Employment versus Contracting in Procurement: Theory and Evidence from U.S. Cities*

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***** PRELIMINARY AND INCOMPLETE *****

Abstract

Local governments can choose to provide services with internally employed labor or through contracts with external providers. We develop a general procurement model that highlights the trade-off between productive efficiency and the costs of administrating performance contracts. We construct a dataset of service provision choices by U.S. cities and document the relationship between service characteristics and contracting choices. Our analysis suggests that economic efficiency concerns, as well as politics, matter for contracting decisions. We discuss implications of our approach for the theory of the firm. *JEL* codes: D21, D23, D73, H11,H72, J45, L22, L23, L33.

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1 Introduction

The last twenty-five years has seen intense debate about whether the private sector can provide a variety of public services more effectively than the government. This debate has touched on services ranging from education, healthcare and transportation to trash collection and street repair. In addition to the normative question of what role government should assume in providing services, it has also raised the positive question of what determines government privatization decisions in practice.

Broadly speaking, there are two views on government privatization decisions. The first, which focuses on transaction costs, looks by analogy to the private sector "make or buy" decision (e.g. Williamson, 1985; Hart, Shleifer and Vishny, 1997). In this account, privatization is ultimately dictated by efficiency considerations. An alternative view, advanced by Boycko, Shleifer and Vishny (1996) among others, emphasizes the private benefits to politicians of keeping service provision inside the government. This view holds that privatization tends to occur only in response to external pressure such as citizen discontent or tight budgets. An analogous account of the private sector would emphasize the private benefits of control that accrue to managers, and the role of shareholders in disciplining managers.

In this paper we develop a theoretical agency model of procurement, and through its lens we empirically examine the determinants of government privatization at the city level. In particular, we consider the choice faced by local governments of whether to provide services "in-house" with their own employees, or through external performance contracts. Our model highlights the trade-off between the inefficiencies of employment contracts, which are broadly used in internal procurement, and the costs of specifying or implementing performance contracts, which are typically used in external contracting. We show that if efficiency or political considerations create a need for high quality goods and services, contracting costs will cause internal employment to dominate performance contracts, despite the fact that the latter result in superior productive efficiency.

Our approach to public procurement views cities as "firms" who maximize a well defined objective function that trades off quality and costs. An alternative approach is that city decisions arise from interactions between various groups with political power, and redistribution of rents will affect the decisions that are reached. By and large, procurement decisions of cities are made by mayors or city managers who face pressures to reduce costs, subject to political constraints and demands for quality.

In our model, the government (or principal) can contract with an agent to buy services using two contractual instruments. The first is *time*, which specifies a minimal time-on-the-job requirement that the agent must fulfil, and is a primary input to production. The

second is *performance*, which specifies a minimal quality level that the agent is expected to deliver, which is the relevant output. We assume that imposing a time constraint involves trivial costs, but that imposing a quality standard results in contracting costs that increase in the level of contractual scrutiny. We show that even though both these instruments can be used, the optimal contract has the principal either buying the agent's time, or input, which we call an *employment contract*, or buying his output performance, which we call a *performance contract*. This corresponds to the fact that most observed contracts, both in the public and private sector, are indeed of these two extreme forms.

Using parameters that describe the costs of contracting, our model yields several testable hypotheses, in particular about how service characteristics will affect the preferred mode of contracting. The model also captures the principal's sensitivity to quality provision through such forces as political pressure and support, and offers predictions on these dimensions as well. We also discuss several possible extensions of our basic model, and highlight the possible predictions that these can imply on procurement data.

Though our model can shed light on many procurement scenarios in the private and public sectors, our empirical analysis narrows the focus to contracting decisions made by U.S. cities. We use survey data on cities collected by the International City/County Management Association (ICMA) in 1997.[1] The survey documents the provision decisions of cities with respect to sixty-four services, including public works and transportation (road construction, street cleaning, residential and commercial waste collection, busing), public utilities, safety (fire, police, emergency services), health and human services, parks and recreation, cultural programs and administrative support functions.

The ICMA survey asks whether the city provides each service, and if so, whether it provides the service using its own employees or through contracts with private sector firms, non-profit firms or another government agency. The link between the surveyed mode of provision, i.e., employment or contracting, and the contractual forms predicted in our model, follows from the fact that all services procured with employees use what our model identifies as *employment contracts*, and almost all the services procured with private contractors use *performance contracts*. Thus, the ICMA provision data as an application of our theory.

We then complement the ICMA data with original survey data that aims at capturing service characteristics. Our theory predicts that contracting decisions will be affected by characteristics such as the ease of measuring and monitoring performance, and the

[1] Our data includes procurement decision for 1982, 1992, 1997 and 2002. We have performed the analysis with the 2002 data, and combined 1997 and 2002 data. These analyses showed that the results we obtained are robust to several cuts of the data, and for now we concentrate on the 1997 data alone. A more comprehensive inclusion will be included in future drafts.

sensitivity of constituents to low quality provision. Unfortunately, such data is not available, and we proceeded to conducted a small survey of 23 city managers, asking each manager to assess thirty different services along a number of salient dimensions.[2] We use this data to construct four measures of contracting difficulty — the difficulty of measuring and monitoring service quality, the difficulty of switching providers, the severity of conflicts between cost control and quality provision, and the extent to which the provision of the service is routine in nature. We also construct two measures of political sensitivity — the sensitivity of city residents to service quality, and the workforce required to provide each service.

Controlling for city fixed-effects, we find that all the predictions of our model are consistent with the correlations in the data. That is, our measures of contracting difficulty and of sensitivity to quality are positively correlated with the decision to provide services with an internal labor force. We also find that our other measures of contracting difficulties, as well as services that require a relatively larger labor force, are positively correlated with the choice to employ internally. Furthermore, we investigate the implications of economies of scale on our model, which suggest that smaller cities should respond differently to the changes in our service characteristic measures. We find empirical support for this prediction as well, which adds a level of credibility to the underlying forces generated by our modelling approach.

Focusing on city characteristics, we find that despite the fact that city fixed effects absorb as much variation as service fixed effects, only a few of our city characteristics are significantly correlated with the method of provision. In particular, unemployment rates, the age of the city and broad regional differences are significantly correlated in interpretable ways. Somewhat surprisingly, the city's form of government does not seem to have a significant effect on the choices made by cities.[3]

Our analysis suggests that certain services can be identified in light of our model as more suitable to be privatized with performance contracts, while others are better pro-

[2]This was out of a total of 33 city managers from across the U.S. whom we approached. At the moment we are designing a broader survey that will be sent out to 242 city managers, which will offer some more refined tests that we plan to pursue in future iterations of this project.

[3]These results suggest that although politics and other influences must be important to explain the variation across cities, we cannot interpret these influences with available data. We also investigate the possibility, suggested by Lopez-de-Silanes, Shleifer and Vishny (1997) that state laws restricting political hiring or imposing budget constraints on local governments might affect contracting choices. In contrast to Lopez-de-Silanes et al.'s results for privatization at the county level, we do not find easily interpretable correlations between state laws and the method of service provision used by cities. This is true when we restrict attention to the laws that they used, and even more so when other relevant laws are added, which for some reason they excluded from their analysis.

cured with a city's own employees. Such an indication based on efficiency considerations could have large scale impacts on the financial expenses of local governments, impacting both productivity, as well as the tax bill of local residents.

In parallel to shedding light on the inner workings of city procurement, our theoretical approach offers a useful contribution to the vast literature on the theory of organizing productive activities. As we mention above, the procurement problem we investigate is generally applicable, be that of an automobile manufacturer who needs to procure a braking system, or an accounting firm who needs to procure information technology services. A natural question that scholars of organization economics should ask is whether we need to develop a theory of our own given the availability of not one, but many theories of the firm. Our answer lies in the observation that the most common approaches to the theory of the firm suffer from deficiencies that encourage the development of a somewhat different theoretical approach.

More specifically, after Coase (1937) raised the important question of what should the firm "make" and what should it "buy", three main theoretical directions were developed. The first is Transactions Cost Economics (TCE), championed by Williamson (1975, 1985), which asserts that "the transaction is the basic unit of analysis and insists that organizational form matters." (1985, p. 18). One basic idea of TCE is that internal organization will allow for more flexible adaptation to events that are hard to contract over, a problem that is enhanced in the presence of high levels of quasi-rents that parties have an incentive to appropriate. TCE then develops empirically relevant predictions on ways in which asset-specificity and transaction complexity will affect the make-or-buy decision, and several studies have verified these predictions.

However, as Hart (1995) argues, the mechanisms that change the nature of the transaction from "buy" to 'make" are not well specified by TCE (Hart, 1995 Ch. 1), leaving the theory itself incomplete, and requiring a more rigorous investigation. This theoretical gap is addressed by the second approach to firms developed by Grossman and Hart (1986) and refined by Hart and Moore (1990), now widely known as the Property Rights Theory (PRT). Using a clean and precise definition of ownership as the right to control ex post decisions, PRT offers a theory of integration that rests on the costs and benefits of allocating decision rights to different parties. The theoretical advance of PRT over TCE allowed PRT to be applied in to variety of organizational issues above and beyond the traditional make or buy question. This, however, comes at a cost that Whinston (2003) convincingly expressed, which is that the empirical content of PRT is all but impossible to take to available data.

