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The effect of public subsidies on firms' investment–cash flow sensitivity: Transient or persistent?

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ABSTRACT

This work analyses the effect of public subsidies on firms' investments and investment–cash flow sensitivity in a longitudinal sample of 288 Italian unlisted non-venture capital backed owner-managed new-technology-based firms (NTBFs), observed over a 15-year period from 1994 to 2008. Seventy five of these firms received one or more public subsidies in the observation period. We use an error correction model (ECM) specification and system generalised method of moment (GMM) techniques that take into account the endogeneity of public subsidies. First, we find that the investments of small NTBFs are sensitive to internal cash flows, while those of large NTBFs are not. Receipt of public subsidies by small NTBFs results in an increased investment rate and a reduced investment–cash flow sensitivity, in the immediately following year. We interpret these results as an indication of the relaxation of financial constraints. Moreover, while the increase in the investment rate does not persist in the long run, the dependence of investments on cash flow remains negligible after receipt of the first public subsidy. These results support the view that public subsidies can help small NTBFs in persistently removing the financial constraints that bind their investment activity.

1. Introduction

Scholars agree that young high-tech firms (NTBFs, new technology-based firms) play a crucial role in modern economies (Audretsch, 1995). It is also argued that capital market imperfections arising from information asymmetries (i.e., hidden information and hidden action) make it difficult for these firms, especially smaller ones, to obtain external financing (Carpenter and Petersen, 2002a; Hall, 2002). In turn, financial constraints negatively influence firms' investments and performance, with obvious negative implications for social welfare. The available empirical evidence that will be surveyed in Section 2 largely supports this view. It is important to highlight that investments in tangible assets, R&D investments and innovation are strongly interrelated for NTBFs (see e.g., Chiao, 2002). The business model, products and processes of these high-tech firms rely on the development of new knowledge. This new knowledge is embodied in the production process through investments in new plant and equipment (Himmelberg and Petersen, 1994). Hence, given the relevance of financial constraints for this kind of firms, it is interesting to investigate how to stimulate NTBFs' investment activity, which significantly affects their ability to innovate.

Accordingly, NTBFs have attracted considerable attention from policy makers at local, national and supranational levels (see e.g., SEC, 2008, 2010), with the presumption that public subsidies can help these firms to overcome the above-mentioned financial constraints. However, whether public subsidies are beneficial to NTBFs is questionable (Holtz-Eakin, 2000). Indeed, public support may simply result in the replacement of market failures with governmental failures. For instance, politicians may use public subsidies to reward constituents, rather than to correct market failures (Cohen and Noll, 1991; Becker, 1983). Public subsidies may also prevent the emergence of active venture capital (VC) markets by "crowding-out" private funds (Leleux and Surlemont, 2003; Cumming and MacIntosh, 2007).

In this paper, we empirically investigate whether public subsidies in fact relax the financial constraints of NTBFs, a research question that has received limited attention in the extant literature (for exceptions see Hyytinen and Toivanen, 2005; Czarnitzki, 2006; Czarnitzki et al., 2011). More precisely, we aim to detect the "treatment" effect of public subsidies on the investment rate and investment–cash flow sensitivity of NTBFs. Following the approach originally proposed by Fazzari et al. (1988), we interpret a large investment–cash flow sensitivity as an indication that a firm is

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financially constrained. Accordingly, the removal of financial constraints after receipt of a public subsidy should result in an *increase* of the investment rate and a *reduction* of the investment–cash flow sensitivity. Moreover, we assess whether these allegedly beneficial effects of public subsidies are transient or persist over time.

For this purpose, we analyse the investments in tangible and intangible assets within a hand-collected dataset consisting of 288 Italian owner-managed privately held NTBFs, observed between 1994 and 2008. To isolate the effect of public subsidies on financial constraints, we build our sample by excluding firms that either received VC or went through an IPO. The sample is extracted from the RITA 2004 (Research on Entrepreneurship in Advanced Technologies) database, developed at Politecnico di Milano. This database is the most comprehensive source of data presently available on Italian NTBFs. In particular, it contains information on all public subsidies received by sample firms from national governmental institutions during the observation period. Previous studies have used the same dataset to investigate recourse to debt financing (Colombo and Grilli, 2007), VC (Bertoni et al., 2010, 2011) and public subsidies (Colombo et al., 2011, 2012, 2013), and their impact on firm performance. Nevertheless, none of the abovementioned works have analysed whether receipt of public subsidies engenders a *positive* and *persistent* effect on the removal of NTBF's financial constraints.

To detect financial constraints, we estimate an error correction model (ECM) specification in the spirit of Guariglia (2008). To take into account the potentially endogenous nature of public subsidies, we resort to a system generalised method of moments (GMM-SYS) estimator for dynamic panel data models. Moreover, we enlarge the usual set of internal instruments through the addition of variables that are a source of exogenous variation for receipt of public subsidies across firms, in order to better control for selection based on unobservables.

