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**Extended Abstract**

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**The Macro-economic impact of financial crisis on private R&D effort in  
Indian Manufacturing sector: a sectoral analysis**

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**Abstract**

The effect of business cycles on long run economic growth and innovative activity has been a central question in macro-economic theory and empirical research. While studies in developed country contexts show R&D to be countercyclical with economic crisis and highly responsive to subsidy programs, in India, not much research has been done to understand the nature of R&D during economic shocks. This study aims to analyze the R&D behavior of firms during economic crisis and the impact of macro-economic policy variables on R&D intensity of manufacturing firms in India during 2000-2015. Among the South East Asian economies, although India is a \$trillion economy, it ranks well behind China, Brazil, South Korea in terms of per capital real GDP, R&D intensity, patent applications and high technology exports. Consequently, Indian manufacturing activity is concentrated in low value-added segment in the global production networks. Using Prowess data set on R&D expenditure the study analyzes R&D behavior in Indian firms and attempts to draw policy implications for developing incentives to encourage R&D behavior in a more effective and sustainable manner

**Key Words:** R&D, Fiscal Incentives, Business cycle, Manufacturing, India

# **The Macro-economic impact of financial crisis on private R&D effort in Indian Manufacturing sector: a sectoral analysis**

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Madhuri Saripalle

## **Extended Abstract**<sup>1</sup>

### **1. Introduction**

The effect of business cycles on long run economic growth and innovative activity has been a central question in macro-economic theory and empirical research. While studies in developed country contexts show R&D to be countercyclical with economic crisis and highly responsive to subsidy programs, in India, not much research has been done to understand the nature of R&D during crisis and its response to fiscal incentives. This study aims to analyze the R&D behavior of firms during economic crisis and the impact of macro-economic policy variables on R&D intensity of manufacturing firms in India during 2000-2015. Using a combination of secondary data sets on R&D expenditure and primary data on interviews of specific sectors like automobiles, the study attempts to draw policy implications for developing incentives to encourage R&D behavior in a more effective and sustainable manner so that India's manufacturing sector is integrated with high value added activities in the global production networks.

Among the South East Asian economies, although India is a \$trillion economy, it ranks well behind China, Brazil, South Korea in terms of per capital real GDP, R&D intensity, patent applications and high technology exports. Consequently, Indian manufacturing activity is concentrated in low value added segment in the global production networks in industries such as electronics and automobiles. In India, R&D policy was primarily focused on the public sector with few linkages with the private sector until the decade of 2000 when innovation policies favored enterprise development as compared to stand alone science and

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<sup>1</sup> The authors may be contacted directly for full version of the paper.

technology policies (Dhar and Saha, 2014). Incentives are mostly in the form of indirect policies in the form of weighted tax deductions, tax holiday, accelerated depreciation and write-off on all revenue and capital expenditure towards R&D. The second type of incentive is in the form of reduced custom duties on technology import, especially in bio-technology and pharmaceutical sectors. The key issue is,

- Firstly, whether the R&D benefits have resulted in increased R&D effort post 2000 and;
- Secondly, given the credit constraints on manufacturing sector, the impact of macro- economic shocks on the innovative activity in this sector.

## **II. Overview of Literature**

It is well established in economic literature that innovation is the key to economic growth. Innovation led by research and development results in increased stock of knowledge as well as the ability to absorb and assimilate that knowledge (Cohen and Levinthal, 1989). However, R&D activity creates an externality and is a classic case of market failure resulting in a divergence between private and social marginal cost. Since producers of knowledge cannot realize the full social return to their efforts if such externalities exist, private incentives for the production of knowledge are distorted and firms are likely to under-invest in R&D efforts. It is imperative that public policy incentivize R&D activities undertaken by private enterprises. The need for incentives becomes all the more during economic crisis, when R&D activity may face a decline. In developed countries it has been found that subsidies and tax incentives help in supporting private R&D, especially during economic crisis.

Private sector contributes to almost 70% of R&D expenditure in developed countries led by the OECD economies which spend on an average 2.3% of GDP on R&D. Whereas the share of developing economies is less than 1% of GDP, with the share of private sector being approximately 40% of total R&D expenditure. China is an outlier in this respect and its R&D is 1.5% of GDP. In the developed country context most of the empirical research has focused on analyzing the impact of direct support programs as indirect incentives were started only in late 1980s. It has been found that direct support does not significantly influence private