The third approach to firms is the applications of agency theory, most notably Holmstrom and Milgrom (1991, 2004), who investigate the reasons that clusters of attributes

seem to co-move together in describing the organization of production. That is, the employment relationship is characterized by restrictions on activities, low powered incentives (or output-insensitive pay) and no ownership of assets, whereas external transactions have the opposite attributes. Their theory is consistent with stylized facts, but like other agency models has a rich set of predictions on observed outcomes that is hard to take to data, and the exogenous parameters of these models are hard to measure.

Our theory builds on insights from TCE in that we consider contractual costs that are transaction specific, yet we circumvent the make-or-buy comparison by focusing on the contractual arrangements between the contracting parties, much in the spirit of Holmstrom and Milgrom (1994). The fact that our make-or-buy data really is about the contractual arrangements, allows us to scrutinize our theory with the procurement data of cities. We get our stark predictions by departing from most of the agency literature that focuses on the strengths of incentives, and instead focus on the choice of contracting over inputs or outputs, a point that has been explored by Lazear (1986, 2000), but has not been explored in the context of procurement methods and the optimal organization of production.

Finally, though the economics literature is sparse on investigation of the productive activities of local governments, these issues have received much attention in the area known as public administration and urban planning. Important contributions by Sclar (2000), Savas (2000) and Warner and Hebdon (2001) have considered the choice of privatization or internal procurement that included ideas from TCE. In this line of work, the papers most closely related to our approach are Brown and Potoski (2003a,b) who also collect an original survey with an emphasis on contracting difficulties. Our advancement over this work is both in the introduction of a clearly specified theoretical model, and in the richer set of empirical prediction that our theory and data allow us to examine.

2 Procurement By Local Governments: An Overview

Local government spending accounts for about 5-6% of U.S. gross national product and roughly half the expenditure of all government agencies.[4] A typical city in the U.S. provides about 40 distinct services, ranging from public works (street repair and garbage collection), to public safety (police and fire), to animal control and maintenance of public recreation areas. Most city services are relatively labor intensive. To the extent that cities require capital equipment to provide services (such as fire trucks or police), it tends not to be highly specialized to the particular city, although there are exceptions, such as municipal libraries, hospitals or sewage treatment facilities.

[4]Quote census reports...*******

City services are provided by a combination of city employees and private and government contractors. The decision of *which* services a city government is responsible for providing is very often political and may depend on a variety of historical and institutional factors.[5] Once provision is decided, however, city administrators have some flexibility in determining how best to provide a given service. The city managers to whom we have talked all emphasize that both economic and political factors go into their decisions.

The way in which city decisions are made can depend on the form of a city's government. Two forms are common. The first is the Council-Manager form that consists of a city council (elected either at-large or from districts that is responsible for policy making, and a professional city manager, appointed by the council, who is responsible for administration. The city council is generally prohibited from interfering with the city manager's administration, but can remove the city manager at any time. In contrast, a Mayor-Council government consists of an elected mayor who serves as the city's chief administrative officer, and an elected council that forms the city's legislative body. The council formulates and adopts city policies and the mayor is responsible for carrying them out.[6]

Whether a city's chief executive is an appointed city manager or an elected mayor, a city government typically has a hierarchy of department managers who report directly to the chief executive. Some of these department managers are responsible for the delivery of services, while others are involved with the internal operation of government. Decisions about contracting are typically made by the chief executive, together with the relevant department head who will be responsible for the implementation of the decision.

[5]For instance, Fire Prevention and Suppression is often thought of as a standard city service. The city government of Stanford's neighbor, Menlo Park, California, however, is not responsible for that city's fire department. Rather an independently elected commission runs the department using share of local tax revenues.

[6]Other forms of government are commision, town-meeting and Official Ballot Referendum. Both forms are relatively rare, particularly in our data in which the smallest cities are under-represented. See "Town meeting tradition seen in decline," *The Boston Globe*, May 9, 2004.
(http://www.boston.com/news/local/articles/2004/05/09/town_meeting_tradition_seen_in_decline/

Table 1: Delivery of City Services, 1997

City Employees	58%
Contract with Private Sector	12%
Contract with Gov't Agency	13%
Mix of Employees/Contracts	12%
Other	5%

Total: 64 Services provided by 914 cities (Source: ICMA, 1997)

To provide a general sense of the breakdown between internal service provision and contracting out, Table 1 reports summary statistics for the 64 services provided by the 914 cities included in the 1997 ICMA survey. Of the total services provided, 58% were delivered using only city employees. A total of 25% were fully contracted out: 12% to private firms and 13% to another public agency, such as the county, a neighboring city or a joint venture of several local governments.[7] Of the remaining services, 13% were delivered using a mix of city employees and private contracts, and the rest are provided by a range of less common modes of provision such as non-for-profit contractors, franchises and volunteers.

As our analysis in this paper is purely cross-sectional, it is worth commenting on general trends in city contracting. Despite many popular press stories about public school contracts and other high-profile contracting decisions, date from ICMA surveys performed at five year intervals between 1982 and 2002 show little evidence of any aggregate trend in contracting behavior. Hefetz and Warner (2004) argue that decisions to contract out services are balanced by decisions to bring contracted services back in-house are both common.[8] Their work suggests that city administrators are responding to changing conditions, or perhaps are experimenting with different methods. Based on this evidence, we will adopt the view that the broad pattern of city contracting is roughly stationary, though individual cities are adjusting on the margin.

[7] In the mid-1970s, the California Legislature allowed two or more public agencies to join together, under a joint powers authority (JPA), to more efficiently provide government services. For example, fire protection services in San Mateo county are provided by such a JPA.

[8] Hefetz and Warner (2004) use the variation across years in the ICMA surveys to capture these dynamic decisions. The ICMA data may not be ideal for such a study for several reasons, the most basic being that there is some measurement error, which can account for most of the small number of changes that occur across the five year periods. A more convincing account is the case study approach in Ballard and Warner (2000) who describe and analyze 26 cases of cities who switched from contracting to employment.

3 Employment versus Contracting: Theory

In this section, we develop a basic model of service provision. The model is not specific to government procurement, but considers a principal who wishes to procure a good or service to fulfill a productive need, and who seeks to maximize net benefits. We then suggest how the model can incorporate political motives that depart from pure efficiency considerations, and explore the consequences of these motives.

3.1 Technology, Endowments and Preferences

Consider a principal who wishes to procure one unit of a good or service from an agent. The production technology consists only of labor inputs; we discuss capital below. Two labor inputs determine the quality of the good or service. The first is time on the job, $t \geq 0$, and the second is the effort intensity of the agent's labor while on the job, $e \geq 0$. Effort intensity can be interpreted as attention to detail or effort of production. We assume that quality is given by the production function

$$q = et.$$

The agent is endowed with T units of time that can be allocated between working for the principal and working in an outside competitive labor market that pays $w > 0$. (This outside activity could also be interpreted as leisure with the time-value of leisure being w). We assume that no labor intensity is required for the outside job, and that the agent bears a personal cost of labor intensity equal to $c(e)$ per unit of time on the principal's job, where $c'(\cdot) > 0$ and $c''(\cdot) > 0$.[9]

We assume that there is some $e_0 > 0$ such that $e_0 = \arg\min c(e)$. That is, an agent left to his own devices would exert some minimal, but positive, level of labor intensity. The motivation for this could be due to one of several possible reasons. The agent may enjoy the job to some extent, or with to avoid utter boredom. Alternatively, he may take some pride in his work, or fear looking bad if nothing is done.[10] The upshot is that an agent hired to work for fixed number of hours $\overline{t}$, and given no additional incentives, will produce quality $q = e_0\overline{t}$.

The agent's preferences are over income and the costs of labor intensity. If he is paid $\overline{w} \geq 0$, spends t hours on the job at an effort intensity e, and allocated the remainder of

[9] We treat labor intensity as a one-time choice, but this involves no loss of generality, because given the convexity of $c(\cdot)$, the least-cost way to provide a total amount of quality is to work at constant labor intensity.

[10] In their analysis of multi-task agency problems, Holmstrom and Milgrom (1991) similarly assume that some effort is exerted even in the absence of explicit monetary incentives.

his time to the competitive sector, his utility will be

$$u(\overline{w}, t, e) = \overline{w} - c(e)t + (T - t)w.$$

The principal's preferences are over service quality and the monetary costs of provision. For a mayor or city manager, preferences over quality will depend on both the awareness of city residents and the importance they place on the service. Preferences may also depend on the political process — for example, whether the mayor enjoys a comfortable majority or is up for re-election. To capture the idea that the marginal value of higher quality can differ across services, we let s denote the sensitivity of city residents to the quality of service provision. Therefore if the quality provided is q, the sensitivity is s and the costs of provision are k, the principal's net benefit is $V(q, s) - k$. We assume that $V_q(q, s) > 0$, and $V_{qs}(q, s) > 0$. The latter assumption implies that quality is more important on the margin if city residents are sensitive to service quality. Finally, to guarantee a unique solution to the principal's optimization problem defined below we assume that the benefits are concave in q, $V_{qq}(q, s) < 0$.[11]

3.2 Information and Contracts

In our model, service quality is completely determined by the combination of the agent's labor intensity e and time spent on the job. There is no uncertainty. We assume, however, that labor intensity is not contractible so the agent has some discretion over how the service will be provided. We will later explore an extension that introduces uncertainty and a need for ex post flexibility in the description of the work that needs to be done.

