



Creative destruction and firm-specific performance heterogeneity

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<https://doi.org/10.1016/j.jfineco.2007.06.005> 

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Abstract

Traditional U.S. industries with higher firm-specific stock return and fundamentals performance heterogeneity use information technology (IT) more intensively and post faster productivity growth in the late 20th century. We argue that this mechanically reflects a wave of Schumpeter's creative destruction disrupting a wide swath of industries, with successful IT adopters unpredictably undermining established firms. This validates endogenous growth theory models of creative destruction and suggests intensified creative destruction as explaining findings associating greater firm-specific performance variation with higher per capita GDPs, economy growth rates, accounting standards, financial system development, and property right protection.

Introduction

Elevated heterogeneity in firm-specific stock return and fundamentals performance is significantly correlated with more intensive use of information technology (IT) and faster productivity growth across a panel of traditional U.S. industries from 1971 to 2000. We argue that this suggests IT, at least in the early decades of its absorption into the economy in the late 20th century, induced a tremor of Schumpeter's (1912) *creative destruction* across a wide swath of U.S. industries. New innovators, with abnormally good performance, unpredictably and continually rose to dislodge established firms, abnormally depressing their performance. This suggests intensified creative destruction as a new explanation for the rising firm performance heterogeneity among publicly traded firms in recent decades in the U.S. and other developed economies observed by Morck, Yeung, and Yu (2000), Campbell, Lettau, Malkiel, and Xu (2001), Irvine and Pontiff (2004), Wei and Zhang (2006), and others.

We study publicly traded firms in traditional U.S. manufacturing and nonmanufacturing industries such as lumber and wood products, retail trade, and motion pictures, that is, we abstract from IT-related firms. We do so because this avoids possible noise in dot.com stock returns and, more importantly, because Bresnahan and Trajtenberg (1995), Helpman and Trajtenberg (1998), Jovanovic and Rousseau (2005), and others argue that IT is a *general purpose technology* (GPT), which, like electricity in the early 20th century or steam power early in the industrial revolution, induces process and product innovation across most industries. Bresnahan and Trajtenberg (1995) and Helpman and Trajtenberg (1998) model GPTs driving economic growth, and cite IT as an example. Oliner and Sichel (2000), Jorgenson (2001), Stiroh (2002), and Brynjolfsson and Hitt (2003) also link IT to economy-wide enhanced productivity.

Our findings complement approaches to economic growth theory, such as Pastor and Veronesi (2005), which model an economy absorbing a new technology and consequently exhibiting sustained elevated firm performance heterogeneity. More generally, this paper builds on Aghion and Howitt, 1992, Aghion and Howitt, 1998, Aghion, Angeletos, Banerjee, and Manova (2004), Aghion, Howitt, and Mayer-Foulkes (2005), Acemoglu (2005), Acemoglu, Aghion, and Zilibotti (2006), and other formalizations of Schumpeter's (1912) concept of creative destruction.

Other research into rising firm-specific performance variation can readily be reinterpreted in light of our findings. Pastor and Veronesi (2003), Fama and French (2004), Fink, Fink, Grullon, and Weston (2005), Bennett and Sias (2006), and Brown and Kapadia (2007) link heterogeneity to small or young firms. Philippon (2003), Irvine and Pontiff (2004), and Gaspar and Massa (2006) stress intensified competition and deregulation. Morck, Yeung, and Yu (2000), Fox, Morck, Yeung, and Durnev (2003), Bris, Goetzmann, and Zhu (2004), Durnev, Li, Morck, and Yeung (2004), Huang (2004), Ozoguz (2004), Biddle and Hilary (2006), and Jin and Myers (2006) link elevated firm performance heterogeneity to financial system development and transparency. Neatly tying all these findings together, Schumpeter (1912) links creative destruction to intensified competition from new, initially small, upstart firms that need external financing to grow rapidly,¹ Murphy, Shleifer, and Vishny (1991) model regulation repressing creative destruction, and Schumpeter's (1939) theory of business cycles posits that intensified competition trails waves of creative destruction. The link we find between IT and elevated firm performance heterogeneity nonetheless survives controls for all these factors as well as for other relevant industry characteristics, suggesting a robust overarching role for IT.

