Journal of Banking & Finance 34 (2010) 1215–1224

Contents lists available at ScienceDirect

Journal of Banking & Finance

journal homepage: www.elsevier.com/locate/jbf

Equity financing and innovation: Is Europe different from the United States?

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ARTICLE INFO

Article history:
Received 8 June 2009
Accepted 14 November 2009
Available online 20 November 2009

JEL classification:
G32
O32

Keywords:
Financing constraints
R&D
Stock issues
Financial markets

ABSTRACT

During the mid and late 1990s young, high-tech firms in the US experienced a supply shift in both internal and external equity fueling a finance-driven boom in corporate R&D. This paper examines whether R&D spending in Europe in a similar way was sensitive to fluctuations in the supply of internal and external equity during the late 1990s and early 2000s. I conjecture that UK and Continental Europe, due to their different financial systems, differ in terms of equity supply. I estimate dynamic R&D regression models for UK and Continental European high-tech firms separately and find significant joint cash-flow effects for newly listed firms in both samples. However, only new firms in the UK experienced a joint external equity effect as well. The findings of this paper suggest a channel through which market-based financial systems outperform the bank-based economies of Continental Europe.

1. Introduction

Recent evidence suggests that the US experienced a finance-driven R&D boom in the late 1990s (Brown, Fazzari, and Petersen, 2009 – BFP (2009) hereon). Young, high-tech firms benefited from supply shifts in both internal and external equity, and this relaxed otherwise binding financing constraints for R&D investment. The findings in BFP (2009) suggest that there exists a significant connection between finance, innovation, and growth. This paper examines whether R&D spending in Europe in a similar way was sensitive to fluctuations in the supply of internal and external equity during the late 1990s and early 2000s. The analysis focuses on R&D investment in the UK and nine other developed European economies (Continental Europe). The UK is particularly interesting because like the US it has a market-based financial system, and similar to the US it experienced a sharp stock issue boom in the late 1990s.

The results are based on a study of 700 publicly traded, high-tech firms, incorporated in Belgium, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden, Switzerland and the UK, with observations from the period 1995–2004. Roughly 40% of the firms are located in the UK. The study applies dynamic Euler equation models with generalized methods of moments (GMM) estimation with separate estimations for the UK and Continental Europe. Both internal and external equity are quantitatively large and jointly significant for new, high-tech firms in the UK. The regression for new, Continental European, high-tech firms provides only a significant joint cash-flow effect. The results are robust with regard to alternative sample splits, estimation procedures, and instrument lag lengths.

New, Continental European, high-tech firms also experienced a stock issue boom in the late 1990s, but this did not matter for R&D as it did for new firms in the UK. Both the increase in R&D-intensity and the stock issue boom were higher in the UK. In the boom year of 1999, new firms in the UK had an average R&D-intensity of 0.248 compared to 0.160 for Continental Europe. The major difference lies in the external equity[1] variable where new firms had an average of 0.333 in the UK and 0.220 in Continental Europe. The empirical analysis suggests that the reason for the higher R&D-intensity of UK firms is their access to external equity which they could spend on additional R&D investment.

My findings on European, high-tech firms corroborate BFP's (2009) US findings and contain important implications. High-tech firms in the US and the UK appear to have similar R&D-intensities and use of cash-flow. They also seem to depend on external equity to a similar degree. Thus, it appears that market-based financial systems are better at providing external funding of R&D investment and at lower costs. This conclusion is in line with existing literature which states that firms without adequate internal financial resources may face binding constraints for their R&D investments when capital-market imperfections are present (Carpenter and Petersen, 2002; Hall, 2002). This illustrates how the nature of a

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[1] Issued stock minus purchased stock divided by the total assets in the beginning of the year.

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doi:10.1016/j.jbankfin.2009.11.015