Following common practices in procurement, we assume that the principal can contract with the agent on a contingent fee $\overline{w} \geq 0$, the payment of which is made if and only if two dimensions of the work were contractually verified to be done. The first requirement that the contract can specify is a minimal time on the job $\overline{t} > 0$. For example, the agent can be required to show up for work at a certain time, and leave only after $\overline{t}$ units of time have been spent on the job, so that the imposed contractual constraint is $t \geq \overline{t}$.

The second requirement that the contract can specify is the minimal quality standard $\overline{q}$ so that the imposed contractual constraint is $q \geq \overline{q}$. For example, the agent can be asked to provide landscaping for a private firm or government agency. The minimal standards can be specifications of the frequency for trimming certain trees and bushes,

[11] To interpret s for a private firm, consider the firm's preferences over quality provision for different subcomponent's. This will depend on how sensitive the final product's performance is to the subcomponent's quality, and this can be captured by s for the subcomponent in question.

the amount of weeds allowed per square yard, and what composition of fertilizers are supposed to be present in different areas of the grounds.

As payments are made if and only if $t \geq \overline{t}$ and $q \geq \overline{q}$, we can interpret the constraint $\overline{t}$ as the principal *buying the agent's time*, and the constraint $\overline{q}$ as the principal *buying a specified service* from the agent. Our setup allows the principal to contract on both of these dimensions, implying a rather general form of possible contracts. Since both the principal and agent are risk neutral, and there is no uncertainty, lotteries will not add instruments above and beyond $\overline{w}$.

We adopt the view that contracts are not costless to write, as they are in many standard agency models, nor that they are prohibitively expensive, as they are in models of incomplete contracting. To keep things simple, we assume the costs of specifying and monitoring compliance of $\overline{t}$ are minimal, but it is costly to specify and verify compliance with a quality standard $\overline{q}$. For example, to meet certain quality thresholds several things may need to be described in advance, like lists of instructions and ex post measurement procedures. Furthermore, when the job is delivered, then to verify the delivery of $\overline{q}$ the principal will usually have to rely on a certain monitoring technology that has its own set-up costs and operating costs.

We assume that to specify a minimal standard of $\overline{q}$, the principal must expend costs equal to $d(\overline{q}, m)$. Here m is an exogenous variable that describes how hard it is either to specify ex ante, or monitor ex post, the provision of $q \geq \overline{q}$. Naturally, we assume that $d(0, m) = 0$ and $d_{\overline{q}} > 0$, which means that specifying and monitoring for a higher quality standard will be more costly, but there is no cost if no standard is specified. Second, we assume that $d_{\overline{q}\overline{q}} > 0$, which says that, for a given service, the marginal increase in minimal standards has increasing costs. This seems natural if specifying and monitoring the first set of issues is rather simple, but as more refined issues come up, both specifying them and verifying their compliance become increasingly difficult. Finally, we assume that $d_{\overline{q}m} > 0$, meaning that increases in m raise the marginal cost of contracting for higher quality.

As mentioned earlier, one can think of the costs of contracting as the costs of specifying standards ex ante. Bajari and Tadelis (2001) take this perspective and derive a cost of contracting function with the above properties by assuming that a project can be broken into separate tasks, ordered by importance, each of which is costly to specify. Contracting costs can also arise from the costs of measuring and verifying quality after the project is completed (Barzel, 1982). In particular, it may be relatively cheap to verify that service met a basic level of quality, but more expensive to verify smaller details.[12]

[12] As an example, consider the ex post verification of a power supply unit that a computer manufacturer procures. It may be easy to verify that it provides the right voltage and power, but more tests are needed

Finally, as we will touch on below, if performance measurement is imperfect, costs of contracting for service quality can arise from other frictions such as the cost of providing incentives for an agent who is risk-averse or wealth-constrained.

3.3 The Agent's Problem

Given a contract $(\overline{w}, \overline{q}, \overline{t})$, the agent's optimization problem is given by,

$$\text{(AP)} \quad \begin{cases} \max_{e,t} & \overline{w} - c(e)t + w(T-t) & \\ \text{s.t.} & t \geq \overline{t} & (EC) \\ & et \geq \overline{q} & (PC) \end{cases}$$

The agent's program has two contractual constraints. The first is the *employment constraint*, (EC), which if binding implies that given desired quality $\overline{q}$ and income $\overline{w}$, the agent would prefer to substitute time for effort intensity in order to deliver the desired quality. The second is the *performance constraint*, (PC), which if binding implies that given the time constraint $\overline{t}$ and income $\overline{w}$, the agent would prefer to deliver a quality lower than $\overline{q}$.

Given our assumptions, there is a unique solution to the agent's problem. It does not depend on the additive wage $\overline{w}$, so we can denote the optimal intensity and time as $e^*(\overline{q}, \overline{t})$ and $t^*(\overline{q}, \overline{t})$. We characterize these functions below. Let $U_A(\overline{w}, \overline{q}, \overline{t}) = \overline{w} - c(e^*(\overline{q}, \overline{t}))t^*(\overline{q}, \overline{t}) + w(T - t^*(\overline{q}, \overline{t}))$ optimal utility under the contract $(\overline{w}, \overline{q}, \overline{t})$.

3.4 The Principal's Problem

The principal's problem is to design a contract $(\overline{w}, \overline{q}, \overline{t})$ that maximizes his net benefits taking as given the agent's best response to the proposed contract. This problem is given by,

$$\text{(PP)} \quad \begin{cases} \max_{(\overline{w},\overline{q},\overline{t})} & V(et, s) - \overline{w} - d(\overline{q}, m) & \\ \text{s.t.} & \overline{w} - c(e)t + w(T-t) \geq wT & (IR) \\ & (e, t) = (e^*(\overline{q}, \overline{t}), t^*(\overline{q}, \overline{t})) & (IC) \end{cases}$$

The two constraints are standard: the *Individual Rationality* constraint (IR) implies that the agent will accept the contract rather than spending all his time T in the competitive

to verify mean-time between failures. It is even more costly to verify the performance under extreme weather and moisture conditions. Thus, even if it may be not too difficult to write down a list of specification for the power supply, it may be quite costly to verify compliance, and as the list gets longer, so do the costs of verification. The exogenous variable m would capture the difficulty of this ex post measurement.

labor market; the *Incentive Compatibility* constraint (IC) implies that the choices of the agent will indeed match what the principal wants to implement.

Lemma 1: (IR) must bind at any solution to the principal's problem.

The proof follows immediately from the fact that reducing $\overline{w}$ does not affect (IC), and is therefore omitted. The next proposition establishes an important and simple characterization of the contract that the principal chooses.

Proposition 1: If $(\overline{w}, \overline{q}, \overline{t})$ solves the principal's problem then at the solution to the agent's problem with $(\overline{w}, \overline{q}, \overline{t})$ either (EC) or (PC) bind but not both. If (EC) binds, the optimal contract is of the form $(\overline{w}, 0, \overline{t})$; if (PC) binds, the optimal contract is of the form $(\overline{w}, \overline{q}, 0)$.

Proof. Assume in negation that at the solution to the agent's problem with contract $(\overline{w}, \overline{q}, \overline{t})$, both (EC) and (PC) bind, and consider an alternative contract $(\overline{w}, \overline{q}, 0)$. At the solution to the agent's problem with $(\overline{w}, \overline{q}, 0)$, we relaxed (EC) so that the agent is providing quality $\overline{q}$ with $0 \leq t^*(\overline{w}, \overline{q}, 0) < \overline{t}$, implying that $U_A(\overline{w}, \overline{q}, 0) > U_A(\overline{w}, \overline{q}, \overline{t})$. But this implies that $(\overline{w}, \overline{q}, 0)$ gives the principal the same utility as $(\overline{w}, \overline{q}, \overline{t})$ but with (IR) not binding, a contradiction. The optimal form of the contract follows from the costs of specification: if (PC) does not bind then specifying any $\overline{q} > 0$ is wasteful. Similarly, if (EC) is not binding then with any arbitrary cost of specifying $\overline{t} > 0$, this specification is wasteful. *Q.E.D.*

The intuition for this result is derived from revealed preference. If both (EC) and (PC) bind at a contract that the agent faces, then by revealed preference the agent would rather deliver the desired quality $\overline{q}$ with a different composition of time and labor intensity. But this means that the agent is better off providing the same quality with a composition of labor that can be left to his discretion, and the principal can therefore get the same quality with a lower payment to the agent.

This result not only simplifies the problem, but adds meaning to the agent's contractual constraints, and to the way these constraints will bind in equilibrium. Namely, if (EC) binds but (PC) does not, then the optimal contract $(\overline{w}, 0, \overline{t})$ looks very much like an *employment relationship* in which the agent agrees to spend a fixed amount of time on the job, and cares little about what needs to be done as long as he cannot be forced to engage in a higher labor intensity than e_0. In contrast, when (PC) binds but (EC) does not, the optimal contract $(\overline{w}, \overline{q}, 0)$ looks very much like a *contracting relationship* (or specific-performance relationship) in which the agent has all the discretion over how to allocate his time and effort, and he is bound by the performance specifications of

the contract. These ideas resonate well with earlier attempts to model the employment relationship (see Simon, 1951 and Williamson, Wachter and Harris, 1971.)

3.5 Optimal Contracts and Comparative Statics

To characterize the optimal contract, it is useful to follow Grossman and Hart (1983) and decompose the principal's problem into the least cost way to implement a level of quality q by the agent, and then the optimal choice of q.

