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

Jonathan Levin and Steven Tadelis
Department of Economics
Stanford University
Stanford, CA 94305-6072

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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 "make-or-buy" procurement model that highlights the trade-off between productive efficiency and the costs of contract administration. We construct a dataset of service provision choices by U.S. cities and show that service characteristics are important determinants of contracting choices, while easily measurable city characteristics play a much smaller role. Our analysis suggests that economic efficiency concerns, as well as politics, matter for contracting decisions. We discuss implications 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 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 examine the determinants of government privatization at the local level. In particular, we consider the choice faced by local governments of whether to provide services "in-house" or through external contracts. We begin by developing a theoretical model of this choice. The model highlights the trade-off between the inefficiencies of internal provision and the costs of specifying or implementing contracts with private providers. 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 outside contractors, despite the fact that these produce with superior productive efficiency.

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. The second is *performance*, which specifies a minimal quality level that the agent is expected to deliver. 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, which we call an *employment contract*, or buying his output performance, which will 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 organization of production. 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.

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 roughly 60 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 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.

We match this detailed service provision data with city characteristics gathered from a variety of sources. These data include population, median income, unemployment, the city's form of government, date of incorporation and other demographic variables. 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.

The last component of our data relates to the characteristics of different city services. Our theory predicts that contracting decisions will be affected by characteristics such as the ease of measuring and monitoring performance, and the sensitivity of constituents to low quality provision. Unfortunately, such data is not easily available. For this reason, we conducted a small survey of city 22 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

[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.

[2] This was out of a total of 30 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.

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.

We find that all of our constructed service characteristics are significantly correlated with city contracting decisions as suggested by our theoretical model. That is, our measures of contracting difficulty are all positively correlated with the decision to provide services internally. Services that are more sensitive to voter reaction are also more likely to be procured internally, as are services with a relatively larger labor force.

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, city population and the age of the city are significantly correlated in an interpretable way. In contrast to Lopez-de-Silanes et al.'s (1997) 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.

While our empirical analysis focuses on contracting decisions by local governments, our study, and in particular our theoretical model, have implications for the private sector as well. The procurement problem we investigate is generally applicable, be that of an automobile manufacturer who needs to procure a braking system, an accounting firm who needs to procure information technology services. Our theory, however, suggests an approach different from the more common approach of defining organization as the sets of assets that are owned together (Hart 1995). We view internal organization as buying the agent's time, or an *employment contract*, and market transactions as buying output using a *performance contract*. This interpretation of the make or buy problem is not just a semantic one, but indeed seems to reflect the way that many organizations operate.[3]

Still, several reasons inspire us to investigate the procurement practices of city administrations in order to shed light on the more general procurement problem. First, we argue that cities are similar in many ways to firms in that they face the same make or buy problem. The list of services that cities procure is long, and these services vary in many important ways. Second, different cities are similar in ways that different firms are not. It is not obvious in what ways different industries should differ in their practices, and what the reasons for these differences would be.[4] Cities, in contrast, face the same

[3] As a rule of thumb, employees have directives that specify their work, but these are often verbal and not specified in a detailed contract so that specific performance contracts are rarely used. In contrast, outside contractors are subject to very detailed contracts and contractual compliance is measured vis-a-vis these formal specifications.

[4] For example, all producers of electronics systems need power supply units. But should manufacturers

production process and broadly speaking share the same objectives. Though cities may differ from one another in important ways, like the size of population, the weather they face, the demographics of their residents and more, public data is available that would allow a careful study to control for these differences.

A challenge, however, in studying the procurement choices of cities and other government procurement agencies is that the objective function is not one of pure profit maximization. Our premise is, therefore, that pressure on local governments cause them to be sensitive to some degree of cost minimization in delivering the services that they provide. This pressure is part of the political system, ether through competition of alternative officials, or through the incentives of residents to reduce the tax bill while maintaining an adequate quality of service provision.

Though our main focus is on cost minimization objectives, we consider the effects of other motives on procurement choices such as political and ideological Motives that are unlikely to explain variation in procurement across services.[5] Instead, they would rather explain variation across measures of political variables, labor unions, demographics and other ideological tendencies that would be city specific. To explain variation across services, we need to have a theory that argues on how service specific characteristics will affect the efficiency (or possibly political) considerations of which services should be procured with employees and which with contractors. This is the goal of our theoretical model, which is also tailored to adequate measurable characteristics that can be taken to the data and tested in a meaningful way.