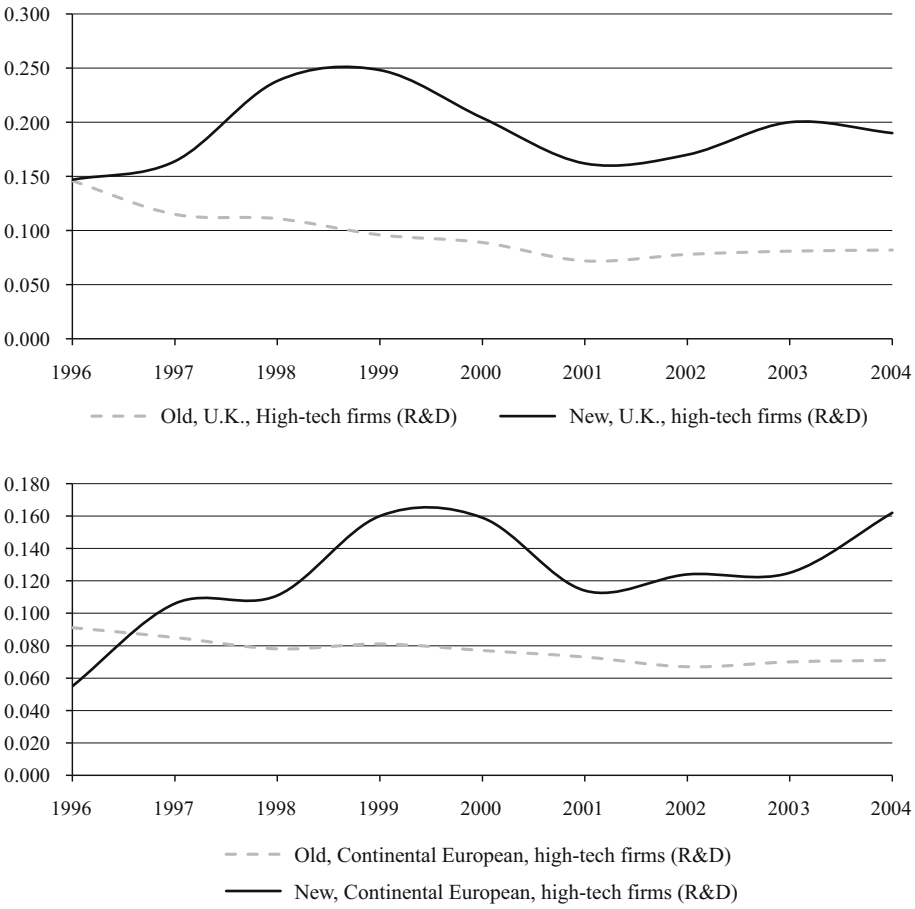

Fig. 1. Average R&D to total assets ratios for old, and new, high-tech firms in the UK (top graph) and in Continental Europe (bottom graph). R&D scaled by beginning of the period total assets for high-tech firms in the UK in the upper graph and in Continental Europe in the bottom graph. The full line represents new, high-tech firms (a firm is considered new if it had its IPO after 1995), and the dashed line represents old, high-tech firms (a firm present at the beginning of the sample period is considered old).

country's financial system may influence the economic growth of the country. Beck and Levine (2002) cannot find any evidence in favor of either market or bank-based financial systems as promoters of economic growth. The market-based financial systems of the US and the UK appear to support R&D-intensive firms better than bank-based systems of Continental Europe. Combining these findings with the importance assigned to R&D in endogenous growth models Aghion and Howitt, 1992, 1998) this observation is a potential explanation of why market-based financial systems outperform the bank-based economies.

The paper proceeds as follows. Section 2 presents the empirical strategy. Section 3 includes the presentation of the data alongside the descriptive statistics and graphical evidence. Section 4 presents the dynamic GMM results and tests their robustness. Section 5 summarizes and discusses the implications of the findings.

2. Econometrics and estimation

R&D investment specifications used in the empirical literature are almost exclusively transformations of capital investment specifications. To my knowledge, BFP (2009) are the first to apply an Euler equation model to R&D investment. The Euler equation model of BFP (2009) is originally derived in Bond and Meghir (1994) for capital investment. I apply the same specification.

The Bond and Meghir (1994) model relates capital investment rates between successive periods and derives from a dynamic optimization with symmetric and quadratic adjustment costs. The advantage of the Euler equation is as follows: by assuming that expectations are formed according to the previously mentioned dynamic optimization scenario, the Euler equation specification controls for expectational influences affecting the investment decision. Since this specification controls for expectational influences it is more straightforward and less ambiguous to interpret the estimation results and to draw conclusions from the econometric estimates.

The empirical model below is the same as in BFP (2009, p. 162). Following Bond and Meghir's (1994) model, a lagged negative cash-flow estimate indicates that the firm is not financially constrained. Besides the sign in front of lagged cash-flow, β_1 should be slightly larger than 1 and β_2 negative and slightly less than 1. Further, in the presence of no financing constraints, contemporaneous cash-flow and the external equity estimates should enter non-significantly. I estimate the Euler model without contemporaneous effects and without the external equity variables to explore the goodness of fit when no financing constraints are present as a first step in the empirical section. This version of the Euler model is referred to as the benchmark Euler model. The main estimating equation below follows BFP (2009) with the purpose of exploring corporate financing constraints affecting R&D. In practice this implies testing the impact of internal and external equity as financing sources of R&D investment.[2] The added variables, compared to Bond and Meghir's (1994) original model are: contemporaneous cash-

[2] Following BFP (2009) I do not include debt in the specification. The annual change of the long-term debt stock normalized by the beginning of the period stock of firm assets was also included in the empirical analysis but was as expected non-significant. Debt is generally not preferred for financing of R&D (see Hall, 2002; Hall and Lerner, 2009). I include long-term debt in the descriptive statistics though.