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The determinants of public versus private provision of Emergency Medical Services ☆

Guy David [a,*], Arthur J. Chiang [b]

[a] The Wharton School, University of Pennsylvania, United States
[b] Graduate School of Business, Stanford University, United States

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ABSTRACT

Competition for the provision of local public services often involves mixing private firms and public agencies. Predicting competitive outcomes therefore requires identifying the productive and strategic advantages of different organizational configurations: pure public, pure private or a public–private mix. We consider a make-versus-buy decision in a government procurement context by identifying the strength of public agencies as having an inherent advantage in accessing local infrastructure while private firms are identified as having a superior incentive to exploit returns to scale technologies due to their ability to service multiple localities. We focus on the choice of system configuration for the provision of Emergency Medical Services (EMS), a socially important service which benefits from infrastructural synergies as well as technological improvements (i.e. medical quality). We test our predictions on a panel data set of the 200 largest US cities and find that smaller cities and poorer access to hospitals favor the mixed public–private configuration in the provision of EMS.

1. Introduction

To ensure the provision of a specific service, local governments can often choose between contracting with a private firm or providing the service through a municipal agency. The factors which determine the local government's choice of provider type have been studied from several perspectives. One approach assumes that differing residual control rights of managers operating under public and private ownership will lead the managers to behave differently under incomplete contracts (e.g. Williamson, 1985; Hart et al., 1997). Whether the public or private behavior is preferable depends on characteristics of the particular service. Levin and Tadelis (2007), develop a framework in which local governments choose provider type based on the relative importance of contracting/monitoring complexity and the value associated with quality of the service. Brown and Potoski (2003) demonstrate that high levels of risk of contract failure lead local governments to engage in a variety of monitoring techniques to improve their ability to monitor and correct vendor performance. However, private firms that contract with multiple municipalities develop a reputation that may mitigate the value of scrutiny.

In this paper, we suggest an alternative make versus buy theory of the determinants of public versus private provision in a government procurement context. We consider city-level provision of services either through in-house provision by a public agency, contracting out with a private firm, or a mixture of the two. Miranda and Lerner (1995) refer to the later case as *benchmarking*, in which a local government contracts out a portion of the service while producing the reminder through in-house production. While our conceptual framework is robust to the inclusion of contract incompleteness, our differentiation between public and private providers is not dependent upon it. Using this approach, we do not make any assumptions about *a priori* differences in behavior and objectives between public and private providers. Nevertheless, we identify a dimension along which public and private entities differ fundamentally: private firms are free to provide services to multiple cities and communities (Donahue, 1989), while a public agency is restricted to its particular city of operation.[1] This in turn generates differences between public and private providers in the size of population they serve, which suggests a discrepancy between the two provider types in their access to economies of scale by aggregating service delivery over a range of cities. As the private firm can serve a larger population, it can reduce its average cost of capital, technological research, and other scale-invariant investments, in turn raising the optimal level of investment

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* Corresponding author.
E-mail address: gdavid2@wharton.upenn.edu (G. David).

[1] While there some examples of intergovernmental contracting across municipalities there is little cooperation among geographically disperse cities in service delivery (Warner and Hefetz, 2003).

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in capital and innovation development for private firms. The attractiveness of these economies of scale to a city will depend in large part on the extent to which frequent implementation of technologies and innovations are vital to the specific public service. Moreover, to the extent that scale advantages are local, the proximity of other cities served by the private firm will also affect the cities' choices of provider type. In addition, we link the optimal provider type to city level characteristics, such as population, local infrastructure, and the size and proximity of neighboring communities. Because such characteristics vary across cities, our theory can support the existence of a mixed equilibrium in which some cities may choose to provide a service through a public agency, some through a private firm, and some through a mixture of public and private providers.

We develop our theory in the context of a vital and largely understudied public service, Emergency Medical Services (EMS). EMS refers to the pre-hospital medical care administered at the scene of a medical emergency and en route to a medical facility as well as to the transportation service itself. It is the "first line of defense" against death and disability for many individuals who sustain traumatic medical events, including cardiac arrest, stroke, and major wounds associated with motor vehicle crashes and violence. In addition to its crucial role in public health, EMS provides a rich environment to investigate the determinants of public versus private provision for complex services. Both public and private providers are represented and there exists variation of provider type across localities and over time. For example, in 2005, approximately half of the largest 200 U.S. cities relied solely on public provision of EMS, while the other half provided EMS by contracting out a portion of the service while producing the reminder through in-house production (JEMS, 2005). Contracting out all elements of EMS to a private EMS firm is rare among the largest 200 U.S. cities. Additionally, some cities changed their EMS providers over time; the 1990s witnessed a significant increase in the percentage of cities incorporating private providers. This trend coincided with widespread consolidation among local private providers, which resulted in the creation of a few nationwide firms that now serve a large number of urban and rural areas.[2] This private consolidation movement appears consistent with our conceptual framework, since it is likely the result of changes in EMS technology and medical standards giving rise to strong scale advantages. In its 1997 Alternative Service Delivery Survey, the International City/county Managers Association (ICMA) found about 40% of U.S. cities to report using a non-government based ambulance service.[3]

