on the choice of local and central buyers. This divergence may be a consequence of the different competencies between local and central buyers, leading them to consider various dimensions of a procurement contract and to take into account their relationship with private firms differently. As we have suggested, another possible explanation may also reside in a desire to avoid suspicions of corruption. Local and central buyers may adopt different strategies in order to protect themselves from such suspicions.

# 4. Conclusion

The objective of this paper was to investigate the determinants of the choice between auction and negotiation in public procurement. This central issue has been the subject of many theoretical developments in the recent procurement literature but few empirical studies have been done.

The results of our tests on the French public procurement practices in the construction sector are consistent with the recent advances emphasizing the role of complexity and uncertainty on the efficiency of procurement procedures. We indeed show that complexity is a key determinant of the trade-off between auction and negotiation even for public buyers. This suggests that economic considerations (i.e. transaction costs minimization and more precisely adaptation costs minimization) drive their choices.

However, our results also indicate that local buyers (e.g. at the city level) have different motivations than central ones. Indeed, some factors are found to be significant determinants of the choice of an award procedure by local buyers, but are non significant for central buyers. This is the case for our proxy for projects' complexity. Estimates show that complex public works lead local buyers to favour the use of negotiation procedures, but complexity does not, surprisingly, have a significant impact on central buyers' choices. Yet, on the overall, standard economic variables (number of potential bidders, contractual experience) seem to better explain central buyers' choices.

A possible explanation of these results is that our specifications do not allow capturing the great heterogeneity of local buyers. Further work would then have to be done to control for it and try to better explain local buyers' choices. Another explanation of the fact that local buyers' choices are poorly explained might also be that local public authorities make hazardous choices and use auctions more systematically for fear of being suspected of favouritism or because they consider that competitive tendering is less costly to organize than negotiation.

Further research would also have to be done to investigate the overall transaction costs induced by each procedure. In other words, the next step of our work would consist in assessing whether taking into account project's complexity in the choices of award procedures impacts on the rate of renegotiation.

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# Appendix 1: Types of public works coded as complex.

| CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 45213342-2 | Ro-Ro terminal construction work. | 45221247-5 | Tunnelling works. | 45232130-2 | Storm-water piping construction work. | 45241300-1 | Pier construction work. | 45246200-5 | Riverbank protection works. | 45243000-2 | Coastal-defence works. |
| 45213341-5 | Ferry terminal building construction work. | 45221248-2 | Tunnel linings construction work. | 45221114-4 | Construction work for iron bridges. | 45221122-3 | Railway viaduct construction work. | 45221246-8 | Undersea tunnel construction work. | 45248000-7 | Construction work for hydro-mechanical structures. |
| 45213340-8 | Construction work for buildings relating to water transport. | 45233110-3 | Motorway construction works. | 45232141-2 | Heating works. | 45247112-8 | Drainage canal construction work. | 45251200-3 | Heating plant construction work. | 45231220-3 | Construction work for gas pipelines. |
| 45252121-2 | Sedimentation installations. | 45253000-5 | Construction work for chemical-processing plant. | 45232151-5 | Water-main refurbishment construction work. | 45247111-1 | Irrigation channel construction work. | 45246400-7 | Flood-prevention works. | 45248500-2 | Movable barrages construction work. |
| 45232400-6 | Sewer construction work. | 45252300-1 | Refuse-incineration plant construction work. | 45234126-5 | Tramline construction works. | 45315100-9 | Electrical engineering installation works. | 45246100-4 | River-wall construction. | 45231210-0 | Construction work for oil pipelines. |
| 45233130-9 | Construction work for highways. | 45221243-7 | Pedestrian tunnel construction work. | 45259900-6 | Plant upgrade work. | 45234210-1 | Cable-supported transport systems with cabins. | 45233320-8 | Foundation work for roads. | 45248300-0 | Construction work for floating docks. |
| 45234250-3 | Teleferic construction work. | 45253310-1 | Water-distillation plants construction work. | 45215100-8 | Construction work for buildings relating to health. | 45231000-5 | Construction work for pipelines, communication and power lines. | 45212321-2 | Auditorium construction work. | 45212354-2 | Castle construction work. |
| 45253800-3 | Composting plant construction work. | 45253300-8 | Distilling or rectifying plant construction work. | 45250000-4 | Construction works for plants, mining and manufacturing and for buildings relating to the oil and gas industry. | 45231200-7 | Construction work for oil and gas pipelines. | 45212320-5 | Construction work for buildings relating to artistic performances. | 45251110-5 | Nuclear-power station construction work. |
| 45213321-9 | Railway station construction work. | 45231112-3 | Installation of pipe system. | 45232410-9 | Sewerage work. | 45247230-1 | Dyke construction work. | 45233330-1 | Foundation work for streets. | 45212220-4 | Multi-purpose sports facilities construction work. |
| 45213320-2 | Construction work for buildings relating to railway transport. | 45221111-3 | Road bridge construction work. | 45247100-1 | Construction work for waterways. | 45213270-6 | Construction works for recycling station. | 45251220-9 | Cogeneration plant construction work. | 45251100-2 | Construction work for power plant. |
| 45253320-4 | Alcohol-distillation plants construction work. | 45252140-1 | Sludge-dewatering plant construction work. | 45215140-0 | Hospital facilities construction work. | 45247270-3 | Reservoir construction works. | 45235000-3 | Construction work for airfields, runways and manoeuvring surfaces. | 45221115-1 | Construction work for steel bridges. |
| 45231300-8 | Construction work for water and sewage pipelines. | 45247130-0 | Aqueduct construction work. | 45232452-5 | Drainage works. | 45315400-2 | High voltage installation work. | 45246410-0 | Flood-defences maintenance works. | 45222200-1 | Engineering work for military installations. |
| 45213332-9 | Airport control tower construction work. | 45212225-9 | Sports hall construction work. | 45254100-3 | Construction work for mining. | 45212351-1 | Prehistoric monument construction work. | 45233310-5 | Foundation work for highways. | 45234121-0 | Tramway works. |
| 45213331-2 | Airport buildings construction work. | 45212360-7 | Religious buildings construction work. | 45233120-6 | Road construction works. | 45247220-8 | Weir construction work. | 45234110-0 | Intercity railway works. | 45251000-1 | Construction works for power plants and heating plants. |
| 45213322-6 | Rail terminal building construction work. | 45317200-4 | Electrical installation work of transformers. | 45252210-3 | Water purification plant construction work. | 45235110-7 | Construction work for airfields. | 45251141-1 | Geothermal power station construction work. | 45234123-4 | Partially underground railway works. |
| 45213330-5 | Construction work for buildings relating to air transport. | 45317300-5 | Electrical installation work of electrical distribution apparatus. | 45233121-3 | Main road construction works. | 45253400-9 | Construction work for petrochemical plant. | 45234112-4 | Railway depot construction work. | 45247110-4 | Canal construction. |
| 45231400-9 | Construction work for electricity power lines. | 45252200-0 | Purification plant equipment. | 45232470-7 | Waste transfer station. | 45262422-5 | Subsea drilling work. | 45251140-4 | Thermal power plant construction work. | | |
| 45253600-1 | Deionisation plant construction work. | 45252150-4 | Coal-handling plant construction work. | 45247210-5 | Dam construction work. | 45234240-0 | Funicular railway system. | 45221113-7 | Footbridge construction work. | | |
| 45232140-5 | District-heating mains construction work. | 45255500-4 | Drilling and exploration work. | 45233000-9 | Construction, foundation and surface works for highways, roads. | 45220000-5 | Engineering works and construction works. | 45234000-6 | Construction work for railways and cable transport systems. | | |
| 45255600-5 | Coiled-tubing wellwork. | 45216120-1 | Construction work for buildings relating to emergency services. | 45233100-0 | Construction work for highways, roads. | 45234120-3 | Urban railway works. | 45247212-9 | Dam-reinforcement works. | | |
| 45233122-0 | Ring road construction work. | 45232221-7 | Transformer substation. | 45232411-6 | Foul-water piping construction work. | 45241400-2 | Dock construction work. | 45234100-7 | Railway construction works. | | |
| 45254000-2 | Construction work for mining and manufacturing. | 45221100-3 | Construction work for bridges. | 45247211-2 | Dam wall construction work. | 45242210-0 | Yacht harbour construction work. | 45255300-2 | Gas terminal construction work. | | |

| CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 | CPV code 2007 | Description 2007 |
|---|---|---|---|---|---|---|---|---|---|
| 45246000-3 | River regulation and flood control works. | 45255430-2 | Demolition of oil platforms. | 45241500-3 | Wharf construction work. | 45242200-7 | Marina construction work. | 45231221-0 | Gas supply mains construction work. |
| 45315500-3 | Medium-voltage installation work. | 45221118-2 | Pipeline-carrying bridge construction work. | 45255210-4 | Oil terminal construction work. | 45241000-8 | Harbour construction works. | 45222100-0 | Waste-treatment plant construction work. |
| 45233224-5 | Dual carriageway construction work. | 45255700-6 | Coal-gasification plant construction work. | 45255200-1 | Oil refinery construction work. | 45212314-0 | Historical monument or memorial construction work. | 45232424-0 | Sewage outfall construction work. |
| 45315700-5 | Switching station installation work. | 45212322-9 | Theatre construction work. | 45247240-4 | Static barrage construction work. | 45314300-4 | Installation of cable infrastructure. | 45232453-2 | Drains construction work. |
| 45221240-6 | Construction work for tunnels. | 45233300-2 | Foundation work for highways, roads, streets and footpaths. | 45253700-2 | Digestion plant construction work. | 45241200-0 | Offshore terminal in situ construction work. | 45231110-9 | Pipelaying construction work. |
| 45214230-1 | Special school construction work. | 45252126-7 | Drinking-water treatment plant construction work. | 45232431-2 | Wastewater pumping station. | 45232150-8 | Works related to water-distribution pipelines. | 45251230-2 | Steam-generation plant construction work. |
| 45253500-0 | Construction work for pharmaceutical plant. | 45221200-4 | Construction work for tunnels, shafts and subways. | 45232430-5 | Water-treatment work. | 45223710-6 | Motorway service area construction work. | 45212353-5 | Palace construction work. |
| 45315300-1 | Electricity supply installations. | 45232120-9 | Irrigation works. | 45232440-8 | Construction work for sewage pipes. | 45243500-7 | Sea defences construction work. | 45212352-8 | Industrial monument construction work. |
| 45233128-2 | Roundabout construction work. | 45234122-7 | Underground railway works. | 45215142-4 | Intensive-care unit construction work. | 45252124-3 | Dredging and pumping works. | 45234200-8 | Cable-supported transport systems. |
| 45221244-4 | Canal tunnel construction work. | 45252120-5 | Water-treatment plant construction work. | 45215130-7 | Clinic construction work. | 45242000-5 | Waterside leisure facilities construction work. | 45212350-4 | Buildings of particular historical or architectural interest. |
| 45221245-1 | Under-river tunnel construction work. | 45221121-6 | Road viaduct construction work. | 45232422-6 | Sludge-treatment works. | 45244100-0 | Marine installations. | 45251150-7 | Construction work for cooling towers. |
| 45253200-7 | Desulphurisation plant construction work. | 45221000-2 | Construction work for bridges and tunnels, shafts and subways. | 45232423-3 | Sewage pumping stations construction work. | 45251111-2 | Construction work for nuclear reactors. | 45212361-4 | Church construction work. |
| 45235100-4 | Construction work for airports. | 45232121-6 | Irrigation piping construction work. | 45247200-2 | Construction work for dams and similar fixed structures. | 45222110-3 | Waste disposal site construction work. | 45251143-5 | Compressed-air generating plant construction work. |
| 45221241-3 | Road tunnel construction work. | 45232450-1 | Drainage construction works. | 45222300-2 | Engineering work for security installations. | 45234111-7 | City railway construction work. | 45223310-2 | Underground car park construction work. |
| 45252127-4 | Wastewater treatment plant construction work. | 45233340-4 | Foundation work for footpaths. | 45235320-2 | Construction work for aircraft aprons. | 45253100-6 | Demineralisation plant construction work. | 45215120-4 | Special medical building construction work. |
| 45213210-8 | Cold-storage installations. | 45221112-0 | Railway bridge construction work. | 45248200-9 | Dry docks construction work. | 45232451-8 | Drainage and surface works. | 45200000-9 | Works for complete or part construction and civil engineering work. |
| 45232460-4 | Sanitary works. | 45233131-6 | Construction work for elevated highways. | 45231113-0 | Pipeline relaying works. | 45247000-0 | Construction work for dams, canals, irrigation channels and aqueducts. | 45244000-9 | Marine construction works. |
| 45252100-9 | Sewage-treatment plant construction work. | 45221110-6 | Bridge construction work. | 45232420-2 | Sewage work. | 45231100-6 | General construction work for pipelines. | 45234124-1 | Underground passenger railway transport. |
| 45252000-8 | Construction works for sewage treatment plants, purification plants and refuse incineration plants. | 45251120-8 | Hydro-electric plant construction work. | 45251142-8 | Wood-fired power station construction work. | 45241100-9 | Quay construction work. | 45234125-8 | Underground railway station. |
| 45232421-9 | Sewage treatment works. | 45221117-5 | Weighbridge construction work. | 45235300-6 | Construction work for aircraft-manoeuvring surfaces. | 45251250-8 | District-heating plant construction work. | 45252130-8 | Sewage plant equipment. |
| 45251240-5 | Landfill-gas electricity generating plant construction work. | 45221242-0 | Railway tunnel construction work. | 45247120-7 | Waterways except canals. | 45221120-9 | Viaduct construction work. | 45255800-7 | Gas-production plant construction work. |
| 45252122-9 | Sewage digesters. | 45232152-2 | Pumping station construction work. | 45222000-9 | Construction work for engineering works except bridges, tunnels, shafts and subways. | 45216113-9 | Prison building construction work. | 45248100-8 | Canal locks construction work. |

