



## Financing flexibility: The case of outsourcing



Luca Di Corato <sup>a,\*</sup>, Michele Moretto <sup>b</sup>, Gianpaolo Rossini <sup>c</sup>

<sup>a</sup> Department of Economics, Swedish University of Agricultural Sciences, Box 7013, Uppsala 75007, Sweden

<sup>b</sup> Department of Economics and Management, University of Padova, Via Del Santo, 3335123 Padova, Italy

<sup>c</sup> Department of Economics, University of Bologna, Strada Maggiore, 45, 40125 Bologna, Italy

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### ABSTRACT

We investigate the relationship between the extent and timing of vertical flexibility and the financial choices of a firm. By vertical flexibility we mean partial/total and reversible outsourcing of a necessary input. A firm simultaneously selects the vertical setting and the financial sources of investment in flexibility, in particular debt and venture capital. A loan may come from a lender that requires the payment of a fixed coupon over time and an option to buy out the firm in certain circumstances. Debt leads to the same level of flexibility of an unlevered firm. Yet investment occurs earlier. The injection of venture capital reduces the quest for vertical flexibility and speeds up investment. Then, there arises a fresh substitutability between a financial (venture capital) and a real variable (vertical flexibility).

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## 1. Introduction

Our intent is to analyze the influence of external financial sources on extent and timing of investment in vertical flexibility by a corporate enterprise that buys inputs from the market (outsourcing) in a variable and reversible manner, going back to internal production whenever economically convenient.

Outsourcing and flexibility are crucial for most firms which apparently buy inputs in variable proportions changing often the span of activity along the vertical chain of production. Vertical flexibility improves the ability to cope with uncertain scenarios and impinges on competitiveness, scale of production and social efficiency. Unfortunately flexibility never comes for free. Procurement of inputs from the market calls for the set-up of a supply chain with specific logistic investment. In addition to that a vertically flexible firm must be ready to substitute an internally produced input with an externally acquired one and viceversa. In other words it must be properly equipped to bring back in-house input production partly or entirely at any time (backsourcing or reshoring). Therefore, vertical flexibility entails keeping alive a dedicated internal facility and the associated know-how. All that may turn out to be quite dear.

\* Corresponding author. Fax: +46(0)18673502.

E-mail addresses: [luca.di.corato@slu.se](mailto:luca.di.corato@slu.se) (L. Di Corato), [michele.moretto@unipd.it](mailto:michele.moretto@unipd.it) (M. Moretto), [gianpaolo.rossini@unibo.it](mailto:gianpaolo.rossini@unibo.it) (G. Rossini)

The costs of flexibility change over time and industries. They depend on technical progress in production, information and logistic services, efficiency of external input markets and the financial sources adopted. An enterprise may choose among many financial avenues in order to invest in vertical flexibility. Equity, debt and other external sources such as venture capital are among the most common. Unfortunately, the financial side of flexibility is most of the times sidestepped in current studies. Funding and organizational issues are examined separately in financial,<sup>1</sup> managerial, industrial organization and operations research literatures.<sup>2</sup> Our purpose is to contribute to bridge the gap by jointly analyzing finance and corporate organization to see whether the commitment to vertical flexibility is affected by the specific financial arrangements adopted. On the real side we shall explore extent and type of vertical flexibility that can be secured by arms' length outsourcing of inputs while maintaining in-house production facilities. On the financial side we shall see how equity,<sup>3</sup> convertible debt<sup>4</sup> and venture capital<sup>5</sup> impact on size and timing of investment in flexibility.

Our investigation is solicited by broad casual observation, literature and press reports,<sup>6</sup> showing (a) that firms change over time their vertical production structure, expanding and/or subsequently contracting (or the other way round) the extent of outsourcing and (b) that partial outsourcing (in some contributions<sup>7</sup> called "concurrent sourcing") is quite popular. In the automotive industry most brands adopt partial outsourcing, i.e., concomitant internal production and purchase, for instance, of engines and other intermediate products from external manufacturers. Moreover, the extent of outsourcing is frequently revised as witnessed by the variable level of value of purchased inputs over revenue found in most balance sheets.<sup>8</sup>

From the point of view of the value of a firm, different degrees of outsourcing and vertical flexibility may be associated with distinct degrees of risk born and, hence, different stock values. Then, it seems consequential examining how financial choices affect the riskiness and the quantity of flexibility acquired. As flexible technologies reduce risk (profit volatility) they may be considered a kind of (real) option whose price should reflect their (option) value (Amran and Kulatilaka, 1999, Ch. 16). As a result, a vertically flexible firm may have a value larger than the corresponding non flexible enterprise. However, as we shall see, this is not always the case if the cost of flexibility and the related financial aspects are properly accounted for.

