DOES INNOVATION CHASE PROFITS, OR DO PROFITS CHASE INNOVATION?

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Abstract

This paper performs an empirical assessment of a debate held decades ago on whether an entrepreneur's or a firm's desire for profits starts with innovation, or whether excess profits or surplus are used as some type of investment fund to perform research, development and innovation. That is, which typically comes first, innovation and then profits, or do profits come first, and then innovation? In the former case, it is held that either the small entrepreneur or the large corporation has an idea for a new and innovative product or service and then finds the ways to fund its development. In the latter case, it is thought that research and development on any new idea or product usually comes about only once a certain level of profitability has been attained by the firm, and development of a new product or service is not undertaken unless it meets a certain target rate of return on investment. The analysis of this paper examines a debate in which Paul M. Sweezy argued that innovation mostly comes about thanks to firms, especially large corporations, investing excess profits into research and development, which was contrary to the traditional view of Joseph Schumpeter who believed that innovative ideas come first, and then firms pursue the innovative ideas. The traditional view is still the predominant view of most people who study innovation, although so far no evidence of a test of the Sweezy contention has been found in the course of doing research on this topic. This paper uses time series data from different governmental and private sector databases and time series least square regression to test the Schumpeter and Sweezy theories.

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Introduction

Innovation and the introduction of new products and the creation of new markets play large roles in economic growth and development theory. The pursuit of profit is a primary motivator for inventors and entrepreneurs, and new products and businesses not only serve the needs of an expanding population but more importantly can also serve as a major source of innovation, which in turn is assumed to be a source of rising standards of living (Harrison, 2015; Decker et al., 2016). Innovation and new inventions cannot only benefit consumers but also benefit producers and workers by helping to raise productivity levels (Griliches and Mairesse, 1981). In forming small enterprises which can sometimes later grow into larger ones, entrepreneurs can enhance existing products and markets or create new products, markets, profits, and employment that help to keep an economy dynamic and thriving (US Small Business Administration, 2012). The US Small Business Administration (SBA) claims that

small businesses accounted for around "64% of the net new jobs created between 1993 and 2011 (or 11.8 million of the 18.5 million net new jobs)" (US Small Business Administration, 2012, p. 1). The same source also states that small businesses are far more productive than their larger counterparts in generating patents per employee by a 16 to 1 ratio over a comparable period of time.

Additionally, the product life cycle theory (Levitt, 1965) states that as new, innovative and successful products are introduced into an economy, the industries and firms that produce the new products initially expand in terms of employment, sales, and household consumption (the introductory and growth stages of the cycle). Later such growth begins to slow until a "maturity" stage of the product life cycle is reached wherein sales, employment, profits and market shares plateau, and the number of competitors within an industry usually shrinks. If a product becomes obsolete or is replaced by a new innovation, the industry may go into decline and possibly disappear from the marketplace. As the businesses and products/services of one generation of entrepreneurs reach a maturity or saturation stage of the product life cycle (Levitt, 1965), new businesses are formed and new products are put on the market every year which in turn should keep an economy expanding. Despite numerous small (and usually less numerous large) business closures every year, there are enough new small businesses and products that survive to help guarantee that a free enterprise or capitalistic economy continues to grow (Decker et al., 2016; Haltiwanger, 2010).

Therefore, within neoclassical or mainstream economic theory, entrepreneurship and innovation are two possible ways that a capitalistic economy could avoid future, or worse than would be otherwise, stagnation and decline.

Theoretical Foundations

Joseph A. Schumpeter's writings on innovation and entrepreneurship have received a great deal of attention over the decades (Schumpeter, 1942; Schumpeter, 1983; Blaug, 1997, p. 445-446). As with mainstream economics, Schumpeter once believed that the role of the small entrepreneur was crucial in bringing about innovation, new jobs, and rising standards of living. Additionally, the entrepreneur was also seen as an antidote to large business concentration in that established industries are sometimes usurped by upstart business and new technologies that replace older businesses and technology. According to Schumpeter, the process of "creative destruction" is one in which older industries are replaced by newer ones thanks to the decline of the older industries and their products and the rise of new products due to entrepreneurship (Schumpeter, 1983). Later, however, Schumpeter began to see large corporations as a source of innovation and rising standards of living. These organizations had the financial and industrial capacity to develop new products, although he also thought that the decline of small business as a source of innovation would eventually cause the middle classes to lose a lot of confidence in the capitalist system since small business and profitable innovation were vehicles of class mobility (Schumpeter, 1942; Foster, 2011).