Our results should comfort financial economists, like Roll (1988), who lament the low R^2 statistics of standard asset pricing models caused by high firm-specific stock return variation in the U.S. and other developed countries. If this reflects faster creative destruction in countries with better institutions, there is no cause for lamentation. Asset pricing models not only retain their basic validity, but may also find a new following among growth theorists as gauges of the intensity of creative destruction and related phenomena. Creative destruction is usually envisioned as creative innovators destroying laggards utterly; however, in practice, the laggards may only be beaten back for a while. Firm-specific performance heterogeneity may thus be a finer and more nuanced metric of the intensity of creative destruction than firm exit rates.

The paper is structured as follows. Section 2 describes our IT intensity, firm performance heterogeneity, and total factor productivity (TFP) measures. Section 3 covers regressions and Section 4 discusses interpretation and statistical robustness issues. Section 5 concludes with a brief discussion of the implications of our results.

Section snippets

Variable construction

This section describes our main variables and the data used to construct them. Our results are robust to various alternative constructions, described in detail in Section 4....

Regressions

Using U.S. industry panel data from 1971 to 2000, we regress firm performance heterogeneity on IT intensity and other relevant control variables. This section describes the regressions used to generate the tables. Their basic patterns of signs and significance are robust to a wide range of alternative variable constructions and econometric approaches, whose discussion is deferred to Section 4....

Robustness checks

A range of alternative approaches produce qualitatively similar results, by which we mean patterns of signs and significance for variables of interest identical to those in the tables....

Conclusions

Elevated firm performance heterogeneity—cross-sectional firm-specific variation in individual firms' stock returns and real sales growth—is associated with intensive investment in information technology (IT). These findings are robust to a wide range of specifications, control variables, and econometric approaches.

Our results support IT serving as a general purpose technology (GPT), inducing a wave of innovation across many industries. Some firms make good use of these opportunities, while...

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☆ An earlier version of this paper circulated as “Patterns of Comovement: The Role of Information Technology in the US Economy” and as NBER Working Paper No. 10937. This research was in progress when Randall Morck was a visiting professor at Harvard. Chun, Kim, and Morck acknowledge partial funding from PSC-CUNY, University of Alberta SAS and Nova fellowships, and the SSHRC, respectively. We thank Philippe Aghion, Cliff Ball, Nick Bollen, Aida Charoenrook, Wonseok Choi, Bill Christie, Art Durnev, Mara Faccio, Daniel Ferreira, Akiko Fujimoto, David Gabel, Amar Gande, Bruno Gerard, Luca Grilli, Campbell Harvey, Peter Howitt, Mark Huson, Boyan Jovanovic, Aditya Kaul, Chansog Kim, Jason Lee, Ross Levine, Kyung-Mook Lim, Ron Masulis, Vikas Mehrotra, Robert Shiller, James Stock, Hans Stoll, and seminar participants at the University of Alberta, Boston College, Boston University, Brown University, the Canadian Economic Association, Chinese University of Hong Kong, Copenhagen Business School, CUNY Graduate Center, the Corporate Governance and Capital Markets Conference in Lisbon, Duke University, Ewha Womans University, the European Finance Association, University of Florida, Georgetown University, Harvard University, Hong Kong Polytechnic, the International Industrial Organization Conference, the Korea Academic Society of Industrial Organization, Kyunghee University, University of Miami, New York University, Ohio State University, Queens College, Sogang University, Stockholm School of Economics, University of Toronto, Vanderbilt University, and the Western Economic Association. We are also most grateful to an anonymous referee for particularly helpful comments.

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