## Appendix 2: Correlation matrix

| | competitive | complex | duration | lvalue | nb_sub | nb_prop | threshold | central | central*complex | central*lavalue | central*nb_sub | central*duration | exp | exp2 | repeat |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| competitive | 1.0000 | | | | | | | | | | | | | | |
| complex | 0.0948 | 1.0000 | | | | | | | | | | | | | |
| duration | -0.0342 | -0.0746 | 1.0000 | | | | | | | | | | | | |
| lvalue | -0.0025 | 0.1031 | 0.3334 | 1.0000 | | | | | | | | | | | |
| nb_sub | 0.0653 | 0.0823 | 0.0563 | 0.2096 | 1.0000 | | | | | | | | | | |
| nb_prop | 0.0608 | -0.0191 | 0.0164 | -0.0444 | -0.0041 | 1.0000 | | | | | | | | | |
| threshold | 0.0279 | 0.0563 | 0.1883 | 0.4911 | 0.1951 | -0.0099 | 1.0000 | | | | | | | | |
| central | -0.2459 | -0.0894 | 0.0949 | 0.1489 | -0.0255 | -0.0828 | 0.0286 | 1.0000 | | | | | | | |
| central*complex | 0.0378 | 0.2913 | -0.0197 | 0.0486 | 0.0331 | -0.0176 | 0.0388 | 0.2789 | 1.0000 | | | | | | |
| central*lavalue | -0.2523 | -0.0885 | 0.1102 | 0.1866 | -0.0188 | -0.0844 | 0.0518 | 0.9961 | 0.2792 | 1.0000 | | | | | |
| central*nb_sub | 0.0243 | 0.0210 | 0.0116 | 0.1026 | 0.3922 | -0.0042 | 0.1236 | 0.1468 | 0.1403 | 0.1626 | 1.0000 | | | | |
| central*duration | -0.2556 | -0.0868 | 0.3962 | 0.2248 | -0.0192 | -0.0712 | 0.0976 | 0.6934 | 0.1208 | 0.7154 | 0.0981 | 1.0000 | | | |
| exp | -0.3491 | -0.1246 | 0.2064 | 0.2071 | -0.0427 | -0.1005 | 0.0289 | 0.6071 | -0.0042 | 0.6213 | 0.0019 | 0.5878 | 1.0000 | | |
| exp2 | -0.3926 | -0.1225 | 0.1884 | 0.1921 | -0.0525 | -0.1041 | 0.0197 | 0.6268 | -0.0150 | 0.6419 | -0.0058 | 0.6214 | 0.9692 | 1.0000 | |
| repeat | -0.0581 | 0.0206 | 0.0455 | 0.1338 | 0.0227 | -0.0368 | 0.0233 | 0.0966 | -0.0181 | 0.1030 | -0.0130 | 0.0954 | 0.2842 | 0.2452 | 1.0000 |