To learn about the public/private decision from the EMS industry, it is important to understand the fundamental features of the service. One of the most important and unique attributes of EMS is the two-tiered structure utilized in most cities, consisting of *first response* and *transport*. In EMS care, a first-responder arrives on the scene of an incident quickly, followed later by a paramedic-equipped ambulance, which has the responsibility of transporting the patient to a suitable hospital. The responsibility of the first responder is to arrive at the scene as soon as possible to assess the situation and provide basic, stabilizing medical care. It is especially imperative that the first responder treat problems for which a patient's condition deteriorates rapidly with time, such as cardiac arrest. The personnel providing first response is often trained only in basic life support (BLS), such as cardiopulmonary resuscitation (CPR) and the use of defibrillators. The transport ambulance, on the other hand, is usually staffed by a highly trained paramedic and equipped with advanced life support (ALS) technology, so that during transport more sophisticated medical procedures can be performed. The provider entity chosen to provide first response in a given city can be different from the provider selected to transport the patient to the hospital. An example of public–private mix is when a public agency such as the city fire department provides first response services while a private EMS firm provides transport service. A pure public model refers to the case in which a public agency operates in both tiers.

Because the primary role of first response is to arrive rapidly enough to prevent death and serious health damage resulting from the most time-critical conditions, there is an overwhelming premium for speed in first response. Fire departments already invest in the infrastructure necessary to provide rapid response to structural fires, which have a similar geographical distribution of occurrence to EMS events, and for which rapid response time is crucial. Therefore, it is logical that the vast majority of municipalities use fire departments for first response.[4]

In transport EMS, relatively complex medical procedures are often performed while the patient is en route to a hospital. Thus, quality of service, defined as highly trained personnel, advanced medical technology, and system management, take on larger importance in transport-tier EMS than in first response. When access to hospitals worsens (e.g. due to hospital closure) in a city, the quality of transport medical care becomes even more critical as this increases average transport time and hence the amount of time a patient will be treated by the transport EMS team before reaching the hospital. Because of the ability to serve multiple cities and hence to enjoy reduced average costs of capital and technology due to scale, private firms generally have an advantage in providing a higher level of quality improvements than public agencies. While quality is important for transport, there still exists a quality-time tradeoff; the sooner the transport ambulance arrives at the scene of an EMS incident, the sooner the patient will arrive at a hospital, where the highest level of medical care can be provided. While private firms have a relative advantage in implementing operational upgrades, public agencies have relative advantages in accessing existing infrastructure, which determines the time from call to arrival at the hospital.[5]

Moreover, the choice of EMS delivery modality given the tradeoff between infrastructure and scale advantages depends on characteristics of the individual city. We argue that a smaller population, reduced access to hospitals, and size and proximity of neighboring cities will increase the city's propensity to privatize the transport portion of its emergency medical services.[6]

The paper is organized as follows: Section II develops our conceptual framework of EMS provision in cities which centers on the interaction of scale and infrastructure with key city characteristics. Using this framework, we narrow the set of potentially optimal configurations for EMS and obtain testable predictions on the effect of city parameters on the choice of EMS provider configuration. In Section III we introduce and describe a panel of the 200 largest cities in the United States in 1991, 1998, and 2005, which includes information on each city's first response and transport provider, as well as demographic characteristics, hospital infrastructure, unionization and crime statistics. In Section IV, we test the implications about the determinants of EMS system design that arise in our framework by estimating several discrete choice models. Section V concludes the paper and discusses potential generalizations of our framework beyond EMS.

2. A theory of the determinants of EMS provision in cities

In this section we develop (informally) a theory of how a local government determines its choice of providers for first response and

[2] The three major national private EMS firms are American Medical Response (AMR), Rural/Metro Ambulance Service, and Southwest Ambulance Service.

[3] ICMA is an organization dedicated to fostering inter-municipality cooperation by offering various forms of consulting with city and county managers.

[4] In 2005, 96% of the 200 largest US cities used fire departments for first response.

[5] Fire departments generally face a lower cost of transport infrastructure because they are already providing first response and hence there exist synergies arising from continuity of provider type, which reduce transport preparedness costs and streamline service.

[6] The potential effects of additional city characteristics on the choice of EMS provider type are discussed in detail in Chiang et al. (2006).