# Information production within the venture capital market: Implications for economic growth and development☆

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A R T I C L E   I N F O

A B S T R A C T

I find venture capitalists' (VCs') information production activities help decrease uncertainty about asset valuations within public equity markets, resulting in price convergence within the cross-section of Initial Public Offerings (IPOs) that are backed by different classes of VCs and price convergence between VC and non-VC backed IPOs. These findings provide evidence that venture capital financing can be a component of an effective or efficient price discovery process within public equity markets that yields beneficial externalities in so far as the pricing of non-VC backed IPOs are concerned. Given a decrease in valuation uncertainty ultimately results in lower costs of capital for issuing firms, larger stock markets, and improvements in market liquidity or efficiency, empirical findings provide evidence that VCs' information production activities are beneficial for economic growth and economic development (price discovery processes that induce efficient allocation of resources within stock markets).

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## 1. Introduction

It is well established that market efficiency – the extent to which prices reflect all publicly available information – is an important indicator of stock market development (see for example, Fama, 1991). In light of the importance of market efficiency for stock market development, economic agents that facilitate price discovery within stock markets contribute directly to stock market development and by extension to economic development. In Leland and Pyle (1977), information production that induces price discovery is an important objective of financial intermediation in markets such as venture capital markets. In Campbell and Kracaw (1980), financial intermediation is most credible when information generated by financial intermediaries (e.g. venture capitalists) is utilized in alternate markets, with the stock market qualifying as an alternate market to the venture capital market.

Suppose as in Gompers (1996) we distinguish between 'incumbent' and 'new entrant' venture capitalists (VCs). If VCs' information production activities are beneficial for price discovery within stock markets, it is reasonable to expect differences in the pricing of IPOs backed by the two classes of VCs identified in Gompers (1996) attenuate over time, resulting in price convergence. Empirical evidence that VCs' information production activities improve the pricing of IPOs that do not have venture capital backing (non-VC backed IPOs) is evidence, however, that VCs' activities yield beneficial externalities within

stock markets; that is, are directly beneficial for price discovery, market efficiency, stock market development, and economic development. Studies such as Lee and Wahal (2004), Megginson and Weiss (1991), and Belghitar and Dixon (2012) provide evidence of cross-sectional differences in initial returns to VC and non-VC backed IPOs. Empirical evidence that financial market development, which includes stock market development, is an important driver of economic growth is provided in studies such as King and Levine (1993), Luintel and Khan (1999), and Rajan and Zingales (1998).

In this study, I examine whether venture capitalists' (VCs') information production activities affect the time series variability of initial returns to IPOs, resulting in price convergence within public equity markets. In order to demonstrate the robustness of the evidence on convergence of initial returns to IPOs, I show cross-sectional variation in initial returns to IPOs is consistent with the positive relation between initial returns to IPOs and the severity of information asymmetry problems in studies such as Beatty and Ritter (1986), Ibbotson, Sindelar, and Ritter (1994), Ritter (1984), or Rock (1986).

With respect to time series convergence, empirical results show, consistent with findings in Gompers (1996), that initial returns to IPOs backed by new entrant VCs start off systematically lower than initial returns that accrue to IPOs backed by incumbent VCs. Over the course of three periods (years), however, initial returns to IPOs backed by new entrant or incumbent VCs converge to some equilibrium level, such that there do not exist any significant differences in initial returns between the two groups of IPOs. These findings provide empirical validation for a three-year reputation development time frame in Nahata (2009), Krishnan and Masulis (2011), and Obrimah (2015).

In comparisons of initial returns to VC and non-VC backed IPOs, I find differences in initial returns between the two classes of IPOs converge but are not fully attenuated over a period of three venture capital financing cycles (9 years), with convergence shown to be induced by the arrival of new and favorable information about VC backed IPOs. Given stock markets cannot be efficient in the absence of price discovery mechanisms or processes, the positive externality from VCs' information production activities – improvements in the valuations of non-VC backed IPOs – is evidence that venture capital has a direct impact on market efficiency (stock market development) and by extension, economic development. My finding that the slowest convergence rates between initial returns to VC or non-VC backed IPOs relate to the innovation dimension of VCs' portfolio activities provides support for a characterization of innovation as an important or unique facet of venture capital activity in studies such as Aggarwal and Hsu (2013) or Lerner, Sorensen, and Stromberg (2011).

Markets within which prices have converged are characterized by less severe valuation uncertainty in relation to markets within which prices have yet to converge. In Huang (2008), uncertainty aversion (aversion to valuation uncertainty) results in slower economic growth, but is mitigated by information production. In Brockman, Liebenberg, and Schutte (2010) there exists a link between swings in information production and the incidence of business cycles. In light of findings in Huang (2008) and Brockman et al. (2010), empirical results in this study provide evidence that VCs' portfolio activities have beneficial effects on uncertainty aversion within stock markets.

Studies such as Loughran and Ritter (2004), Kirkulak and Davis (2004), Dimovski, Philavanh, and Brooks (2011), Chemmanur and Fulghieri (1994), and Megginson and Weiss (1991) provide mixed evidence on relations between initial returns to IPOs and market reputation. In this study, the formal theory I develop for the assessment of interactions between market reputation and initial returns to IPOs predicts market reputation can be associated with relatively higher initial returns to IPOs whenever the arrival of new innovative projects induces reputable intermediaries to bring their superior information production skills to bear on the pricing of new innovations. Comparisons of time series trends in initial returns to VC or non-VC backed IPOs provide support for the predictions of the formal theory.

Signalling theories (see for example, Allen & Faulhaber, 1989; Grinblatt & Hwang, 1989; Welch, 1989), information asymmetry theories, and litigation risk theories of IPO underpricing (Alexander, 1993; Drake & Vetsuypens, 1993; Lowry & Shu, 2010; Tinic, 1988) all imply differences in initial returns between high risk and low risk IPOs do not attenuate over time. My finding that initial returns to IPOs converge fastest among the most innovative ventures, resulting in initial returns that are comparable to those which accrue to the least innovative ventures provides evidence that independent of beneficial effects of information production, neither of information asymmetry, signalling, nor litigation risk theories are well adapted to explaining time series variation in initial returns to IPOs.

My findings complement studies which provide evidence of direct, as opposed to indirect benefits from venture capital for economic growth (Total Factor Productivity) and development (Innovation or Patent Rates). These studies include Kortum and Lerner (2000) or Abdou and Varela (2009) and Chemmanur, Krishnan, and Nandy (2011), which find, respectively, that venture capital financing contributes to growth rates of innovation (patents) and improvements in Total Factor Productivity (TFP) of private firms. Consistent with externalities from venture capital, Samila and Sorenson (2011) find the arrival of venture capital financing within a geographical area is associated with a significant increase in non-venture capital backed entrepreneurial activity. Since the arrival of venture capital financing can itself be induced by improvements in arrival rates of good projects within opportunity sets, both venture capital and non-venture capital activity can be induced by the richness of the opportunity set, but with venture capital activity helping to refine information sets or prices. Empirical findings in this study provide evidence of a mechanism – information production that induces refinements in prices – via which the arrival of venture capital within an opportunity set can induce increases in investment activities not backed by venture capitalists.

The rest of the paper proceeds as follows. Section 2 develops the theoretical framework. Section 3 discusses the matching methodology adopted in the implementation of the study. Section 4 describes data, empirical variables, and the structure of empirical tests. Section 5 reports results from empirical tests. Section 6 reports results from robustness tests that establish the directionality of externalities from information production. Section 7 concludes the study.