The economics literature that tries to understand the organization of production within and across firms has a long history, starting with Coase (1937), through Williamson's (1975, 1985) Transactions Costs approach to more recent developments of agency theory like Holmstrom and Milgrom (1991, 1994) and the property rights approach originating in Grossman and Hart (1986) and Hart and Moore (1990). The research on procurement at the local government level has received much less attention.

*****LITERATURE REVIEW TO BE COMPLETED*****

of televisions procure their power supplies in the same way that computer manufacturers should? The answer may depend on specific production processes that would be hard to measure and account for.

[5] In particular, we explore the empirical relationships of procurement decisions with demographic and legal characteristics, similar to Lopez de Silanes, Shleifer and Vishny (1997), but find little evidence consistent with theirs.

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.[6] 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.

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.[7] 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.[8]

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

[6] Quote census reports...*******

[7] 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.

[8] 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/

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.

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.[9] 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.[10] Their work suggests that city administrators are responding to changing conditions, or perhaps are experimenting with different methods. Based on

[9] 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.

[10] 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

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.

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 $c''(\cdot) > 0$.[11]

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

in Ballard and Warner (2000) who describe and analyze 26 cases of cities who switched from contracting to employment.

[11] 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.

take some pride in his work, or fear looking bad if nothing is done.[12] 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 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, $V_{qq}(q, s) < 0$.[13]

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

[12] 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.

[13] 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.

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, 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.[14] 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

[14] 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 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.

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 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 $d(\overline{q}, m)$).[15]

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

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

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.

[15] 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).

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 that 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.

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. If a cluster of cities chooses to privatize the service and employ a private contractor, they will all be subject to contracting costs. If, however, one city produces internally and sells the service to the other cities then there are larger scale efficiencies, and at least one city does not bare the contracting costs. 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 may 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.[16]

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 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 of these that describe barriers to contracting and two are aimed at capturing political sensitivity and responsiveness to job provisions (see Appendix C). 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.

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

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).

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.[17]

In addition to the service characteristics, we collected a variety of city characteristics such as population, average wages, percent unemployment, percent of the population with high school degrees. These variables come from various publications of the US Census. 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

[17]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.

impact on the contracting decisions of county governments, though for a different and much smaller group of services.[18]

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 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 across services.

In tables 4.3 through 4.6 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 4.3 through 4.5 focus on city characteristics, while table 4.6 focuses on a particular service characteristic, namely, how many cities provide the service. In table 4.3 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.

Table 4.3: Summary of Modes of Provision by Population Quintiles

[18]These laws were obtained from the U.S. Advisory Commission on Intergovernmental Relations (US-ACIR, 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.

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

In table 4.4 we present the same breakdown for different cities according to how many services these cities provide. Similar to Table 4.3, 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 4.4: 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 4.5 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.

Table 4.5: 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%

Finally, Table 4.6 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.

Table 4.6: 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

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 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 correlate 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, we obtain an R^2 of 0.29, and when we suppress the city dummies and only include city fixed effects, 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, 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. Each column represents a regression of the mode of procurement (the dependent variable) on a *single* service characteristic (the independent variable), controlling for city fixed effects using city dummies. The specification we use for each of the six 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 six measures are preserved.[19]

As the results indicate, all the coefficients are negative and highly significant. The negative correlation with MEASURE and SENSITIVITY are consistent with the correla-

[19]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.

tions 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).

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 the six regressions above on 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.

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.

5.2 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 and the area (square miles) of the city. Controlling for service characteristics with service dummies, we find that a city's square mileage, and whether a city was incorporated after 1950, are significant. The form of government is close to significant depending on the specification.

The magnitude of the effect of a city's area is very small: a shift of one standard deviation from the median size (moving from a city with 24 square miles to one with 66 square miles) will decrease the number of contracted services by less than one service. Cities incorporated after 1950 contract out on average 2 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.

Interestingly, the form of government does not seem to be very important. The first specification suggests that cities run by city managers have a slight tendency to procure more with contracts, which may resonate with the idea that mayors may be more sensitive to politics (and like larger governments and loyal employees). To more carefully consider this 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, suggesting that once we control for service characteristics generated from our survey, the correlation with the form of government disappears.

Finally, 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.[20] 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

[20] Our measures for unemployment rates and wage premiums are at the county level, since we could not find this data at the city level.

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.

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.

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 employment contracts. We derive comparative statics that have implications with respect to measurable decisions made by cities, and test the hypotheses generated from the theoretical analysis.

- Our empirical analysis suggests correlations that are consistent with choices made on the basis of efficiency considerations, and are less supportive of the view that political considerations are determining the procurement choices of cities.

