



Choice of flexible production technologies under strategic delegation

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Abstract

This paper analyzes a managerial delegation model in which firms can choose between a flexible production technology which allows them to produce two different products and a dedicated production technology which limits production to only one product. We analyze whether the incentives to adopt the flexible technology are smaller or greater in a managerial delegation model than under strict profit maximization. We obtain that the asymmetric equilibrium in which only one firm adopts the flexible technology can be sustained under strategic delegation but not under strict profit maximization when products are substitutes. We extend the analysis to consider welfare implications.

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1. Introduction

This paper studies the production technology chosen by firms' owners when considering strategic interactions. To analyze this issue, it must be noted that most large firms are characterized by a separation between ownership and management. This means that the decision of the owners on what technology to choose is influenced by the incentive schemes that they offer to their managers. However, technology choice literature usually treats firms as economic agents which maximize strict profits (see for example, [Bester and Petrakis \(1993\)](#) and [Röller and Tombak \(1990\)](#)). Seeking to set our study in a more realistic framework, we analyze the

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incentives to adopt flexible technologies considering explicitly the separation between ownership and management.¹ We consider the owner/manager relationship as a strategic delegation problem where owners decide what technology to adopt and delegate production decisions to managers.

The literature on strategic delegation (see [Vickers \(1985\)](#); [Fershtman and Judd \(1987\)](#) and [Skivas \(1987\)](#)), analyzes the incentive contracts that owners of competing firms give to their managers and how such incentive contracts affect the oligopoly outcome. These studies show that firms' owners are interested in driving their managers away from strict profit maximization for strategic reasons.

In this work, as in [Fershtman and Judd \(1987\)](#), we assume that firms' managers will be given an incentive to maximize an objective function consisting of a linear combination of profits and sales revenue. We consider that firms have to choose between two production technologies: a flexible technology, which allows firms to produce two different products and a dedicated technology which limits production to a single product. We analyze how strategic delegation contracts affect firms' decisions between these two types of technology.

To illustrate our analysis of the decision whether to adopt a flexible or a dedicated technology, we consider the automotive industry (see [Elkins et al. \(2004\)](#)). This industry has traditionally purchased dedicated technologies to produce a given product model at high volume. Flexible technologies are employed to produce one product class, with several model variants in the class. [Elkins et al. \(2004\)](#) define a dedicated machining system as that which can produce only a single product model. By contrast, a flexible machining system is an adaptable system that can be changed quickly and easily to produce a planned range of product classes and product models, with a product model being a specific variant within a product class. [Elkins et al. \(2004\)](#) argue that investment cost is the major determinant in deciding between different technologies. This is the case, for example, in the automotive industry. We set our model in this context. Moreover, the investment needed to implement any technology is assumed to be exogenous, so we do not consider licensing of production technologies.² On the other hand, automotive corporations are usually large firms characterized by a separation between ownership and management. Other industries in which a similar problem arises are the machine-tool, aerospace, heavy machinery, electronic and military equipment industries (see [Röller and Tombak \(1990\)](#)).

[Röller and Tombak \(1990\)](#) and [Kim et al. \(1992\)](#) propose a game in which firms' owners choose between a flexible technology and a dedicated one. They examine market conditions under which strict profit-maximizer firms would choose a flexible technology. They find that when the difference in fixed costs between the two technologies (denoted as F) is sufficiently low, both firms adopt the flexible technology. By contrast, when F is sufficiently high, neither firm adopts the flexible technology. The asymmetric equilibria in which only one firm adopts the flexible technology do not exist when products are substitutes. They find that consumer (producer) surplus is largest when both firms adopt the flexible (dedicated) technology. However, the results on total surplus depend on the value of parameter F . In general, the larger F is, the lower the benefit that the economy obtains from the adoption of flexible technologies is. As a result, a welfare-maximizer agent would encourage both firms to adopt the flexible technology

¹ There is a branch of literature that studies the effects of ownership structure on firm performance (see for example, [Fama and Jensen \(1983\)](#) and [Milgrom and Roberts \(1992\)](#)). In these studies, the relationship between the owner and the manager is modeled as a principal-agent problem. The compensation scheme seeks therefore to solve incentive problems for managers.

² Assuming an innovator who sets the price of an innovation, [Saracho \(2002\)](#) analyzes firms' technology choice in a context of strategic delegation by considering n firms that produce a homogeneous good.

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