To implement q with an employment contract $(\overline{w}, 0, \overline{t})$, the principal must specify $\overline{t} = q/e_0$ and pay the agent

$$W(q|EC) = \frac{w}{e_0} q \ .$$

To implement q with a performance contract $(\overline{w}, \overline{q}, 0)$, the agent must specify $\overline{q} = q$. Given this, the agent's problem is:

$$\begin{aligned} &\max_{e,t} \overline{w} - c(e)t + w(T-t) \\ &\text{s.t. } et \geq q \end{aligned}$$

Letting λ denote the multiplier on the quality constraint, the Kuhn-Tucker conditions for an interior solution are

$$\begin{aligned} \lambda t &= c'(e)t \\ \lambda e &= c(e) + w \end{aligned}$$

The optimal effort, $e^*(q,0) = e^*$, solves $c'(e) \cdot e = c(e) + w$ and is independent of q. The independence follows from the multiplicative separability of the production function. The optimal time allocation is $t^*(q,0) = q/e^*$. Therefore

$$W(q|PC) = \frac{w + c(e^*)}{e^*} q.$$

Following the logic of the revealed preference argument of Proposition 1 we have,

Lemma 3: $W(q|PC) < W(q|EC)$ and $\frac{dW(q|PC)}{dq} < \frac{dW(q|EC)}{dq}$ for all $q > 0$.

Proof. The first inequality follows from the proof of Proposition 1. If quality q is provided with (EC) binding, then by relaxing (EC) the agent needs less compensation to provide the same quality level. The second inequality follows directly from the first. *Q.E.D.*

Lemma 2 formalizes a simple result that echoes some commonly heard criticisms of public provision. It says that *ignoring contracting costs*, private contractors are always

more efficient than internal employees. But to conclude that external contracting, or "privatization", always dominates internal employment is a mistake.

When contracting costs are accounted for, the cost of implementing quality q is $W(q|EC)$ with an employment contract and $W(q|PC) + d(q, m)$ with a performance contract. The least cost function of implementing q is

$$C(q, m) = \min\{W(q|EC), W(q|PC) + d(q, m)\}$$

Our next result states lower quality projects can be implemented at relatively low cost with a performance contract, while the converse applies for higher quality projects.

Proposition 2: For any m there exists some $q(m)$ such that $C(q, m) = W(q|EC)$ if and only if $q > q(m)$.

Proof. This follows the convexity of $d(q, m)$ and the linearity of $W(q|PC)$ and $W(q|EC)$, combined with the fact that $W(0|EC) = W(0|PC) = d(0, m) = 0$. *Q.E.D.*

The intuition for this result follows from the way in which performance contracts impose contracting costs on the relationship, costs that are not incurred in the less efficient production via employment contracts. The convexity of $d(\cdot, m)$ implies that specifying higher quality will impose an ever increasing cost of contracting. This cost, at some point, outweighs the benefits of the more efficient production of performance contracts, and there is some threshold $q(m)$ after which provision is less costly with employment contracts. Figure 1 illustrates this proof.

It is useful to revisit our point about productive efficiency in light of this result. When one thinks of services provided by the public sector, they indeed operate with lower incentives resulting in less productive efficiency. The conclusion that privatization is therefore always desirable fails to take into account that contracting involves transaction costs that need not be incurred when employment contracts are in place. As one city manager put it, "if I contract out a service then I have to hire another contract officer to manage the contract" (which is another interpretation of $d(\overline{q}, m)$).[13]

We now turn to the solution of the principal's problem, which can be restated as

$$\max_{q} \quad V(q, s) - C(q, m) \ .$$

[13] This trade-off between productive efficiency and contracting costs is related to other trade-offs identified in the literature. In the multi-task analysis of Holmstrom and Milgrom (1991) the costs of better incentives on the contractible task (more efficiency) is the loss of effort on the non-contractible task (costs of contracting). More closely related are the costs of specifying the job in Bajari and Tadelis (2001).

Let $q^*(m,s)$ be the principal's optimal choice of quality. From our above result, there will exist some threshold $q(m)$ such that if $q^*(m,s)$ is greater than $q(m)$, the principal will rely on employment, while if $q^*(m,s)$ is less than $q(m)$, the principal will use a performance contract.

Proposition 3: (*i*) The threshold $q(m)$ is decreasing in m; (*ii*) The solution $q^*(m,s)$ is increasing in s so that fixing m, there exists some $\widehat{s}(m)$ such that an employment contract is used if and only if $s > \widehat{s}(m)$; and (*iii*) $q^*(m,s)$ is non monotonic in m, but fixing s there is some $\widehat{m}(s)$ such that an employment contract is used if and only if $m > \widehat{m}(s)$.

Proof. Part (*i*) follows from the fact that $d(\overline{q},m)$ is increasing in m. Part (*ii*) follows from $V(q,s)$ being supermodular in (q,s). For part (*iii*), note that an increase in m has no effect on the cost of an employment contract, but raises both the marginal cost and the total cost of quality under a performance contract. Therefore, if the optimal contract given $m = m'$ is an employment contract, the optimal contract given $m > m'$ will also be an employment contract. This implies the final claim of (*iii*). To see that $q^*(m,s)$ need not be monotone in m, note that if the optimal contract given $m = m'$ is a performance contract, the optimal contract given $m > m'$ will be either a performance contract with lower quality or an employment contract, which potentially could have higher quality. *Q.E.D.*

That increased sensitivity will increase the optimal quality, and hence decrease the use of contracting, is straightforward. The effect of an increase in contracting difficulties m is more subtle. An increase in m will always decrease the use of contracting, but it can either decrease or increase the optimal service quality provided. If the principal is initially contracting for the service, and m increases from m_0 to m_1, she may continue to contract for a lower quality, or potentially switch to internal provision. In the latter case, quality may well increase, as is depicted in Figure 2C.

The conclusion from Proposition 3 is that services with either more sensitivity, or with more contracting difficulties, should be "made" with employment contracts, while services with less sensitivity and contracting difficulties should be "bought" with performance contracts. These are two of the central hypothesis we explore empirically in Section 5.

3.6 Extensions (Very Preliminary)

Scale Economies

Our model assumes that there are no fixed costs of production and hence no notion of a minimum efficient scale. For services that require substantial start-up costs, or involve indivisibilities in production, economies of scale may play a crucial role in determining the method of provision. In particular, a city that is too small to justify independent production of the service may want to contract with a private sector firm that provides the same service to other governments. Alternatively, a small city may want to reach an agreement with other local governments to jointly produce or contract for the service.

This suggests two empirical implications. First, the effects highlighted in our model may be most relevant for cities that are not very small or, in the case of small cities, for services that do not involve substantial scale economies. If scale economies are present, however, there are additional implications of the theoretical model we develop. In particular, services that are often contracted, say due to low values of m or s, will be able to have a private sector industry that, through competitive forces, takes advantage of the efficient scale of operation. Services that are less likely to be procured externally due to high values of m or s will not be adopted by smaller cities internally since they have a cost disadvantage. Thus, we would expect larger cities to be more responsive to increases in m or s.

Second, economies of scale may also reflect on the decision between producing a service internally, or purchasing it from another public provider. In particular, consider services that have high values of m so that contracting is less desirable. smaller cities may prefer then to use employment contracts with other local governments to economize on scale. Indeed, city managers have confirmed that many of the contracts with other local governments are employment contracts and not performance contracts. This implies another correlation in the data. Namely, that for high values of m, external contracting is more likely with other public providers. We address these implications explicitly in our empirical work, and indeed believe that scale economies play a substantial role in the contracting decisions of small cities.

Capital Inputs and Ownership

The model we developed assumes that labor is the only productive input, and that effort intensity affects the productivity of time. Our model can be extended to include capital inputs by assuming quality is a function of both capital and labor inputs. We sketch the ideas verbally.

When production requires capital as well as labor inputs, several new questions arise. First, what is the optimal mix of capital and labor? Second who makes decisions about capital acquisition? If, for example, the agent is more informed about the optimal composition of effort intensity and capital equipment, the principal may want to rely on the

agent's advice to make capital decisions. And third, who pays for (and hence owns) the acquired capital?

If the principal uses a performance contract, it should be fairly clear that if the agent bears the costs of capital acquisition, as well as the private time and effort costs, he will choose an efficient mix of inputs. This occurs because the agent will always want to deliver the specified quality using the least-cost available production plan. Imposing a constraint on the agent, such as choosing or specifying potentially inefficient capital equipment can only raise the costs of procuring a given level of quality. In this sense, the model can explain a commonly observed feature of performance contracts: the contractor not only decides on how to do the job, but generally owns and operates all the relevant capital equipment.

On the other hand, if the principal uses a pure employment contract, the agent will have no incentive whatsoever to make efficient capital input decisions. On the other hand, to procure a fixed quality level q, the principal would choose the capital input that allowed the agent to produce quality q in the least time at minimal work intensity e_0. So this suggests that under an employment contract, the principal would control capital acquisition, which again squares with what we observe in reality.

An open question, which requires formal modeling, is whether there are alternative contractual forms that might dominate pure employment or pure specific performance when capital decisions and ownership are included in the model. We plan to investigate this in future work.

Uncertainty and Flexibility

Our model assumes an environment where there is no uncertainty. Many city services are indeed relatively routine in nature, but for others, there may be significant uncertainty as to precisely what will need to be done. A prominent example is police and safety services. Though there are the routine tasks of patrolling the streets and cruising for traffic violations, the kind of events related to crime and neighborhood disruptions are so vast in nature and unpredictable, that specifying them in a well defined contract is all but impossible. When there is uncertainty, a contract that specifies certain requirements may be rendered irrelevant by circumstances, resulting in the need to renegotiate contractual details.