- 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.

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 Services

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 5.1: Linear Probability Regressions for Contracting

MEASURE	-.0822					
	(.0054)**					
FLEXIBILITY		-.0412				
		(.0061)**				
HOLDUP			-.0347			
			(.0048)**			
COST_VS_QUAL				-.0998		
				(.0060)**		
SENSITIVITY					-.1033	
					(.0063)**	
#EMPLOY						-.1462
						(.0059)**
constant	.3355	.3346	.3348	.3337	.3405	.3405
	(.0031)**	(.0032)**	(.0032)**	(.0031)**	(.0032)**	(.0032)**
Sample size	14,076	14,076	14,076	14,076	14,076	14,076

Fully Contracted=1, Partial Contracts=0.5, Only Employees=0;
Includes city fixed effects; Robust standard errors in parentheses

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

MEASURE	-.0740					
	(.0067)**					
FLEXIBILITY		-.0306				
		(.0076)**				
HOLDUP			-.0201			
			(.0057)**			
COST_VS_QUAL				-.1050		
				(.0072)**		
SENSITIVITY					-.1098	
					(.0075)**	
#EMPLOY						-.1707
						(.0071)**
Qi× Population	-1.24e-07	-1.08e-07	-1.85e-07	-7.54e-08	-7.58e-08	-4.75e-08
	(3.70e-08)**	(4.54e-08)*	(2.84e-08)**	(3.66e-08)*	(3.16e-08)*	(3.03e-08)
constant	.3372	.3364	.3371	.3356	.3429	.3437
	(.0040)**	(.0040)**	(.0040)**	(.0039)**	(.0040)**	(.0039)**
Sample size	14,076	14,076	14,076	14,076	14,076	14,076

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 5%; **significant at 1%

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

MEASURE	-.1326					
	(.0051)**					
FLEXIBILITY		-.0739				
		(.0060)**				
HOLDUP			-.0824			
			(.0045)**			
COST_VS_QUAL				-.1217		
				(.0060)**		
SENSITIVITY					-.1119	
					(.0062)**	
#EMPLOY						-.1611
						(.0054)**
constant	.2354	.2367	.2351	.2365	.2453	.2462
	(.0031)**	(.0031)**	(.0031)**	(.0031)**	(.0032)**	(.0032)**
Sample size	14,076	14,076	14,076	14,076	14,076	14,076

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

Table 5.4: Linear Probability Regressions for Contracting: City Characteristics

AREA	-.0004	-.0004
	(.0001)***	(.0001)***
POP2000	3.77e-08	3.00e-08
	(2.82e-08)	(2.76e-08)
FORM_GOV	.0135	.0133
	(.0075)*	(0119)
UNEMP_RATE		-.0037
		(.0018)**
YEAR_INC	.00014	.00012
	(.0001)	(.00013)
YEAR>1950	.0685	.0734
	(.0120)***	(.0170)***
constant	.0240	.0871
	(.1827)	(.2511)
Sample size	13435	6479

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 5.5: Linear Probability Regressions: State Laws for Cities

Regression with robust standard errors — Number of obs = 12911
F(15, 12832) = 19.91
Prob > F = 0.0000
R-squared = 0.3132
Adj R-squared = 0.3091
Root MSE = .35247

outsource	Coef.	Robust Std. Err.	t	P>|t|
law90ci_me~t	-.0512783	.0105503	-4.86	0.000
law90_purc~e	-.0001523	.0087421	-0.02	0.986
law90_nopo~t	.0620686	.0071488	8.68	0.000
law90_no_s~e	-.0805747	.0258359	-3.12	0.002
unemrate	-.0021104	.0012979	-1.63	0.104
wagepremium	-.0337403	.0148911	-2.27	0.023
law90_no_s~t	-.0099398	.0105943	-0.94	0.348
law90ci_de~s	-.1013296	.0259546	-3.90	0.000
law90ci_ba~t	.0010293	.0097471	0.11	0.916
law90ci_ta~e	-.0376984	.016657	-2.26	0.024
law93ci_sp~t	-.0041444	.0074155	-0.56	0.576
percentre~88	-.0483711	.0344636	-1.40	0.160
ufog	.0141182	.0086309	1.64	0.102
yearinc	.0000452	.0000937	0.48	0.630
y50	.0359	.0117915	3.04	0.002
_cons	.448549	.1836305	2.44	0.015
service	absorbed		(64 categories)	

Appendix B: ICMA Questionnaire

Appendix C: Service Characteristics Survey

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