



## Financial innovation: The bright and the dark sides<sup>☆</sup>



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### ABSTRACT

Based on data from 32 countries over the period 1996–2010, this paper is the first to assess the relationship between financial innovation, on the one hand, and bank growth and fragility, as well as economic growth, on the other hand. We find that different measures of financial innovation, capturing both a broad concept and specific innovations, are associated with faster bank growth, but also higher bank fragility and worse bank performance during the recent crisis. These effects are stronger in countries with larger securities markets and more restrictive regulatory frameworks. In spite of these seemingly ambiguous findings, our evidence points to a positive net effect of financial innovation on economic growth: financial innovation is associated with higher growth in countries and industries with better growth opportunities.

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### 1. Introduction

*“Everybody talks about financial innovation, but (almost) nobody empirically tests hypotheses about it.”*

Frame and White (2004)

*“I wish somebody would give me some shred of evidence linking financial innovation with a benefit to the economy.”<sup>1</sup>*

–Paul Volcker, former Chairman of the Federal Reserve

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<sup>1</sup> See “Paul Volcker: Think More Boldly,” *The Wall Street Journal*, December 14, 2009, p. R7.

The Global Financial Crisis of 2007–2009 has spurred renewed wide-spread debates on the “bright” and “dark” sides of financial innovation.<sup>2</sup> The traditional *innovation-growth view* posits that financial innovations help improve the quality and variety of banking services (Merton, 1992; Berger, 2003), facilitate risk sharing (Allen and Gale, 1991, 1994), complete the market (Duffie and Rahi, 1995; Elul, 1995; Grinblatt and Longstaff, 2000), and ultimately improve allocative efficiency (Ross, 1976; Houston et al., 2010), thus focusing on the bright side of financial innovation. The *innovation-fragility view*, on the other hand, focuses on the “dark” side. Specifically, it identified financial innovations as the root cause of the recent Global Financial Crisis, by leading to an unprecedented credit expansion that helped feed the boom and subsequent bust in housing prices (Brunnermeier, 2009), by engineering securities perceived to be safe but exposed to neglected risks (Gennaioli et al., 2012), and by helping banks develop structured products to exploit investors’ misunderstandings of financial markets (Henderson and Pearson, 2011). This paper uses different indicators of financial innovation and an array of bank-, industry and country-level data

<sup>2</sup> In early 2010, the Economist organized a 10-day online debate between Ross Levine and Joseph E. Stiglitz on the role and benefits of financial innovation: <http://www.economist.com/debate/overview/166>.

and analyses to test these hypotheses in a sample of 32 countries over the period 1996–2010.

Given the active academic and policy debate on the role of financial innovation, there is a striking paucity of empirical studies of the real and financial implications of financial innovation, mainly due the lack of data.<sup>3</sup> Unlike in manufacturing, patents are scarcely used in the financial service industry or even unavailable, as in the European Union. As a consequence, most existing studies focus on very specific innovations such as new forms of financial securities (e.g. Grinblatt and Longstaff, 2000; Schroth, 2003; Henderson and Pearson, 2011), the introduction of credit scoring techniques (Frame and White, 2004, 2009; Akhavein et al., 2005), new forms of mortgage lending (Gerardi et al., 2010) or new organizational forms, such as Internet-only banks (e.g. DeYoung, 2001, 2005; DeYoung et al., 2007). These studies so far have yielded mixed findings.

On the one hand, there is supporting evidence that financial innovation increases bank growth and supports financial deepening. For example, DeYoung et al. (2007) find that Internet adoption improved U.S. community banks' profitability – primarily through deposit-related charges. Several studies document that small business credit scoring increases the quantity of bank lending (Frame et al., 2001, 2004; Berger et al., 2005). Saretto and Tookes (2013) find that CDS trading increases bank credit supply, while Norden et al. (2014) show that banks that use credit derivatives as risk management tool pass these benefits on to their clients in form of lower interest spreads and cut lending less during the recent crisis. Using “counterfactual historic analysis”, Lerner and Tufano (2011) document the positive contribution to financial deepening and economic growth of financial innovations, such as venture capital and equity funds, mutual and exchange-traded funds, and securitization.

