Tools and approaches in public contracting research

Moszoro, Marian W.

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Marian W. Moszoro

Introduction

Since Coase (1960), the economic analysis of contracts has been focused on their reciprocal nature. The literature has thus focused on transaction costs and contractual hazards (Crocker and Reynolds, 1993), incentives and commitment (Laffont and Tirole, 1993), incompleteness, verifiability, and reference points (Fehr, Hart and Zehnder, 2011), and relational contracting and the value of future business (Baker, Gibbons and Murphy, 2002) to explain contract features and the degree of discretion – for example, the choice of first-price versus cost-plus contracts (Crocker and Reynolds, 1993) or auctions versus negotiations (Bajari, McMillan and Tadelis 2009). These studies have been, nevertheless, agnostic about the implications of politics for public contract design.

In recent years, there has been increased interest in marrying economics and politics to understand public contracting. Public contracting accounts for approximately 12 percent of GDP in OECD member countries.[1] On the other hand, public contracting is the government's activity most vulnerable to waste and corruption, and its efficiency is a substantial component of voters' political choices.

Public-sector and private-sector contracts have been studied extensively in their separate domains, but there exists no overarching theory that explains the idiosyncrasies of public with regard to private contracts. This gap is due, in part, to the difficulty in comparing contractual objects across public and private spheres, but also due to the limitations in accounting for political factors.

This chapter suggests tools and approaches to measure the basic features of public contracting and to address some fundamental research questions: Why do public contracts differ from similar contracts in the private sector? How do public oversight and political hazards affect public contracting? Do elected officials facing tighter political competition contract less or more efficiently than their peers in politically less volatile environments? These problems are (mostly) known; the

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1 OECD (n.d.). "Public procurement." Accessed July 7, 2018 at http://www.oecd.org/gov/ethics/public-procurement.htm.

novel "twist" consists of identifying and measuring the trade-offs that arise due to the interaction of agents under public oversight and political competition.

The chapter proceeds as follows. The next section highlights particular frameworks that shed light on public contract design and the frictions introduced by politics. The third section shows political datasets and innovative techniques to collect novel data. The fourth summarizes the state of the art in econometric techniques applied to causal inference with a focus on public contracting. The fifth section concludes with ideas for further exploration in public contracting and behavioral political economics.

Theoretical frameworks of public contract design

Public contract design relates to three disciplines: public administration, industrial organization, and political economy. According to the public administration litera- ture, "red tape" is associated with a large number of formal processes that appear to be essential to ensure the public sector's functions. Rules and regulations are intended to decrease the public agents' uncertainty about how they should behave (Kurland and Egan, 1999). Additionally, rules and regulations prevent abuses of power, protect people's rights (Baldwin, 1990), and reflect values rooted in equity (Forrer et al., 2010).

In the industrial organization literature, public contract features are determined by informational asymmetries, the extent of the verifiability of information, and the presence of repeated interactions (Macaulay, 1963). When terms can be contested by excluded sellers, bidding specifications and agreements are carefully delimited with more formal features (Marshall, Meurer and Richard, 1994).

Political economists have also studied the engagement of interested parties (McCubbins, Noll and Weingast, 1989; De Figueiredo, Spiller and Urbiztondo, 1999) and consumers (Prendergast, 2003) as instruments of beneficial oversight – that is, both honest and opportunistic challenges are costly but have positive wel- fare effects: for example, increased competition and lower corruption.

By adding ad hoc assumptions – such as corruption, frequent renegotiation, and possibly conflicting objectives – the aforementioned frameworks equate public contracts with imperfect private contracts. Thus, political risks are (tacitly) assumed away or considered insignificant.

Contractual, institutional, and political data sources

The first step to and limitation of any empirical work is data collection. The Quality of Governance Standard Database (Teorell et al., 2018) is a panel dataset that draws on several freely available data sources related to the quality of governance and

political data such as freedom from corruption, the rule of law, and political regimen in more than 150 countries.[2]

The United Nations Conference on Trade and Development (UNCTAD) Database of Treaty-based Investor–State Dispute Settlement Cases contains more than 3300 treaties and agreements by type of agreement, geographical region, country grouping, treaty status, full text, and treaty language, which can be used, for example, to account for disputed cases and average time to solve them.[3]

Cross-country empirical analysis, especially regarding institutions, raises problems of endogeneity and biases. Subnational data can be used to test political risk factors: the institutional framework is similar to all jurisdictions, and the data present sufficient contractual and political heterogeneity. The US International City/County Management Association (ICMA) offers datasets from national surveys dating back to 1982 for approximately 8000 municipalities with populations of 2500 or greater and covers a variety of topics including service delivery and form of government (e.g., elected mayors and appointed managers).[4]

Assembling novel subnational data can certainly be a starting point and competitive advantage for an ambitious researcher. Complementary measures or even entirely novel datasets can be squeezed from (relatively) homogeneous sets of documents – for example, from bidding announcements, court decisions, press news, political speeches, web pages, online comments, and so on – using algorithmic data reading and textual analysis. Despite its fancy name, these techniques are available to any researcher through free scripts (e.g., Python and R). Moreover, pictures and PDF files can easily be converted into machine-readable text with great accuracy using OCR (optical character recognition) packages. In the era of big data, we can expect that textual analysis and machine learning will play a major role in empirical research of contracts.[5]

Empirical design for public contract analysis

An analysis by *The Economist*[6] of the keywords in working paper abstracts published by the National Bureau of Economic Research in the last 30 years shows the rising importance of empirical methods for causal inference. These methods can usefully be applied to research on public contracts and political institutions.