One way of incorporating uncertainty into our model is as follows. Let $1-\theta$ denote the probability that circumstances will be "routine," and θ (small) denote the probability of an exceptional event. Exceptional events require the agent to perform a different task. For simplicity, suppose that the production technology has the same form, $\hat{q} = \hat{e}\hat{t}$, where $\hat{e}, \hat{t}$ are the labor intensity and time spent on the new task. Moreover, assume that the

benefit of quality in the event of non-routine circumstances is $V(\hat{q}, s)$ and the cost of effort is $c(\hat{e})$ so the benefit and cost functions are unchanged.

If the initial contract is an employment contract, it is easy to see that the principal can obtain the same quality and benefit simply by re-directing the agent's time to the exceptional task. The same is not true of a performance contract, because provided θ is relatively small, it will be optimal to specify a performance standard only for routine events. Thus, if an exceptional event occurs, the principal will either get no benefit, or will have to re-contract, which involves additional costs of specification and monitoring. The cost of specifying a certain level of quality could be the same as in the initial contract, or in principle, higher or lower.

This simple model, which we believe could be expanded on, suggests that performance contracts will tend to work best for routine services, while employment will be relatively more efficient for services which demand greater adaptation and flexibility.

Theory of the Firm

Our interpretation of employment contracts as "make" and performance contracts as "buy" are not only appealing for their semantic convenience, but they indeed seem to reflect the way that many contractual relationships are performed. For the most part, the procurement of goods and services are done either by employees who are part of the firm and who have little discretion over the allocation of their time, or by contractors who are external to the firm's organizational structure, and who choose how to deliver a pre-specified product. As a rule of thumb, employees have directives that specify their work, but these are often verbal and not specified in a detailed contract. Outside contractors are subject to very detailed contracts and contractual compliance is measured vis-a-vis these formal specifications.

We fall short, however, from pushing this distinction to define the "organizational boundaries" of the principal, be it a city or a private firm. What we call a contracting relationship can be done with "employees" who have full discretion, and our employment relationship can be between a firm and an outside contractor who by choice defers his discretion over the allocation of his time.[14]

That said, casual empiricism suggests that the choice of firm boundaries looks very much like the choice of contractual relationships that we describe. Interestingly, if one considers the relationship between employee discretion and performance measures in firms, then the amount of discretion an employee has over his time allocation is generally inversely related to the sensitivity of his pay to performance (cites...). Thus, the

[14]Interestingly, there are legal constraints that do not allow for this kind of relationship (***expand, and mention benefits...***)

ingredients of our model may indeed be suited to describe a wide array of facts regarding the modes of production and incentives in organizations.

4 Data: Procurement by U.S. Cities

To test the implications of our theory we collected data on the procurement activities of U.S. cities. The data comes from several sources, most notably the Alternative Service Delivery survey conducted by the ICMA in 1997. The ICMA distributes the survey to a representative sample of roughly 5000 (??) U.S. cities; of these 914 cities responded. This data has been used in other empirical studies of local government provision, e.g., Hefetz and Warner (2004) and some of the references therein.

The ICMA asks city administrators to verify, out of a list of 64 services, which ones they provide and if they provide the service, by what mode of delivery (see Appendix A). Modes of delivery include provision by city employees only (we refer to this as employment), contracting out to a private for profit entity, contracting out to another public provider, a combination of the above, and other less frequent forms of procurement. In our data, therefore, a unit of observation is a city-service pair.

Our theoretical model predicts a positive correlation between service characteristics that reflect difficulties in contracting, and internal provision of services. We also predict that services subject to more resident sensitivity are likely to be procured with employment. To construct measures of service characteristics, we developed and administered an additional survey of city managers. For this survey we chose a representative subsample of 30 of the ICMA services, and asked respondents to rank each service along six dimensions. Four dimensions describe barriers to contracting and two are aimed at capturing political sensitivity and responsiveness to job provisions (see Appendix B). For *each* question we standardize the answers of *each* city administrator to have zero mean and unit variance before averaging the standardized responses to construct an average response for each service.

The first dimension we consider is how easy or hard it is to measure and monitor the provision of quality for each service. The resulting variable is MEASURE, where higher values of MEASURE are associated with harder measurement and monitoring problems, associated with higher values of m in the theoretical model. The second question asks city administrators to rank services from routine and easy to specify to unpredictable and hard to specify resulting in a need for ex post flexibility. The resulting variable is FLEXIBILITY where higher values of Flexibility are associated with less routine services.

The next two questions construct variables to measure contracting problems associated with two other theoretical concepts that have been explored and can be subject to

empirical scrutiny. The third variable is HOLDUP, which measures the difficulty in replacing contractors due to specificity or lack of competition. The idea that holdup leads to internal procurement was advocated by Williamson (1975, 1985), Klein, Crawford and Alchian (1978) and Hart (1995). The fourth variable is COST_VS_QUAL, which measure the severity of conflict between incentives to minimize costs and the incentives to provide quality. As Holmstrom and Milgrom (1991) argue, these problems will lead to lower cost incentives, and relate this to more internal organization of production. (See Hart, Shleifer and Vishny (1997) for an application of this conflict to the provision of government services). Arguably, this variable is endogenous to the extent that conflicts are an equilibrium value of a more primitive comparison of contracting costs and sensitivity, implying that including this variable in regressions is questionable.

The final two questions capture political economy factors. Question five generates the variable SENSITIVITY, which is a measure of how sensitive constituents are to failures in quality provision of different services. We associate this with the variable s in our model, and as we argued, higher values of s result in a demand for high quality, which will lead to employment becoming more desirable as compared to contracting. Finally, question six aims at ranking services along how many employees are needed to perform it, and results in the measure #EMPLOY. This may be associated with a political economy story in which city politicians prefer to provide jobs for their community members, so other things equal, services that require more employees may be more likely to be procured internally.[15]

In addition to the service characteristics, we collected a variety of city characteristics such as population, percent unemployment, form of government, region and other controls. These variables come from various publications of the US Census. [16] As we mentioned in Section 2, a city characteristic of interest is the form of Government, which is collected by the ICMA. The two common forms are Mayor/Council and Council-Manager; there are also two infrequently used forms of city government, Commission

[15]This may not be the case for some cities. In the Silicon Valley, for example, most city employees can't afford to live in the cities that they work in. However, for most cities this is not the case, and many cities offer housing assistance programs for their employees.

[16]We also investigate the possible effect of state laws that constrain a city's ability to use its internal labor force for political gains, and state laws that limit a city's ability to issue debt. Lopez de Silanes, Shleifer and Vishny (1997) report that these laws impact on the contracting decisions of county governments, though for a different and much smaller group of services. These laws were obtained from the U.S. Advisory Commission on Intergovernmental Relations (USACIR, 1990, 1993). Lopez de Silanes et. al. also obtained county level data on the percent of employees that are unionized. Unfortunately, this data does not seem to exist at the city level. Our estimates were very different from Lopez de Silanes et. al., implying that the effects of laws may not be as easy to interpret as they suggest.

and Town Meeting. One hypothesis is that decisions under the mayor-council form may reflect a larger political component due to the elected nature of the chief executive.

Finally, we conjectured from discussions with city managers we learned that cities may vary importantly by their age, either because older cities have had more time to set up infrastructure needed to provide services internally or because of the fairly recent advent of what are informally referred to as "contract cities" which do very little internal provision (Cupertino, California, just south of Stanford is a contract city). To test this hypothesis, we collected data on the date of incorporation to measure for city age.

We present the broad summary statistics of our data in tables 4.1 and 4.2. In table 4.1 we show the summary statics for city characteristics. As we can see, there is no difference in the way the cities provide the whole sample of 64 services, and our restricted sample of 30 services for which we have the constructed measures of questions 1 through 6 of our survey. In table 4.2 we show the summary statistics of procurement decisions across services. Table 4.3 presents the summary statistics of the aggregated measures for each of the six questions.

In tables 4.4 through 4.7 we provide some summary statistics that describe the breakdown of provision between the more prominent modes of provision, and these are presented with the data cut along several dimensions. Tables 4.4 through 4.6 focus on city characteristics, while table 4.7 focuses on a particular service characteristic, namely, how many cities provide the service. In table 4.4 we present the breakdown between modes of provision for different city sizes according to population (from the 2000 U.S. Census). As we can see, there is not much of a difference between smaller and larger cities, but larger cities do seem to provide more services with a mixture of in house employees and outside contractors.

In table 4.5 we present the same breakdown for different cities according to how many services these cities provide. Similar to Table 4.4, there is not much of a difference between cities that provide fewer services and cities that provide more services. Cities that provide more services do seem to provide more services with outside contractors, with an edge to outside public contractors.

Table 4.6 presents the breakdown for different forms of government. Strikingly, there is not much of a difference between different forms of government, and maybe surprising, this difference is less pronounced then for other city characteristics.

Finally, Table 4.7 breaks down the mode of provision by the popularity of services that are provided by cities. Interestingly, here the differences in the method of provision are very visible with clear trends. Services that are provided least frequently are fully contracted out almost half the time, while service that are provided most frequently are fully contracted out less than six percent of the time. Similarly, services that are

provided least frequently are procured through internal employment a third of the time, while service that are provided most frequently are procured through internal employment more than eighty percent of the time. This relationship between the frequency of provision and the mode of provision resonates with an interesting point that some city managers have made. These managers identify certain services as "core to mission", which though they have not defined in any clear way, they claim are very unlikely to be contracted out. As we will see shortly, this seems to be correlated with our measure of political importance, such as sensitivity, and to a lesser extent job provision.

