

## Short sellers and innovation: Evidence from a quasi-natural experiment

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# Short sellers and innovation: Evidence from a quasi-natural experiment

## Abstract

We examine the causal effect of short sellers on innovation. Using exogenous variation in short-selling costs generated by a quasi-natural experiment, Regulation SHO, which randomly assigns a subsample of the Russell 3000 index firms into a pilot program, we show that short sellers have a positive, causal effect on firm innovation. The positive effect of short sellers on innovation is more pronounced when firms are subject to a larger agency problem and a higher degree of information asymmetry. Our paper provides new insights into an under-explored and possibly unintended real effect of short sellers – their encouragement for firm innovation.

Key words: Innovation; Short selling; Regulation SHO; Pilot program

JEL number: G14; G18; O31; O32

## 1. INTRODUCTION

There has been an intensive debate about the economic impact of short sellers among academics, practitioners, and regulators in the past few decades. Critics of short sellers claim that they affect security prices adversely, lead to high market volatility, and undermine investors' confidence in the economy because of panic selling. Moreover, some anecdotes suggest that short sellers, given their strong incentives to profit from their short positions, may engage in opportunistic or even unethical behavior by disseminating pessimistic, false rumors about a firm. However, advocates of short selling take an opposite stand and argue that short sellers actually help improve market efficiency, facilitate price discovery, and prevent financial misconducts due to their active information production and intensive monitoring of the corporate management.<sup>1</sup>

While there might be an element of truth in both sides of these arguments, in practice it is hard to identify the causal effect of short sellers on the real economy due to the endogenous nature of short sales: short selling activities could give rise to or result from the underlying characteristics of the corporate sector. For instance, a drop in stock prices following a period of active short sales may imply that short sellers depress the price level via their trading, but it could also reflect the fact that short sellers merely predict an upcoming decreasing trend in the stock market and thus trade on their expectation.

In this paper, we exploit a quasi-natural experiment, Regulation SHO, to tackle the above endogeneity problem and provide the first empirical study that examines the causal effect of short sellers on technological innovation, which is perhaps the most important driver of economic growth. The impact of short sellers on innovation is of particular interest to policy makers and firm stakeholders not only because innovation is a crucial driver of a nation's economic growth (Solow, 1957) and competitive advantage (Porter, 1992), but also because short selling activities in the U.S. are highly regulated and can be altered by a series of security laws and regulations over time.

We rely on existing literature and the prevailing views of short selling to propose two competing hypotheses regarding the effect of short sellers on firm innovation. Our first

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<sup>1</sup> In a highly publicized case, short seller Muddy Waters LLC discovered that Sino-Forest, a Canadian company that had its operations in China, exaggerated the level of its principal assets (i.e., trees) that were not even owned by the company. In contrast, Sino-Forest's auditor, Ernst & Young, failed to detect the accounting fraud but still claimed "we are confident that Ernst & Young Canada's work... met all professional standards. ... Ernst & Young Canada did extensive audit work to verify ownership and existence of Sino-Forest's timber assets." (New York Times, December 6, 2012)

hypothesis conjectures that short sellers impede firm innovation. Short sellers are often accused of creating tremendous price pressure on a firm's stock (e.g., Mitchell, Pulvino, and Stafford, 2004), which leads to excessive pressure on managers to focus on short-term activities, exacerbating the managerial myopia problem (e.g., He and Tian, 2013; Fang, Tian, and Tice, 2014). Manso (2011) theoretically shows that tolerance for failure is necessary for effectively motivating and nurturing innovation due to the long-term, risky, idiosyncratic, and unpredictable nature of technological innovation.<sup>2</sup> However, short sellers have an innate distaste for tolerance towards short-term failures, because their main job is to identify underperforming firms, sell short these stocks to reflect their unfavorable information, and make trading profits. As a consequence, firm managers who care more about short-term stock prices as well as operating performance may sacrifice long-term firm value by cutting their investments in long-term, risky, but innovative projects to keep their stock prices high in the presence of short selling pressure. Therefore, our first hypothesis, the *pressure hypothesis*, argues that short sellers, by imposing short-term pressure on managers to prevent stock prices from falling, impede firm innovation.