In the ensuing pages we concentrate on two alternative cases: debt and venture capital. In the first the control right over the investment decision in flexibility is allocated to the firm (i.e., the shareholders), while in the second the control belongs with an outside investor, a venture capitalist. While the timing of the investment is set by one party the terms of the investment are determined by both parties. In both circumstances the level of outsourcing is set by the operating party. As to the financial sources, in the first case we deal with debt financing, while the second features a pure equity offer where risk, profits and, finally, ownership are shared with an outside investor without side payments (i.e., no debt service by the firm). We consider venture capital since it represents an important tool for firms, in particular in fast growing and innovation intensive sectors<sup>9</sup> and, unlike debt, it provides a risky capital involvement that, as we shall see, makes the difference.

Our investigation assumes that debt is warranted to reflect the fairly popular practice of associating loans to innovative firms with call options on part of the capital of the borrowing firm. After all it may be hard to finance an investment unless the lender gets a handsome collateral. In our case this is represented by an option to buy the firm in case outsourcing makes production in-house relatively less convenient. The result is that debt makes a firm invest in the vertically flexible technology earlier than in the pure equity case. Nonetheless, when debt is insured by the associated option, the extent of flexibility acquired is equal to that adopted with equity. Only the timing can be affected since shareholders rush to reap profits from flexibility as soon as possible since they know that future may be gray due to the Damocles' sword of the buyout. When we move to the alternative case of venture capital outsourcing becomes lower than with equity. Risk sharing provided by venture capital makes a firm less willing to adopt outsourcing as insurance against cost uncertainty. Venture capital (a financial resource) appears to be a substitute for outsourcing (a real variable). The firm gets outside capital instead of externalizing a share of the vertical chain of production.<sup>10</sup> Then, we establish a novel substitutability between a real internal organization choice and a financial variable, proving that finance and industrial setting are intertwined decisions.

<sup>1</sup> See, for a good survey of main related issues, [Tirole \(2006\)](#).

<sup>2</sup> See [Van Mieghen \(1999\)](#), [Wang et al. \(2007\)](#), [Moretto and Rossini \(2012\)](#).

<sup>3</sup> We exclude from our investigation new equity raised through a capital increase since it tends to reduce the price of existing stock and may open the way to a loss of control. See [Eckbo et al. \(2007\)](#).

<sup>4</sup> In general, issuing convertible bonds is one way for a firm to favor investors willingness to fund the investment (<http://www.entrepreneur.com/article/159520>).

<sup>5</sup> Recent empirical literature emphasizes the weight of venture capital in the growth of infant firms ([Hellmann and Puri, 2002](#); [Jørgensen et al., 2006](#); [Da Rin et al., 2011](#)).

<sup>6</sup> For instance Apple has recently increased the outsourcing of some inputs while reducing and bringing back home other inputs. See for further examples: [The Economist \(2011, 2013\)](#), [Forbes \(2012\)](#). See also empirical assessments in [Klein \(2005\)](#) and [Rossini and Ricciardi \(2005\)](#). Specific examples may be found in [Benaroch et al. \(2012\)](#). An interesting textbook case relating to the vertical flexibility story of toy giant Lego is narrated in [Larsen et al. \(2010\)](#). The historical evolution of outsourcing in Ford and GM may be read in [Shih \(2013\)](#). A web site containing updated news about reshoring in the U.S. is <http://www.reshorennow.org/news/>.

<sup>7</sup> See for instance [Lambrecht et al. \(2016\)](#).

<sup>8</sup> This ratio may change also for technology reasons – a new input is added or an existing input is abandoned – and because of changes in relative prices along the vertical chain of production.

<sup>9</sup> See, in the vast literature on venture capital, [Gompers and Lerner \(2001\)](#) and [Metrick and Yasuda \(2010\)](#).

<sup>10</sup> A growing empirical literature shows the importance that venture capital has for new firms ([Hellmann and Puri, 2002](#); [Jørgensen et al., 2006](#); [Kaplan and Lerner, 2010](#); [Da Rin et al., 2011](#)). See also the Venture Capital Yearbook ([National Venture Capital Association, 2014](#)).

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