On the other hand, financial innovations such as securitization change the ex-ante incentives of financial intermediaries to carefully screen and monitor the borrowers (Allen and Carletti, 2006). Wagner (2007a, b) shows that financial innovation that reduces asymmetric information can actually increase risk-taking due to agency problems between bank owners and managers, or because of lower costs of fragility. In the context of the recent lending boom and subsequent Global Financial Crisis, several authors have pointed to distortions introduced by financial innovations, such as securitization and new derivative securities, and how they have contributed to aggressive risk taking, reduction in lending standards and thus fragility (e.g., Keys et al., 2010; Dell'Arciccia et al., 2008; Rajan, 2006; and Gennaioli et al., 2012). Subrahmanyam et al. (2014) find that CDS trading significantly increases credit risk as financial institutions reduce monitoring, while Wang and Xia (2014) document that banks exert less effort on ex post monitoring when they can securitize loans. Overall, there is no conclusive evidence on whether financial innovation is good or bad for the financial sector. Meanwhile, none of the existing papers has taken a holistic approach to financial innovation and its implications for bank growth and fragility. This paper attempts to fill this gap by providing cross-country evidence on the real and financial sector consequences of financial innovation, looking beyond individual innovations to broader measures of activities that result in new products, delivery channels and organizational forms.

We follow Tufano's (2003) concept of financial innovation, which includes the process of invention (the ongoing research and development function) and diffusion (or adoption) of new products, services or ideas, and focus on R&D spending in the finan-

cial sector as well as several product or output based measures of financial innovation.<sup>4</sup> Specifically, using OECD innovation survey data on banks' R&D expenditures across 32 mostly developed countries over the period 1996–2010 as a broad indicator of financial innovation, as well as a financial system's securitization capacity and the importance of off- to on-balance-sheet assets as gauges of innovation in specific areas, we relate financial innovation to bank growth and bank fragility over the period 1996–2010 and bank performance during the recent financial crisis. Using a sample of more than 2000 unique banks across 32 countries, we find that a higher level of financial innovation is associated with higher bank growth and higher fragility at the same time. Consistent with these findings, we show that banks' profitability dropped at a higher rate during the recent crisis and the buy-and-hold stock returns during the crisis were lower in countries with higher pre-crisis levels of financial innovation.

The seemingly ambiguous relationship between financial innovation and bank performance raises the question of its impact on the real sector. An extensive literature in finance and growth finds a positive correlation between financial development and economic growth (e.g. King and Levine, 1993a, b; Beck et al., 2000), while an extensive banking crisis literature has established rapid credit growth as one of the most robust crisis predictors (e.g., Jorda et al., 2013).<sup>5</sup> Similarly, the net effect of financial innovation on economic growth remains an empirical question that goes beyond its effects on banking sector outcomes. We therefore directly investigate the association of financial innovation with economic growth to pin down the net impact of financial innovation on the real economy.<sup>6</sup> We try to mitigate the potential endogeneity problem, which is often a concern in the finance and growth literature, by offering several tests of channels and mechanisms through which financial innovation is associated with real sector outcomes. Specifically, we use the approach of Bekaert et al. (2005, 2007) to gauge the relationship between financial innovation, exogenous growth opportunities and GDP per capita growth, and follow the approach by Rajan and Zingales (1998) to focus on the differential effects of financial innovation on industries with different growth opportunities (Fisman and Love, 2004, 2007). We find that a higher level of financial innovation is associated with a stronger relationship between a country's exogenous growth opportunities and GDP per capita growth and with a higher growth of industries that have greater growth opportunities. We also show that cross-country and time-variation in financial innovation cannot be explained by growth opportunities. While the cross-country setting of our estimations does not allow the definite elimination of any endogeneity bias, this reduces concerns that our findings are driven by reverse causation or omitted variable bias.

The existing literature on financial innovation also predicts significant differences of its effects according to its nature and the regulatory environment and market structure in which financial innovation happens and which influence banks' incentives for

<sup>3</sup> See discussion in Frame and White (2004, 2009) who conduct a thorough survey of the empirical literature on financial innovation. For theoretical literature related to financial innovation, Duffie and Rahi (1995) introduce a special issue of Journal of Economic Theory.

<sup>4</sup> This is different from Laeven et al. (2015), one of the few other cross-country papers in this area, who focus on one specific financial innovation – Private Credit bureaus. Loayza and Ranciere (2006) combine these two effects in a panel analysis and find a positive long-run relationship between financial development and growth, while the short-run coefficient on current financial development enters negatively. Rancière et al. (2008) find a robust positive link between the first moment of credit growth and economic growth, and a negative relationship between the second and third moment and GDP growth. Similarly, studies of financial liberalization show its positive effects on financial deepening and economic growth as well as dampening effects on consumption volatility, but also a higher likelihood of suffering systemic banking crises (Bekaert et al., 2005, 2007 Rancière et al., 2006).

<sup>5</sup> The existing literature focus on the effect of financial development (Private Credit), information sharing, financial openness and liberalization, financial integration among others on economic growth (e.g., King and Levine, 1993b; Bekaert et al., 2005; Bekaert et al., 2007; Djankov et al., 2007; Houston et al., 2010).

<sup>6</sup> See Levine (2005) for a literature survey.

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