Schumpeter (1942) is thought to have had an influence on Paul M. Sweezy's (1953) thinking regarding innovation, business cycles and economic growth (Foster, 2011; Baran and Sweezy, 2017), although Schumpeter thought that firms, whether large or small, pursued innovation with profits as a goal whereas Sweezy thought that profits or surplus, or the accumulation of profits or surplus, came first, and then firms

looked for investment outlets through innovation to absorb the surplus (Schumpeter, 1942; Sweezy, 1942; Sweezy, 1953; Foster, 2011). For Schumpeter, economic crises mostly arose due to innovation cycles wherein sometimes not enough new innovations were forthcoming to yield new products and new industries so as to keep an economy growing. For Sweezy economic crises arose from a lack of surplus or profit absorption wherein the number of new innovative products and businesses were not enough to absorb all of the surplus generated in a capitalist economy, and so growth stagnated as a growing portion of surplus failed to be reinvested. In general, for Schumpeter, innovators and innovation chased after profits, whereas for Sweezy, profits pursued or looked for possible innovation as an investment outlet (Schumpeter, 1942; Sweezy, 1942; Sweezy, 1953; Foster, 2011). Samuelson (1969) and Foster (1999) have written about a congenial, public debate held at Harvard University during the 1946-47 school year between Schumpeter and Sweezy on their opposing ideas, especially on economic stagnation and the causes of recessions and depressions. Although politically and ideologically different, the two economists were good friends throughout their careers (Samuelson, 1969; Samuelson, 1972); Foster 1999). Their disagreements on what causes stagnation, economic slumps as well as economic recoveries also included their views on innovation.

Data Sets

Since both Schumpeter and Sweezy believed that large corporations did most of the innovation in the US economy, some measurements of large corporation profits or increases in their value on the one hand and large corporation research and development (R&D) expenditures on the other hand are needed to test the hypotheses of 1) whether R&D expenditures in the present lead later to greater corporate profits or wealth, or, 2) whether greater corporate profits lead to more contemporaneous time period expenditures on R&D. The first hypothesis holds that innovation occurs as a result of the risky and time-consuming pursuit of future and possible profits through R&D expenditures and efforts in previous time periods. Since patenting a new idea or product can take several years, and since R&D efforts can take several years before a patent is filed for a new innovation (US Patent and Trademark Office, 2018), a lag of 10 years between R&D expenditures and corporate financial gain is used to examine the Schumpeter theory of innovation. R&D expenditures by companies in the US from 1953 to 2007 (US NSF, 2007) are used to predict the Standard and Poor 500 Index (S&P 500) values from 1963 to 2017 (Damodaran, 2018; S&P, 2018). In 2008, there was a change in the way data were compiled, and so the series ends in 2007. The S&P 500 is a stock market index based on the market capitalizations of 500 large companies having common stock listed on the NYSE or NASDAQ. There are data bases which show corporate profits as a percentage of US Gross Domestic Product over the years. However, these percentages include the profits of small and medium sized corporations which typically do not engage in that much research development as do the larger or largest corporations in the US (US NSF, 2012). Therefore, since the S&P 500 index measures corporate performance regarding profits and wealth creation for the largest publicly traded 500 corporations, increases in its values over time are used as a measurement of payoff for the largest corporations with respect to their R&D efforts.

To examine the Sweezy notion of innovation, the S&P 500 index is used as an independent variable to predict the level of R&D expenditures in the subsequent. This

is done since Sweezy argues that profitability in the short run and in just a short term prior period determines the level of R&D spending in a current time period. A one-year time lag is used. Therefore, the level of R&D spending predicted by the S&P Index is just one year after the S&P 500 measurement, and so the S&P 500 Index values for 1952 to 2006 are used to predict corporate R&D spending from 1953 to 2007.

Sample Runs

Box-Cox regression analysis and scatterplot results indicated that for the Schumpeter hypothesis that it was best to use a model wherein the natural log of the S&P 500 Index from 1963 to 2017 (the dependent variable) was regressed against the corporate R&D expenditures as a percentage of GDP from 1953 to 2007 (the independent variable). The Breusch-Godfrey LM test for autocorrelation indicated rejection of the null hypothesis of no serial correlation, so Newey-West standard errors were calculated. The results are shown below.

Table 1. Model for Schumpeter Theory

Dep. Variable: Ln S&P 500 Index 1963 to 2017				
Ind. Variable	b	Newey-West S.E.	t	p-value
R&D Exp. Pct. GDP 1953 to 2007	2.858	0.165	17.28	0.000
Intercept	2.12	0.203	10.44	0.000
R-squared: 0.8982				
Adjusted R-squared: 0.8963 N=47				

For the Sweezy theory, Box-Cox regression analysis and scatterplot results indicated that a natural log model was best to use wherein the corporate R&D expenditures as a percentage of GDP from 1953 to 2007 (the dependent variable) were regressed against the natural log of the values of the S&P 500 Index from 1952 to 2006 (the independent variable). The Breusch-Godfrey LM test for autocorrelation indicated rejection of the null hypothesis of no serial correlation, so Newey-West standard errors were calculated. The results are shown below.

Table 2. Model for Sweezy Theory

Dep. Variable: R&D Exp. Pct. GDP 1953 to 2007				
Ind. Variable	b	Newey-West S.E.	t	p-value
Ln S&P Index 1952 to 2006	0.377	0.01	35.21	0.000
Intercept	-0.577	0.048	-11.98	0.000
R-squared: 0.936				
Adjusted R-squared: 0.935 N=55				

Results and Conclusions

The results indicate that the Sweezy theory may be a more credible explanation of innovation since it has a higher explanation of variance. However, it is only slightly better than the Schumpeter model by just 4% or so. The models are limited by the fact

that R&D data is only available in one consistent format from 1953 to 2007 and that it would be better to have the actual profits of the S&P 500 Index corporations over time. These are currently being gathered by the author of this paper. At such a high level of aggregation (macroeconomic aggregation), it is hard to discern some microeconomic influences on the results, and sometimes other events outside of the invention or development of new products cause corporate profits to increase.