Alternatively, there are at least two plausible reasons why short sellers may, even unintentionally, encourage innovation. First, moral hazard models such as Grossman and Hart (1988) and Harris and Raviv (1988) suggest that managers who are not properly monitored will shirk or tend to invest more in unchallenging routine tasks to enjoy private benefits such as “quiet life” (Bertrand and Mullainathan, 2003). Value-destroying underinvestment in innovative projects due to agency problems could be mitigated by the threat of depressing stock prices from short sellers who have been shown to serve as an effective disciplinary force in the corporate setting (Karpoff and Lou, 2010; Massa, Zhang, and Zhang, 2013a, 2013b; Fang, Huang, and Karpoff, 2013). Whenever short sellers detect managerial slack such as shirking on long-term innovative projects, they could immediately short sell the company's stock, leading to negative market reactions and potential disciplinary actions against the managers, including reduced bonuses and even forced managerial turnover. As a result, managers would be motivated to work hard and maximize firm value by making value-enhancing investment in innovative projects.

Second, as Holmstrom (1989) points out, innovative activities involve exploring untested and unknown approaches that have a high probability of failure, which makes the innovation

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<sup>2</sup> Recent empirical papers such as Acharya et al, (2013, 2014), Ederer and Manso (2013), and Tian and Wang (2014) all find supporting evidence for the implications of the failure tolerance theory.

process risky and long. Therefore, firms investing more heavily in innovative projects may be subject to a greater degree of information asymmetry (Bhattacharya and Ritter, 1983), are more likely to be undervalued by equity holders, and have a greater exposure to hostile takeovers (Stein, 1988). To minimize the chance of such expropriation, managers tend to reduce their investment in long-term innovation projects (in many cases sub-optimally) and exert more effort on routine tasks that offer faster and more stable returns, resulting in a typical managerial myopia problem. Since short selling is a costly trading strategy to implement, short sellers, relative to other stock market participants, generally spend more resources in information gathering and processing. Consequently, they offer a potential remedy for the above underinvestment problem in innovation by actively producing information about firm fundamentals, short selling overvalued stocks, and making stock prices more efficient.<sup>3</sup> While the actual trading actions by short sellers reveal bad news (i.e., overvaluation) about the short-sold stocks, the fact that short sellers do not take actions after producing information about a firm's fundamentals itself conveys good news to the equity market. In other words, the *possibility* of short selling a stock (rather than the *actual* trading of it) can potentially reduce the information asymmetry (as well as the associated stock undervaluation problem) for innovative firms. Since firm-specific information, including that concerning innovative activities, can now be better incorporated into current stock prices, firms exposed to a larger number of potential short sellers would be more willing to engage in value-enhancing innovation activities.<sup>4</sup>

Taken together, the alternative hypothesis argues that short sellers, by reducing information asymmetry of innovative firms and actively disciplining managers, encourage firm innovation. We term this view the *disciplining and information hypothesis*.

We test the above two hypotheses by examining the effect of short sellers on firm innovation. Obtaining patent information mainly from the National Bureau of Economic Research (NBER) Patent Citation database, we use the number of patents granted to a firm and

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<sup>3</sup> Boehmer, Jones, and Zhang (2008, 2013) show that short sellers are important contributors to efficient stock prices. Boehmer and Wu (2013) find that stock prices are more accurate when short sellers are more active.

<sup>4</sup> It is conceivable that information revelation and transparency may sometimes reduce firms' incentives to innovate due to strategic concerns. If most of the information that short sellers could produce is about firms' innovation-related business secrets, then firms exposed to a larger number of short sellers may actually reduce their innovation activities, especially when these activities need to be hidden from industry and product market competitors. However, as outsider information producers, short sellers are unlikely to access the core technology or business secrets of the firms they sell short, so the possible leakage of strategic information through their information production activities does not appear to be a serious concern for our study. Moreover, this "adverse" consequence of information production by short sellers actually predicts the opposite to our main findings below.

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