5 Empirical Analysis

We use the data described above to test the predictions of our theoretical model. Before we begin with a more refined analysis, it is useful to consider the way in which the two broad views on government contracting decisions that we describe in the introduction prevail in our data. The first view, which is driven by efficiency considerations, should imply that service characteristics will be the primary influence on the choice of procurement. The second view, which emphasizes the private benefits to politicians of keeping service provision inside the government, implies that political and city characteristics should play a prominent role in the choice of procurement.

To get an impression of the importance of service versus city characteristics in explaining the variance in our data we run three linear probability regressions that capture city and service fixed effects. Letting y_{ij} be the procurement choice of city i for service j, the regressions we run of of the form $y_{it} = d_i\beta_i + d_j\beta_j + \varepsilon_{ij}$ where d_i is a dummy for city i and d_j is a dummy for service j. When we suppress the service dummies and only include city fixed effects ($d_j = 0$ for all j), we obtain an R^2 of 0.29, and when we suppress the city dummies and only include service fixed effects ($d_i = 0$ for all i), we obtain an R^2 of 0.26. Finally, when we include both fixed effects we obtain an R^2 of 0.47. These results imply that both city and service characteristics are important in explaining the choice of procurement methods in cities, that their influence is of similar orders of magnitude, and that the influence of both channels is fairly uncorrelated.

5.1 Service Characteristics

We test the way in which service characteristics, as measured by our survey questions, are correlated with the procurement decisions of cities. In Table 5.1 we present a the correlations of individual service characteristics on the choice of procurement, controlling for city fixed effects using city dummies. The first column represents the regression

suggested by our model. The dependent variable is the mode of procurement, and the two independent variables are measurement problems and service sensitivity. Each of the other columns represents a regression of the mode of procurement (the dependent variable) on a *single* service characteristic (the independent variable). The specification we use for each of the five regressions in table 5.1 is a linear probability model where for the dependent variable, y_{ij}, fully contracted equals 1, partially contracted equals 0.5 and only employees equals 0. We have performed the same regressions with partially contracted once being counted as 0, and once as 1, and the signs and significance of the coefficients are preserved.[17]

As the results indicate, all the coefficients are negative and highly significant. The negative correlation with MEASURE and SENSITIVITY in the first column are consistent with the correlations predicted by our basic model. The negative correlation with HOLD-UP is consistent with arguments from Transaction Cost Economics as advocated by Williamson (1985), and the negative correlation with COST_VS_QUAL is in line with the implications of the Multitasking framework developed by Holmstrom and Milgrom (1991, 1994).

5.2 Service Characteristics and Economies of Scale

When we consider the effects of economies of scale as discussed in section 3.6, more refined predictions can be taken to the data. First, larger cities will have the economies of scale advantage to bring services inside the city with employees. Therefore, at the margin, we would expect larger cities to respond more strongly to our six survey measures of contracting disadvantages than smaller cities. To test for this prediction we run six regressions on each of the single service characteristics with another independent variable that is the interaction of city size—as measured by the city population from the 2000 census—with the specific service characteristics. The prediction is that this interaction effect will be negative (less external contracts) since larger cities will be more responsive to the increases in the difficulties of contracting.

As table 5.2 shows, this is confirmed for each of the six characteristics. Interestingly, if we consider the effect of the service characteristics on the smallest cities then these are very small. In particular, the smallest city in our data has a log-population of

[17] We also ran Probit and Logit regressions with these three specifications of partial contracting, and once again, the significance and signs remained robust. We also ran regressions that only consider employment versus contracting, excluding partial contracting, and the qualitative results remain robust. Finally, we performed the regressions allowing for clustering in cities, and the results were again almost identical.

Notice that in the regressions above we lump two different procurement choices together: contracting with a private provider and contracting with a public provider. We argued in section 3.6 that economies of scale will have additional implications with respect to the distribution of choices between these alternatives. Namely, services with low costs of contracting (e.g., low values of MEASURE or FLEXIBILITY) will be contracted out, and private sector firms can exploit the economies of scale across several adjacent municipalities. For services with high costs of contracting, these economies of scale cannot be exploited by smaller cities. Then, a cluster of smaller cities may benefit from having one city provide the service to other adjacent municipalities.

This would imply that at higher levels of contracting costs, some services will be bought from the public sector. This in turn implies that if we only consider our regressions for employment versus private sector contracting and disregard the observations with public sector contracting, then the effects of contracting costs will be more pronounced, i.e., the slopes will be more negative. We test this prediction in table 5.3 that indeed verifies this implication of economies of scale. For each of the four contracting costs (MEASURE, FLEXIBILITY, HOLD-UP and COST_VS_QUAL) the slopes in table 5.3 are significantly steeper, and these are estimated with very strong accuracy

Interestingly, these effects are not pronounced for our political measure of SENSITIVITY. This would be consistent with a story in which a city's administration wants to retain control over sensitive services, which implies that economies of scale are not important enough for them to give up this control. This may also be related to the ideas that some city managers expressed with respect to some service being "core to mission", which deserves a more careful look.

5.3 City Characteristics

To test for the effect of city characteristics on the choice of procurement, we regress the procurement method on demographics such as the population size and the unemployment rate, and on city characteristics such as the form of government (council-manager or mayor-council), the age of the city, the area (square miles) of the city, and its broad geographical location. Controlling for service characteristics with service dummies, we find that whether a city was incorporated after 1950 and whether the city is in the West region are significant.

Cities incorporated after 1950 contract out on average 3 more services than older cities. This is consistent with stories suggested by city managers in which younger cities have less of a history and infrastructure to produce internally. We have tested for several breakpoints in time, and choosing around 1950 produced the strongest results. We believe this may be a consequence of the baby boom after which suburban areas

that were not incorporated grew, which in turn increased the gains from incorporation, and these "newcomers" relied more on contracting. City managers with whom we spoke anticipated that cities in the west are more likely to use more contracting, and indeed these cities contract out about 2 more services. Although the story we were told is not deep, it is worth mentioning. Namely, the history of the west is more individualistic and of free enterprise, which may explain why such a difference is present.

Interestingly, the form of government does not seem to be very important. To more carefully consider the effect of governance we run the six service characteristic regression with the interaction of form of government—mayor or manager—with the specific service characteristics. In these regression there was no significant interaction.

It is worth noting that we could not obtain data on unionization of employees at the city level. In our discussions with city managers it became clear that this is a thorny issue that plays a role in many decisions, the procurement decision being one. In general unions tend to resist contracting out since it us in effect a loss of control over some of the city's activities.[18]

6 Conclusion

- The procurement problem of cities is an important one, and it can be influenced both by efficiency considerations and by political considerations. We argue that efficiency considerations would distinguish choices across service characteristics, while political considerations are more likely to involve choices across city characteristics.

- We develop a general model of procurement that emphasizes the trade-offs between the productive efficiency of performance contracts and the low costs of contracting with inefficient employment contracts. We derive comparative statics that have implications with respect to measurable decisions made by cities, and test the

[18] As mentioned in the introduction, we regress the choice of procurement on state laws in the same way that Lopez de-Silanes et. al. (1997) do as best as we can, and we control for service fixed effects and other city characteristics. Though many of the coefficients are significant, only one remains significant with the sign that Lopez de-Silanes et. al. find in their analysis: a law that prohibits political activity by employees. Other laws and covariates either loose significance or turn out to be significant with the opposite sign. We conclude that the effect of laws is at best ambiguous, and it is unclear whether there are consistent stories that can account for these correlations. In the USACIR data we found laws that are relevant to Lopez de Silanes et. al.'s arguments that have been omitted from their analysis, and when those are included the results are even more ambiguous. We found this to be true even when we replicated the regressions that they run on county level data.

hypotheses generated from the theoretical analysis.

- Our empirical analysis suggests correlations that are consistent with choices made on the basis of efficiency considerations. Though the view that political considerations influence the procurement choices of cities are supported by the fixed effects of cities, our available data does not seem to account for political influences in interpretable ways.

- Additional work that would carefully capture outcomes data would be useful in further investigating the efficiency consequences of procurement choices made by cities.

- Our theoretical framework emphasizes the contractual choices of buying time, or inputs, versus buying performance, or outputs. This distinction is not new, and has been mentioned primarily in the context of incentive contracts (Williamson, 1975, Lazear, 1986, 2000) but it has not received much emphasis in the literature that explores the boundaries of firms. This distinction may be useful in understanding the boundary choices of firms, and the relationships between incentives and the organization of production.