Therefore, the results could be spurious, and so in future models control variables need to be developed. While doing research on this paper, no tests of the Schumpeter and Sweezy hypotheses were found, and no literature on an appropriate lag time between R&D expenditures and corporate profitability could be found. Although one can conclude that the Sweezy model is showing better preliminary results, more research needs to be done on the two theories and more work on each model needs to be done. These are areas of future research.

References

Baran, P.A. and Sweezy, P.M. (2017), *The Age of Monopoly Capital: Selected Correspondence of Paul A. Baran and Paul M. Sweezy, 1949-1964*, Baran, N. and Foster, J.B. (Ed.), Monthly Review Press, New York, NY.

Blaug, M. (1997), *Economic Theory in Retrospect,* Cambridge University Press, Cambridge, UK.

Damodaran, A. (2018), S&P Data, Stern School of Business, New York University available at: http://people.stern.nyu.edu/adamodar/ New_Home_Page/data.html (accessed July 4, 2018).

Decker, R.A., Haltiwangerb, J., Jarmin, R.S. and Miranda, J. (2016), "Where has all the skewness gone? The decline in high-growth (young) firms in the U.S.", *European Economic Review*, Vol. 86, July, pp. 4-23.

Foster, J.B. (1999), "Remarks on Paul Sweezy on the Occasion of His Receipt of the Veblen-Commons Award", *Journal of Economic Issues,* Vol. 33 No. 2, pp. 223-228.

Foster, J.B. (2011), "On the Laws of Capitalism", *Monthly Review*, Vol. 63 No. 1, May 1, available at: https://monthlyreview.org/2011/05/01/on-the-laws-of-capitalism (accessed July 4, 2018).

Foster, J.B. (2014), *The Theory of Monopoly Capitalism: An Elaboration of Marxian Political Economy*, Monthly Review Press, New York, NY.

Griliches, Z. and Mairesse, J. (1981), "Productivity and R and D at the Firm Level", NBER Working Paper No. 826, December, available at: http://www.nber.org/papers/w0826.pdf (accessed July 4, 2018).

Haltiwanger, J., Jarmin, R.S. and Miranda, J. (2010), "Who Creates Jobs? Small vs. Large vs. Young. U.S. Bureau of the Census", Center for Economic Studies (CES), 10-17 August, available at: https://www.census.gov/ces/pdf/CES-WP-02-17.pdf (accessed July 4, 2018).

Harrison, J.D. (2015), "The Decline of American Entrepreneurship – in Five Charts", *The Washington Post*, February 12, available at: https://www.washingtonpost.com/news/on-small-business/wp/2015/02/ 12/the-decline-of-american-entrepreneurship-in-five-charts/?utm_term =.c7a395fc3ddd (accessed July 4, 2018).

Levitt, T. (1965), "Exploit the Product Life Cycle", *Harvard Business Review*, Vol. 43,

November, available at: https://hbr.org/1965/11/exploit-the-product-life-cycle (accessed July 4, 2018).
Romer, D. (2012), *Advanced Macroeconomics*, McGraw-Hill Irwin, New York.
S&P Historical Prices by Year (2018), S&P Historical Prices by Year, available at: http://www.multpl.com/s-p-500-historical-prices/table/by-year (accessed July 4, 2018).
Samuelson, P.A. (1969), "Memories", *Newsweek*, Vol. 73 No. 22, June 2, p. 84.
Samuelson, P.A. (1972), *Collected Scientific Papers*, Vol. 3, MIT Press, Cambridge, MA.
Schumpeter, J.A. (1942), *Capitalism, Socialism, and Democracy*, Harper and Brothers Publishers, New York.
Schumpeter, J.A. (1983), *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle,* Transaction Publishers, New Brunswick, US.
Sweezy, P.M. (1942), *The Theory of Capitalist Development: Principles of Marxian Political Economy*, Monthly Review Press, New York, NY.
Sweezy, P.M. (1953), "Schumpeter's Theory of Innovation," in *The Present as History: Essays and Reviews on Capitalism and Socialism*, Monthly Review Press, New York, pp. 274-282.
US NSF (2007), Survey of Industrial Research and Development, US National Science Foundation (NSF), available at: https://www.nsf.gov/statistics/iris/history_pub.cfm (accessed July 4, 2018).
US NSF (2012), National Science Foundation Statistics, available at: https://www.nsf.gov/statistics/seind12/pdf/c04.pdf (accessed July 4, 2018).
US Patent and Trademark Office (2018), Patent Process Overview. available at: https://www.uspto.gov/patents-getting-started/patent-process-overview (accessed July 4, 2018).
US Small Business Administration (2012), Frequently Asked Questions, SBA Office of Advocacy, September, available at: https://www.sba.gov/sites/default/files/FAQ_Sept_2012.pdf (accessed July 4, 2018).