2   The Quality of Government Institute (2018). "QoG Standard Data." Accessed February 2018 at https://qog.pol.gu.se/data/datadownloads/qogstandarddata.

3   UNCTAD (2018). "International investment agreements." Accessed February 2018 at http://investmentpolicyhub.unctad.org/IIA.

4   ICMA (2018). "ICMA survey results datasets." Accessed February 2018 at https://icma.org/icma-survey-research-datasets.

5   For more on data sources in this book see Teorell, Chapter 27 and Prüfer and Prüfer, Chapter 28 in this volume.

6   *The Economist* (2016). "Economists are prone to fads, and the latest is machine learning." November 26.

Laboratory experiments

The gold standard for causal inference is laboratory experiments. Laboratory experiments can serve to close the causal loop: from a theoretical model through empirical (but not conclusive) evidence to dissected causal inference.

Martinelli and Palfrey (2017) survey experimental political games, including elections with more than two alternatives and electoral competition and democratic accountability with imperfect information. This is a promising area for research on the role of third parties – for example, political opponents and watchdogs – on the contracting strategies taken by the political actors. It is arduous, however, to bring politicians and public managers to the laboratory to run behavioral experiments.

The limitations of laboratory experiments leave us to field interventions and observational data.

Randomized control trials

Randomized control trials (RCTs) involve randomly assigning a policy to some people and not to others so that researchers can be sure that differences are caused by the policy. The analysis, then, is a simple comparison of averages between the two groups.

RCTs have been enjoying attention and appeal to top-tier publications (see, e.g., Chattopadhyay and Duo, 2004). There are, however, at least three significant concerns. First, the interventions are applied in a limited (controllable) area or part of the population, mainly in a developing country, which raises questions about the external validity of the results. For example, to what extent are the results from a procurement RCT in a village in West Africa informative about procurement in East Africa, Norway, or South Korea?

Second, RCTs are usually conducted in less regulated places where it is cheaper to carry them out. Would these same interventions in a developed country raise flags? Is it ethical to provide a focal and temporary intervention on a random subsample of the population instead of remedying the problem?

Third, by offering alluringly simple ways of evaluating certain policies in a short time, RCTs may tempt economists to lose sight of deeper policy questions that are not easily testable using RCTs, such as the effects of institutions, monetary policy, or social norms on contracting practices.

Propensity score matching and controls

When random variations of the independent variables of interest cannot be induced experimentally, researchers can harness other techniques to isolate confounding effects and create quasi-experimental setups. A usual technique to compare "apples to apples" is matching (Ravallion, 2001).

With the increasing facility to collect data and access advanced statistical software, matching has been receding in favor of multivariate regression analysis. If we stratify our data, matching places more emphasis on cells most likely to be treated, whereas regression places more emphasis on cells with similar numbers of treated and untreated cases. Matching tries to address the differences in the groups being compared, which it can do only to the extent that these differences are captured in observable characteristics. In this sense, it offers no improvement over regression, which also "matches" observable characteristics.

As Angrist and Pischke (2009, Ch. 3) argue, "regression can be motivated as a particular sort of weighted matching estimator, and therefore the differences between regression and matching estimates are unlikely to be of major empirical importance." In this context, control variables serve to partial out the effects of observable characteristics on the dependent variable, so that the remaining effect is due to the variation of the variable of interest.

Regression analysis of contracts with rich controls can be the starting point of many empirical studies to substantiate theoretical claims, but falls short of causal inference by modern standards.

Instrumental variables

Three usual suspects blamed for blurring the causal interpretation of multivariate regression are omitted variable bias, endogeneity, and reverse causality. Whereas there is no clear technique to address the first concern with observable data other than to supplement the data and produce stronger common support with fixed effects, there are ways of solving for endogeneity and reverse causality. The techniques applied in empirical institutional and contractual analysis are instrumental variables, difference-in-differences, and regression discontinuity design.

An instrumental variable (IV) approach induces changes in the explanatory variable but has no independent effect on the dependent variable, allowing a researcher to uncover the causal effect of the explanatory variable on the dependent variable. Put simply, in a first stage the endogenous variable is regressed on the instrument (or instruments); then the predicted values of this first-stage regression are used in a second stage instead of the endogenous variable. If the instrument is good, the predicted variable contains only the variations associated with the instrument and not with the outcome variable or other omitted variables. This is the method used by Acemoglu and Johnson (2005) to analyze the institutions that protect citizens against governmental expropriation and the institutions that enable horizontal (private) contracting between citizens. To circumvent the endogeneity problem, they instrument property rights institutions using settler mortality and population density before colonization, and contracting institutions by the identity of the colonizing power.

