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Efficient contracting and incentive agreements between regulators and bus operators: The influence of risk preferences of contracting agents on contract choice

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ABSTRACT

Contracts that govern transactions between regulators and operators are an important feature of service delivery in public transport. This paper reviews the literature on efficient contracting in general and its application to public transport contracts and found little empirical evidence on the influence of risk preferences of contracting agents on contract choice, a fundamental premise of classical contracting theory. Departing from the existing literature, this paper develops a choice experiment to study public transport operators' preferences for different contractual forms. People involved in the public transport industry across Australia are invited to do the survey but the respondents are mainly bus operators in New South Wales. The respondents are offered two hypothetical contracts with different risk profiles and incentives and asked to indicate their preferences as well as their acceptance to provide the services under the contract they prefer. A non-linear scaled multinomial logit model is estimated to establish the role of risk allocation on contract preference of bus operators and the optimal amount of risks and incentives, conditioned on the operators' attitude towards risk. The results help authorities design performance-based contracts to obtain their objectives while maintaining the operators' level of satisfaction.

1. Introduction

Interest in contracts has been growing amongst those involved with public passenger transport. As governments move towards separation of regulation from operations, explicit contracts are becoming more common. The incentive implications of different contracts (including cost-plus, gross-cost, gross-cost with incentives and net-cost) have been explored in many case studies (e.g., Alexandersson and Pyddoke, 2003, and Kennedy, 1995). Classical agency theory describes the way in which principals (i.e., regulatory authorities) and agents (operators) trade-off risk-sharing and effort incentives when forming a contract. Operators are assumed to be risk-averse and authorities risk-neutral. Risk can be efficiently allocated to the regulatory authority, but this gives the operator no incentive for effort. As a result, we would expect to find operators bearing at

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[1] Louise was a PhD student at ITLS in 2005–2006 but left for personal reasons and did not complete her research. This paper draws in part on Louise's contribution, and undertakes a survey and analysis.

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least some risk, the optimal amount depending on the preferences of both parties as well as other factors such as the cost of monitoring effort.

Risk-aversion attitude of the operator has intuitive appeal; however, empirical evidence supporting the role of risk preferences in contract choice has generally proved elusive. Risk-aversion is not directly observable, and research has most often examined actual contract choices based on published data that are subject to a widely acknowledged problem. That is, we cannot affirm that agents select contracts based on their underlying risk and incentive structure or on other factors that are specific to the contracting environment and unobserved to the analyst.

The current paper develops an experiment to explore this selection problem. The experiment randomly allocates contracts to agents so that differences in observed behaviour can be analysed as agent's responses to the different risk and incentive structures at stake. There are few examples of such experiments in the literature and only one in public passenger transport in the rail context (Preston et al., 2000),[2] despite an increasing interest in the type of contracts that govern transactions between regulators and public transport operators amongst transport researchers. An exception is the use of Performance-Based Contracts (PBCs) designed to enhance operator performance via incentives. PBCs have been suggested as a contract form more likely to deliver an efficient outcome than the prevalent fixed-fee or cost-plus approaches (Hensher and Stanley, 2003; Carlquist, 2001; Johansen et al., 2001). However, the use of PBCs in public transport has been limited to a few countries such as Norway (Fearnley et al., 2005), Sweden (Alexandersson and Pyddoke, 2003), New Zealand (Wallis, 2003) and Australia (Hensher and Stanley, 2003). Are these the only public transport environments where the use of incentive contracts is efficient, or is there simply a lag in diffusion of this more efficient contracting technology? The transport literature is strangely silent on this issue.

When looking for answers outside the transport literature, it is apparent that an extraordinary amount of empirical research has been undertaken relating to the use of different contract forms. Literally thousands[3] of studies have been conducted which seek to explain and optimise contract use (for an overview of the literature see Boerner and Macher, 2002; Shelanski and Klein, 1995; Lyons, 1996; and Masten and Saussier, 2000). For example, empirical research has been applied to defence (e.g., Crocker and Reynolds, 1993; Adler et al., 1999), agriculture, health (Gaynor and Gertler, 1995), mineral exploration, information technology (Banerjee and Duflo, 2000), education, construction (Bajari and Tadelis, 2001), fund management, electricity and much more. Contracts are everywhere and ongoing questions about the foundations of contract theory make this an open and fertile area of research.

The paper is organised as follows. The next section briefly grounds our discussion in the broader economic literature, discussing the extant contracting literature and its limitations. Persistent inconsistencies in the empirical work are identified, and explanations are explored. The usefulness to the transport context of the main findings from the theoretical and empirical literature on contract form is then discussed. This is followed by a description of a choice experiment designed to study bus operators' preferences for different contractual forms and their use in the provision of public transport services across Australia. Estimation results of a non-linear scaled multinomial logit model are then presented with the influence of risk preferences on contract choice and the operator's risk attitude emphasised. The paper concludes with a discussion of implications for future research.

2. Contract theory

The cost of contracting, both within and between firms, is central to the 'make or buy' question introduced in Coase's famous 1937 article that founded the modern theory of the firm. Informed by both transaction cost economics and the neoclassical paradigm, a branch of enquiry emerged relating to incentive systems (Holmstrom and Milgrom, 1991, 1994). This line of research focuses on the incentive problem between a principal and an agent.[4] Cheung (1969) and Stiglitz (1974) were amongst the first to apply what we now recognise as the classical principal–agent framework with risk aversion attitude, in an attempt to explain the existence of sharecropping.[5]

Drawing parallels to the sharecropping example as described by Gibbons (1998), this section briefly describes the principal-agent model in general form to illustrate the central role of risk allocation and incentives on contract choice. Consider a principle (the authority regulator) who contracts an agent (the operator) to provide a bus service y. In order to provide the bus service, an agent takes an action a which is unobservable to the principal. For simplicity, the output might be expressed as a linear function of action a such that $y = a + \varepsilon$, where ε is a random variable (with mean 0 and variance σ^2)

[2] Preston et al. focussed on managers' preferences with respect to contract size and length, exclusivity, and the degree of regulatory control. Risk preferences were not investigated. In addition, using a simple multinomial logit form, they did not allow for correlation across the 12 choice scenarios presented to each respondent.

[3] In their survey of the literature of transaction cost economics, much of which is directly relevant to contract choice, Boerner and Macher (2002) incorporated over 600 studies. Inclusion of relevant studies using principal-agent theory, and from related fields such as psychology and law, would be expected to add to this number exponentially.

[4] Gibbons (2005) shows the relationship between incentive theory and other branches of the theory of the firm: rent seeking theory (e.g., Williamson, 1979, 1985; Klein et al., 1978); property-rights theory (e.g., Grossman and Hart, 1983; Hart and Moore, 1990) and adaptation theory (e.g., Simon, 1951; Williamson, 1991).

[5] Interest in the moral hazard induced by sharecropping can be traced to Adam Smith's *The Wealth of Nations*.