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Appendix A: Tables

Table 4.1: Summary Statistics for Cities

Variable	Mean	Std Dev	5%	95%
Service Provision (All 64 services)				
Number of services provided	40.05	11.08	24	59
Number of services provided (provision method reported)	31.75	13.36	3	53
% inhouse	60.61%	28.57%	0.00%	100.00%
% fully private	14.44%	17.12%	0.00%	43.75%
% fully public	13.20%	18.44%	0.00%	48.57%
% partial	11.30%	15.16%	0.00%	41.18%
% other means	0.46%	1.64%	0.00%	3.51%
Service Provision (subsample of 30 services)*				
Number of services provided	20.70	5.21	12	29
Number of services provided (provision method reported)	16.05	6.70	2	26
% inhouse	59.63%	29.49%	0.00%	100.00%
% fully private	16.45%	18.84%	0.00%	52.63%
% fully public	11.78%	17.77%	0.00%	45.45%
% partial	11.72%	15.96%	0.00%	42.11%
% other means	0.42%	1.84%	0.00%	4.00%
City Characteristics (Census)				
Area (square miles)	24.00	42.70	2.80	78.10
Population (2000)	59,215	182,005	5,423	173,627
County-level median household income (1997)	38,767	8,533	27,147	57,267
Civilian labor force (1999)	55,403	129,526	14,122	142,809
% Unemployment rate (2000)	4.092	2.469693	1.6	8.5
Form of government (0=manager, 1=mayor/council)	24.97%	43.31%	0.00%	100.00%

Table 4.1: Summary Statistics of City Characteristics

Table 4.2: Summary Statistics for Service Provision and Method of Delivery

Service	# cities providing	# cities providing that report provision	make	buy private	buy public	partial buy	other
Animal control	761	643	58.0%	11.7%	20.7%	8.9%	0.8%
Building security	579	450	74.9%	14.0%	0.7%	10.4%	0.0%
Buildings and grounds maintenance	875	642	67.0%	3.9%	0.2%	28.8%	0.2%
Collection of delinquent taxes	553	457	35.7%	7.2%	42.5%	13.8%	0.9%
Commercial solid waste collection	508	365	34.0%	53.2%	0.5%	11.8%	0.5%
Crime prevention/patrol	885	706	92.9%	0.0%	5.1%	2.0%	0.0%
Drug and alcohol treatment programs	204	172	1.7%	33.1%	48.3%	6.4%	10.5 %
Emergency Medical service	691	532	57.3%	14.3%	14.1%	13.5%	0.8%
Fire prevention suppression	823	628	90.8%	0.3%	7.8%	1.1%	0.0%
Insect/rodent control	423	366	37.7%	14.8%	35.8%	11.2%	0.5%
Inspection/code enforcement	889	721	87.7%	2.5%	1.0%	8.9%	0.0%
Legal services	731	561	35.8%	41.9%	1.6%	20.5%	0.2%
Operation and maintenance of recreation facilities	853	643	78.8%	1.2%	5.3%	14.3%	0.3%
Operation of daycare facilities	209	180	18.3%	58.3%	17.2%	4.4%	1.7%
Operation of libraries	562	439	55.1%	3.9%	37.4%	3.6%	0.0%
Operation of museums	326	218	21.1%	43.1%	28.0%	6.0%	1.8%
Operation of parking lots and garages	341	264	75.4%	13.3%	4.5%	6.4%	0.4%
Parks landscaping and maintenance	866	664	74.1%	3.3%	4.7%	17.9%	0.0%
Programs for the elderly	518	317	35.6%	13.6%	25.6%	21.5%	3.8%
Residential solid waste collection	653	497	52.9%	39.6%	0.6%	6.4%	0.4%
Sanitary inspection	450	388	46.9%	4.1%	42.0%	7.0%	0.0%
Sewage collection and treatment	734	604	68.2%	4.6%	15.2%	11.9%	0.0%
Snow plowing/sanding	615	475	84.4%	1.1%	2.1%	12.2%	0.2%
Solid waste disposal	518	411	33.8%	39.2%	22.6%	3.6%	0.7%
Street repair	883	571	52.5%	6.0%	1.2%	40.3%	0.0%
Street/parking lot cleaning	825	637	75.8%	12.7%	0.9%	10.4%	0.2%
Tree trimming and planting on public rights on way	817	550	51.8%	14.9%	1.5%	31.6%	0.2%
Utility meter reading	604	513	78.4%	14.0%	3.7%	3.3%	0.6%
Vehicle towing and storage	531	462	7.6%	83.3%	2.2%	6.5%	0.4%
Water treatment	672	572	77.6%	3.7%	14.7%	4.0%	0.0%

Table 4.3: Summary Statistics for Service Characteristics

Service Name	measure	flexibility	holdup	costvsquality	numemploy	sensitivity
Animal control	0.204168	0.3740579	0.3939517	-0.3134748	0.0085036	0.251043
Building security	-0.4517552	-0.3637439	-0.7600064	-0.4588112	-0.3679338	-0.7350549
Buildings and grounds maintenance	-0.6876074	-0.2699951	-0.7946846	-0.2270933	0.0438502	-0.3777477
Collection of delinquent taxes	-0.4491754	-0.4076928	-0.2550122	-0.6137352	-0.8383054	-0.6137235
Commercial solid waste collection	-0.9555222	-0.6093711	-0.2751826	-0.4597398	-0.3911422	-0.2212436
Crime prevention/patrol	1.111676	0.9911567	1.102881	1.098096	1.004551	0.9312993
Drug and alcohol treatment programs	0.830986	1.115195	0.5081858	0.8844951	-0.2704561	0.2516036
Emergency Medical service	0.3193143	0.1242775	0.727737	0.6080957	0.5038671	1.017435
Fire prevention suppression	0.8855673	0.2771463	1.079387	0.3966445	1.24079	0.7680829
Insect/rodent control	0.4736264	0.1058937	-0.136147	-0.153477	-0.2917415	-0.1808836
Inspection/code enforcement	0.8355353	0.8241334	0.5580254	0.8253134	0.0258256	0.2383511
Legal services	0.1269747	0.5519041	0.0878325	0.3665676	-0.0955713	-0.8532079
Operation and maintenance of recreational facilities	0.2047761	0.0430678	0.0657181	0.0607167	0.2548876	0.2966021
Operation of daycare facilities	0.5293912	0.5169723	0.0912267	0.6278273	0.3141589	0.5641885
Operation of libraries	0.279841	-0.0698593	0.3375404	0.2250085	0.8349478	0.4172244
Operation of museums	0.38333	-0.0279509	0.3795955	0.2508702	0.2900673	-0.096271
Operation of parking lots and garages	-0.5471097	-0.6001663	-0.9122643	-0.7352628	-0.4916489	-0.7400047
Parks landscaping and maintenance	-0.3094459	-0.6196305	-0.4851577	-0.4366722	0.2527163	0.0798958
Programs for the elderly	0.7646807	0.612753	0.35938	0.6269119	0.3459396	0.3647987
Residential solid waste collection	-1.087793	-0.7498615	-0.0294873	-0.4597398	-0.030644	0.7728643
Sanitary inspection	0.399224	0.2609694	0.2474656	-0.0868649	-0.3632174	-0.2205075
Sewage collection and treatment	0.0042373	0.0331155	0.5533405	0.2985473	0.374664	0.0265272
Snow plowing/sanding	-0.2920465	0.0041287	-0.3919034	-0.1626498	-0.4159734	-0.1325222
Solid waste disposal	-0.4415992	-0.5012363	0.4047891	-0.5436118	-0.7342005	-0.6701638
Street repair	-0.1735218	0.1125744	-0.5116626	-0.0167599	0.0351865	0.3117651
Street/parking lot cleaning	-0.3476348	-0.7476349	-1.033445	-0.4049861	-0.3486972	-0.178599
Tree trimming and planting on public rights on way	-0.3004984	-0.19539	-0.9190338	0.198705	-0.162441	0.1737647
Utility meter reading	-0.5609902	-0.9186628	-0.4567038	-0.9246223	-0.6089266	-0.6669905
Vehicle towing and storage	-0.6512005	-0.3695806	-0.8399002	-1.105323	-0.4432959	-0.279159
Water treatment	-0.1340894	0.0943633	0.5333698	0.21523	0.374664	0.3764238

Table 4.4: Summary of Modes of Provision by Population Quintiles

Quintile	1	2	3	4	5
City employees only	61.1%	62.1%	56.3%	56.7%	57.6%
Fully contract: Private Only	13.1%	12.8%	13.6%	13.0%	11.6%
Fully contract: Public Only	13.1%	12.3%	14.8%	13.2%	9.2%
Partially contract: Pub. & Pr.	8.7%	9.2%	11.1%	12.5%	16.4%
Otherwise contracted	4%	3.6%	4.1%	4.6%	5.2%
	100%	100%	100%	100%	100%

Quintiles correspond to city population as follows: 1. less than 14,222;
2. 14,222-22,563; 3. 22,563-36,758; 4. 36,578-69,368; 5. greater than 69,368

Table 4.5: Summary of Modes of Provision by Number of Services Provided by Cities

Quintile	1	2	3	4	5
City employees only	62.4%	66.6%	62.4%	55.6%	46.0%
Fully contract: Private Only	13.1%	11.3%	9.8%	13.2%	16.8%
Fully contract: Public Only	12.3%	8.9%	8.3%	13.4%	20.2%
Partially contract: Pub. & Pr.	9.0%	9.8%	14.3%	13.2%	11.4%
Otherwise contracted	3.1%	3.4%	5.2%	4.6%	5.6%
	100%	100%	100%	100%	100%

Quintiles correspond to no. of services provided by city as follows:
1. less than 30; 2. 30-36; 3. 36-41; 4. 41-49; 5. more than 49

Table 4.6: Summary of Modes of Provision by Form of Government

Quintile	Mayor/Council	Council Manager	Commission	Town Meeting
City employees only	60.9%	58.1%	69.5%	0.0%
Fully contract: Private Only	14.5%	12.4%	10.0%	60.0%
Fully contract: Public Only	11.3%	13.0%	6.8%	35.0%
Partially contract: Pub. & Pr.	10.3%	11.8%	8.4%	0.0%
Otherwise contracted	3.0%	4.7%	5.3%	5.0%
	100%	100%	100%	100%