Although the IV technique is clear and sound, there is no recipe for which variables constitute suitable instruments – which is good news for researchers. To some

extent, the IV approach calls for old-school economics in the pursuit of a sound story and robust analysis to justify the choice of instruments. Newly accessible time-varying geographic information systems (GIS) – for example, aerial imagery, Google Trends or ESRI – can also provide food for thought.

Difference-in-differences and synthetic controls

A usual technique for causal inference is using exogenous events (e.g., law changes, natural disasters) that affected some subjects (e.g., some municipalities) but not others, and then measuring the difference of the treatment on the treated versus the non-treated. A standard requirement is to show that the treated and non-treated groups before the event are similar – for example, to show a "parallel trend" before the event between the groups.

Moszoro and Spiller (2018) harnessed two referenda in California (failed Proposition 26 and successful Proposition 39) regarding changes in the required supermajority to issue general obligation bonds as a way to assess the causal relationship between political hazards and the choice of municipal bond type. Moreover, instead of two groups being treated at different times, they have one event of interest (Proposition 39) and one counterfactual or placebo event (Proposition 26), which constitutes a perfect setup for causal inference: namely, the probability of issuing a general obligation (GO) bond[7] should remain the same after Proposition 26 failed, and increase after Proposition 39 was passed.

The difference-in-differences technique assumes that the change in the treated is only due to the treatment, and does not show how the treated subjects would have evolved had the treatment not taken place. A way to overcome this problem is the use of "synthetic controls." For example, instead of comparing Paris to Toulouse and Marseille before and after an event (e.g., a change in the local regulation in Paris), one can construct a "synthetic Paris" as a mix of, say, 12 percent Lille, 37 percent Lyon, and 51 percent Strasbourg, where the weights are given by regression estimates. We then compare the real Paris after the event with the synthetic Paris. This technique, thus, encompasses a difference-in-differences plus matching and instrumenting.

Regression discontinuity design

Regression discontinuity design (RDD) is a technique that emulates experimental setups. It compares similar entities on either side of a (sharp or fuzzy) cut-off to gauge the effect of a treatment. If being below or above the cut-off is random, the effect of the treatment (e.g., different policies below and above the cut-off) on the treated can be claimed to be causal.

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7 A general obligation bond (GO) is a municipal bond backed by the credit and taxing power of the issuing jurisdiction rather than the revenue from a given project. General obligation bonds are issued with the belief that a municipality will be able to repay its debt obligation through taxation or revenue from projects. No assets are used as collateral.

Kantorowicz (2017) studies the causal effect of electoral systems on fiscal outcomes using an empirical design that exploits a discontinuity in the application of electoral rules in Polish municipalities. In the period of 1998–2014, the national electoral law stipulated that the municipalities of up to 20 000 inhabitants were subject to majoritarian elections and that the municipalities above this threshold were governed by an open-list proportional system. This setting allows the use of a regression discontinuity design (RDD) for the comparison of municipalities just below and just above the 20 000 thresholds, providing a quasi-experimental setting for a credible evaluation of the effects of electoral regimes on fiscal policy outcomes.

Perspectives for research in public contracting and politics

The majority of economic studies on contracts has focused on private-to-private contracts. Public contracts have been seen as "special cases" of most generic private contracts. But what makes contracting in public organizations different from contracting in private organizations – oversight, corruption, or multiple objectives? There are many issues and niches of public contracting to explore. On the theoretical side, we need models that address renegotiations, public accountability, and public managers' choices comprehensively and convincingly.

On the empirical side, relevant policy questions could be tested: for example, the determinants of public-sector in-house contracts versus concessions and fixed-price versus cost-plus contracts, the rate of renegotiations induced by contract design or governmental opportunism, and contractual practices in comparable public and private organizations (e.g., companies, universities, and NGOs) in similar functional areas (e.g., procurement and personnel management).

To analyze these policy alternatives, novel experiments and empirical tests should be designed. Online platforms (e.g., using Amazon Mechanical Turk, Prolific, and Qualtrics)[8] can play a major role as laboratories without borders, where the pool of subjects is wider and more heterogeneous. Also, panel data from geographic information systems (GIS) can become a useful source of instrumental variables.

Organizational discontinuities can be exploited to show the causal channel from political oversight to contractual practices – for example, procurement and personnel management. For example, many water companies in France have changed their organizational structure in the past: from municipal to private, and from private to municipal. Assuming that there is organizational inertia, one could compare the terms of the last auctions and job openings before privatization to the first auctions and job openings after municipalization.

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8 See: https://www.mturk.com/, https://www.prolific.ac/, and https://www.qualtrics.com/online-sample/. Accessed July 7, 2018.

The intersection of public contracting and behavioral political economics is a promising research area. The key to success is to find relevant setups, propose novel data and techniques to collect behavioral patterns, and advance empirical strategies that address this specific inter-sectoral relationship.

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