Our results highlight that small Italian NTBFs are financially constrained, while large NTBFs are not. Receipt of public subsidies by small NTBFs results in an increase of the investment rate and in a reduction of the investment–cash flow sensitivity in the immediately following year. These effects are both statistically significant and of large economic magnitude. Conversely, the effect of public subsidies on large NTBFs is negligible. Moreover, we find that for small NTBFs, the dependence of investments on cash flows remains negligible from receipt of the first public subsidy onward, while the increase in investment rate does not significantly persist in the long term.

The paper is structured as follows. In the next section, we briefly survey the literature on firms' financial constraints, and we discuss the expected effect of public subsidies on the investment rate and investment–cash flow sensitivity of NTBFs. Section 3 describes the data and briefly illustrates the industrial policy measures in support of Italian NTBFs. In Section 4, we describe the econometric methodology. In Section 5, we present the results of the econometric analysis. Section 6 concludes and discusses the policy implications of the study.

2. Literature review and theoretical background

2.1. The empirical literature on firms' financial constraints: Lessons for NTBFs

If capital markets were perfect, every privately profitable investment would be financed in equilibrium and under the additional assumption of tax neutrality between debt and equity, the source of financing would be irrelevant (Modigliani and Miller, 1958). As a corollary, internal liquidity (i.e., current cash flows) would not affect firms' investments (Jorgenson, 1963; Hall and Jorgenson, 1967). Conversely, if investors are less informed than entrepreneurs, firms adhere to a "pecking order" when financing their investments (Myers and Majluf, 1984). First, they rely on internal sources of funds; then, when internal capital is exhausted, they turn to the external capital source with the lowest cost, which usually is debt (at least for firms with low leverage). Fazzari et al. (1988) argue that while the marginal opportunity cost of internal capital is constant, the debt supply curve is upward-sloping, and greater capital market imperfections result in a steeper slope. Under these circumstances, one would expect that the investments of firms that are more financially constrained (i.e., they face a steeper debt supply curve) are more sensitive to cash flows. The authors also show that investment–cash flow sensitivity is higher for firms with low dividend payouts, which allegedly have more binding financial constraints. Several studies replicated the above analysis by grouping firms according to different proxies of information costs (see Hubbard, 1998; Hall, 2002, for comprehensive surveys) and considering samples of small firms operating in high-tech industries (e.g. Himmelberg and Petersen, 1994; Carpenter and Petersen, 2002b). Based on these previous works, in what follows we will interpret a positive investment–cash flow sensitivity as a sign of binding financial constraints that negatively affect the investment activity of NTBFs.

We are aware that the approach proposed by Fazzari et al. (1988) presents some weaknesses. First, Kaplan and Zingales (1997) theoretically demonstrate that the relationship between financial constraints and the sensitivity of firms' investments to cash flows is not necessarily monotonic. Accordingly, for the 49 low-dividend firms included in the Fazzari et al.'s (1988) study, they use detailed information from the annual reports and financial statements to rank the extent to which these firms are financially constrained, finding that the investments of the least financially constrained firms are the most sensitive to the availability of cash flow.[2] However, Kaplan and Zingales (1997) focus their analysis only on a group of allegedly financially constrained firms, discussing whether differences in the investment–cash flow sensitivities are informative about differences in the extent of the financial constraints faced by these firms. It remains the case in Kaplan and Zingales's (1997) model that a firm facing no financial constraints would display no sensitivity of investments to cash flows.

Second, Jensen (1986) points out that opportunistic behaviour by managers who misuse firm's free cash flows to pursue personal objectives (e.g., empire building) could cause overinvestment and lead to a positive relationship between investment rate and level of cash flows in the absence of any financial constraint. In this vein, Pawlina and Renneboog (2005) using a sample of U.K. listed firms, find that the investment–cash flow sensitivity is higher when firm's managers have higher discretion. This applies when managerial ownership is low and in absence of effective monitoring of managerial decisions by blockholders. Even though overinvestment and underinvestment problems stem from different theoretical considerations, they generate similar empirical effects and are thus difficult to disentangle. Vogt (1994) reports evidence that both effects are at work and that overinvestment and underinvestment dominate for larger and smaller firms, respectively. In this paper, we focus attention on privately held owner-managed NTBFs that did not receive external equity by VC investors. As ownership and control generally are not separated in these firms, agency problems between owners and managers tend to be negligible.[3] Therefore, in

[2] In the same vein, results that contradict Fazzari et al.'s (1988) hypothesis were found by Kadapakkam et al. (1998) and Cleary (1999, 2006), among others.

[3] The presence of external individual investors like business angels might lead to horizontal agency costs (or principal–principal conflicts, see Young et al., 2008) between these external equity holders and the owner-managers. However, the