Table 4.7: Summary of Modes of Provision by Frequency of Service Provision

Quintile	1	2	3	4	5
City employees only	33.4%	46.0%	59.6%	73.4%	84.7%
Fully contract: Private Only	19.4%	23.7%	13.2%	5.5%	1.5%
Fully contract: Public Only	29.3%	18.1%	6.3%	3.6%	4.3%
Partially contract: Pub. & Pr.	8.7%	7.3%	17.6%	15.7%	7.5%
Otherwise contracted	9.2%	4.9%	3.3%	1.8%	2.0%
	100%	100%	100%	100%	100%

Quintiles correspond to no. of cities providing the service as follows: 1. less than 403; 2. 403-528; 3. 523-617; 4. 617-685; 5. greater than 685

Table 5.1: Linear Probability Regressions for Contracting

MEASURE	-.0410				
	(.0068)***				
FLEXIBILITY		-.0426			
		(.0062)***			
HOLDUP			-.0391		
			(.0048)***		
COST_VS_QUAL				-.1019	
				(.0060)***	
SENSITIVITY	-.0839				
	(.0078)***				
#EMPLOY					-.1492
					(.0060)***
constant	.3308	.3305	.3313	.3304	.3384
	(.0031)***	(.0031)***	(.0031)***	(.0031)***	(.0031)***
Sample size	14,396	14,396	14,396	14,396	14,396

Fully Contracted=1, Partial Contracts=0.5, Only Employees=0;
Includes city fixed effects; Robust standard errors in parentheses
*significant at 10%; **significant at 5%; ***significant at 1%

Table 5.2: Linear Probability Regressions for Contracting: Population Size and Service Characteristics

MEASURE	-.2467					
	(.0541)***					
FLEXIBILITY		.2567				
		(.0625)***				
HOLDUP			.3292			
			(.0476)***			
COST_VS_QUAL				.1954		
				(.0599)***		
SENSITIVITY					.1292	
					(.0629)***	
#EMPLOY						.0591
						(.0071)**
Qi× ln(Population)	-.0317	-.0291	-.0356	-.0289	-.0229	-.0203
	(0052)***	(.0060)***	(.0046)***	(.0057)***	(0060)***	(.0057)***
constant	.3313	.3309	.3315	.3308	.3382	.3388
	(.0031)***	(.0032)***	(.0032)***	(.0031)***	(.0032)***	(.0032)***
Sample size	14,213	14,213	14,213	14,213	14,213	14,213

Fully Contracted=1, Partial Contracts=0.5, Only Employees=0;
Includes city fixed effects; Robust standard errors in parentheses;
Qi×Population is the interaction of population with the specific service characteristic that is used in the particular column;
*significant at 10%; **significant at 5%; ***significant at 1%

Table 5.3: Linear Probability Regressions for Contracting: Employee versus Private Contracting Only

MEASURE	-.1040				
	(.0068)***				
FLEXIBILITY		-.0773			
		(.0060)***			
HOLDUP			-.0882		
			(.0044)***		
COST_VS_QUAL				-.1259	
				(.0060)***	
SENSITIVITY	-.0597				
	(.0080)***				
#EMPLOY					-.1668
					(.0055)***
constant	.2331	.2304	.2302	.2311	.2421
	(.0031)***	(.0031)***	(.0030)***	(.0030)***	(.0031)***
Sample size	12,271	12,271	12,271	12,271	12,271

Fully Contracted=1, Partial Contracts=0.5, Only Employees=0;
Includes city fixed effects; Robust standard errors in parentheses
*significant at 10%; **significant at 5%; ***significant at 1%

Table 5.4: Linear Probability Regressions for Contracting: City Characteristics

Area	-.00019	-.00016
	(.00011)*	(.00011)
ln(Population)	-.00989	-.0141
	(.00837)	(.0083)*
FORM_GOV	.00138	-.00029
	(.0126)	(.0126)
UNEMP_RATE	-.00492	
	(.00191)***	
YEAR_INC	.00002	-3.61e-06
	(.00014)	(.00014)
YEAR>1950	.0738	.0799
	(.0176)***	(.0145)***
Midwest	.0104	.0145
	(.0182)	(.0182)
South	-.0006	.0004
	(.0193)	(.0193)
West	.05104	.0483
	(.0191)***	(.0190)***
constant	.4543	.3960
	(.2864)	(.2860)
Sample size	6,479	6,479

Fully Contracted=1, Partial Contracts=0.5, Only Employees=0;
Includes city fixed effects; Robust standard errors in parentheses
*significant at 10%; **significant at 5%; ***significant at 1%

Appendix B: Service Characteristics Survey

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Questionnaire for Service Provision in Cities

Dear City Manager/Administrator,

We are conducting a study to better understand the way in which local governments choose to deliver public services. In particular, we would like to understand more clearly some of the limitations and barriers to contracting out service delivery.

Part of our study uses survey data collected by the International City Management Association (ICMA) regarding local governments' service delivery choices, and is augmented by US Census data. We believe we can make significantly better use of this data by obtaining a small amount of additional information from experienced administrators that is targeted specifically at obstacles to contracting out service delivery.

On each of the next pages is a statement aimed at characterizing a potential barrier to private sector service delivery. Following this is a list of city services. For each statement, you will be asked to circle a response for each of the listed services from a scale of 1 to 5, and the scale is tailored to the individual question. If there is a service that you do not provide, but feel comfortable adding your assessment, please do.

The questionnaire should take no more than fifteen minutes. We understand that your time is extremely valuable. The information you can provide, however, will help us considerably. Ultimately, we hope that our study will provide significant value for city administrators in evaluating their outsourcing practices, and we plan to share our findings with you once they are obtained.

Please return the questionnaire to either of us by email, fax or regular mail, and if you have any questions or comments, feel free to use the contact information listed above.

Thank you for participating in this project,

Jonathan Levin Steve Tadelis

Question 1: Measuring and Monitoring Service Quality.
To evaluate performance, it is important to measure and monitor the quality of the service provided. For each service listed below, imagine you were considering contracting out the service. Assess how **easy or difficult it would be to measure and monitor the quality** of service provision.

	Easy	Relatively Easy	Average	Relatively Hard	Hard
Public Works & Transportation:					
Residential solid waste collection	1	2	3	4	5
Commercial solid waste collection	1	2	3	4	5
Solid waste disposal	1	2	3	4	5
Street repair	1	2	3	4	5
Street/parking lot cleaning	1	2	3	4	5
Traffic sign/signal installation/maintenance	1	2	3	4	5
Tree trimming & planting on public rights of way	1	2	3	4	5
Inspection/code enforcement	1	2	3	4	5
Operation of parking lots and garages	1	2	3	4	5
Water distribution and treatment	1	2	3	4	5
Sewage collection and treatment	1	2	3	4	5
Public Utilities:					
Utility operation and management:	1	2	3	4	5
Utility meter reading	1	2	3	4	5
Public Safety:					
Crime prevention/patrol	1	2	3	4	5
Fire prevention and suppression	1	2	3	4	5
Emergency medical service	1	2	3	4	5
Vehicle towing and storage	1	2	3	4	5
Health and Human Services:					
Sanitary inspection	1	2	3	4	5
Insect/rodent control	1	2	3	4	5
Animal control	1	2	3	4	5
Operation of daycare facilities	1	2	3	4	5
Programs for the elderly	1	2	3	4	5
Drug and alcohol treatment programs	1	2	3	4	5
Parks, Recreation and Culture:					
Operation and maintenance of recreation facilities	1	2	3	4	5
Parks, landscaping and maintenance	1	2	3	4	5
Operation of libraries	1	2	3	4	5
Operation of museums	1	2	3	4	5
Support Functions:					
Buildings and grounds maintenance	1	2	3	4	5
Building security	1	2	3	4	5
Fleet management/vehicle maintenance	1	2	3	4	5
Collection of delinquent taxes	1	2	3	4	5
Legal services	1	2	3	4	5

Question 2: Need for Flexibility

For some services there is significant uncertainty about precisely what (or when) things need to be done. Other services are more predictable, making it easier to specify in advance what needs to be done. For services that are less predictable there is a greater need for flexibility and adaptive guidance. For each service below please rank the need for flexibility and adaptive guidance.

Question 3: Provider Scarcity or Lock-in.

For some services it may be hard to find qualified providers or to switch providers once an initial provider is found. This could be due either to specialized expertise, specialized or expensive physical capital, or the lack of a closely related private sector market. For each service below please assess the ease of finding or switching outside providers.

Question 4: Cost/Quality Conflicts.

There is always the potential for conflict between the desire to save on cost and the desire to provide a higher quality of service. For each of the services below please assess the severity of conflict between controlling costs and providing quality. (We are not asking which services are relatively expensive, but rather for each given service, the potential for conflict between cost control and quality provision)

Question 5: Resident Sensitivity and Response.

Problems with service provision may trigger a response from city residents. Residents are more aware of, and more sensitive to problems with some services as compared to others. For each service below, please assess the level of resident sensitivity to problems that might be encountered in the provision of that service.

Question 6: Provision of jobs for the community.

The provision of city services can provide important jobs for the local community. The actual provider of the service, whether it be the city, a neighboring government, or a private provider, has a degree of control over who gets these jobs. For each service below, please assess the importance to the local community of the jobs created in the provision of this service.