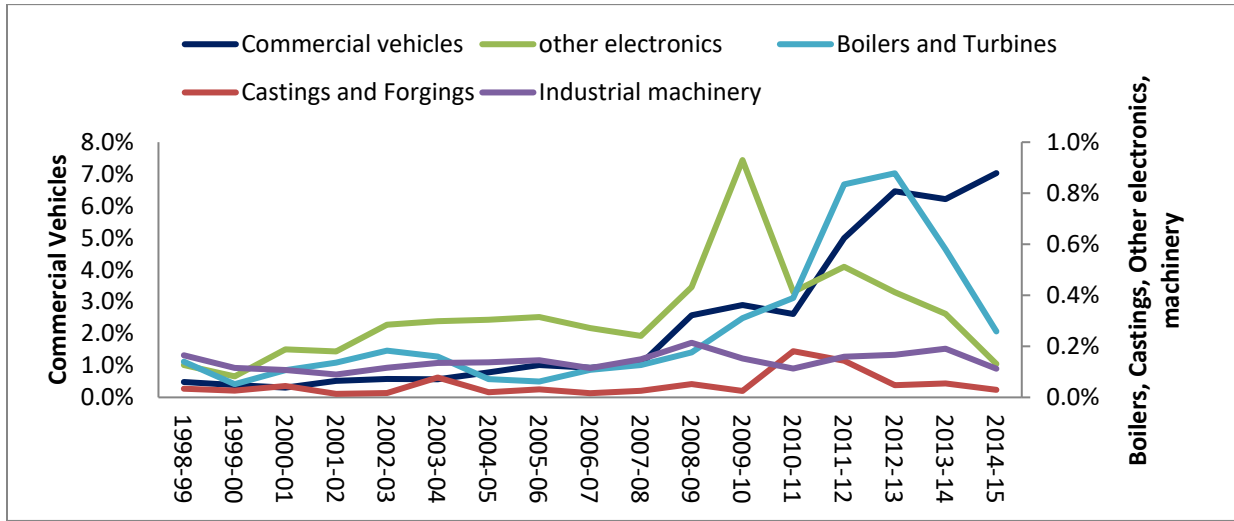
R&D investment vis-à-vis indirect support. Apart from policy variables, the other key macro variables that influence private R&D are the nominal interest rate and public R&D expenditure that can have a substitutive or complementary relation with private R&D.

*Is R&D investment countercyclical?*

The effect of business cycles on long run economic growth and innovative activity has been a central question in macro-economic theory and empirical research. In the emerging economy context, not much evidence is available with respect to presence of capital constraints. Sasidharan et al (2015) find internal cash flow to be significant in financing R&D as opposed to external funding during 1992-2011. Furthermore, based on similar financing pattern during inactive and active market phases, they find support to the argument that R&D may not be declining during the period of crisis and infact may be countercyclical in case of Indian manufacturing firms.

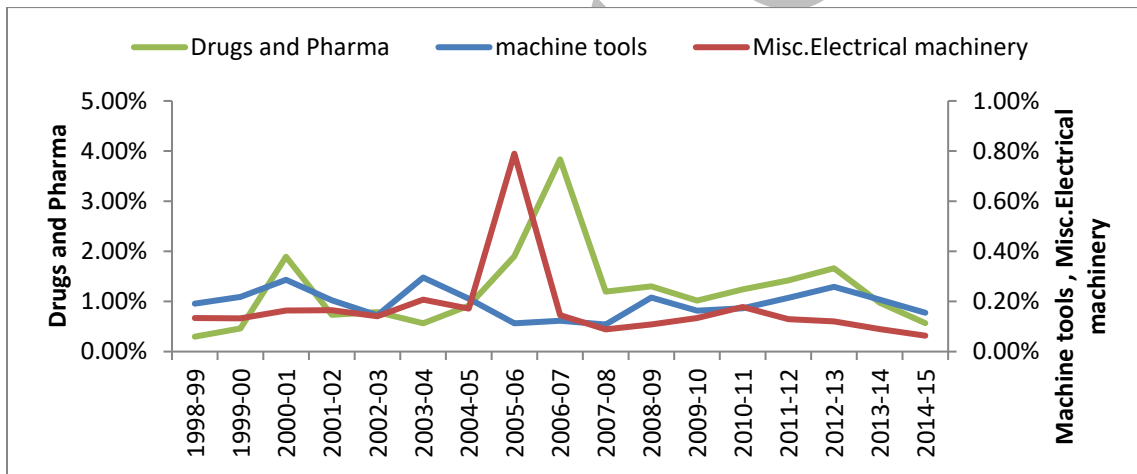
However, there is no strong evidence that firms increase R&D spend during the period of crisis. India is among the few emerging economy countries which fared better in terms of growth slowdown during recession. However, corporate profitability suffered a setback during the 2008-09 crisis. In contrast, there was a sudden spurt in R&D investment activity in some industries such as automobiles, engineering, electronics as opposed to decline in others such as Drugs and Pharma and machine tools, during March 2007-08, 2008-09 and March 2009-10 (Figures 1 and 2).

Figure 1: R&D intensity in Indian manufacturing firms: counter-cyclical



Source: Prowess Database

Figure 2: R&D intensity in Indian manufacturing: Pro-cyclical



Source: Prowess Database

### III. Conceptual framework

The study attempts identify if there is a structural break in R&D intensity of the manufacturing firms during the economic crisis, by analyzing the data for the period 2000-2015. It then attempts to estimate the determinants of private R&D effort as a function of public R&D, nominal interest rates, number of in-house

R&D units recognized by DSIR and tax incentives in the form of depreciation allowances during pre and post crisis periods. A panel data approach is used whereby a random/fixed effects model will be estimated initially. The data sources used for the study will include Prowess database for firm level R&D expenditure, data on macroeconomic variables will be acquired from Reserve Bank of India databank. Finally, data on public expenditure on R&D, fiscal incentives and number of recognized R&D units will be procured from the Department of Scientific Research.

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