

Do Australian firms have a lower propensity to undertake R&D?

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Australian policy makers are concerned about the level of R&D. Popular perception has 'Australia' doing too little R&D (see Barlow 2006). Employing a macro-economic framework, Brooks and Davidson (2004) argue Australia does as much R&D as can be expected. This study will employ a micro-econometric modeling strategy to address a similar question. Do Australian firms have a low propensity to undertake R&D?

In the first instance the propensity to undertake R&D will be estimated by calculating latent propensities to undertake R&D across a range of high-income economies including Australia. This will allow me to investigate the gap, if any, between those firms that do undertake R&D, and those that 'should' undertake R&D but do not. I will also investigate the value-relevance of R&D across economies making use of the latent propensities to investigate whether the stock market valuation of R&D is lower in Australia (see Bosworth and Rogers 2001). I will also investigate whether the propensity and value-relevance of R&D is systematically related to values such as a legal origin, investor protection (see La Porta et al. 1999), and national institutional factors such as tax concessions (see collection in Nelson 1993).

◆ **Significance and innovation**

The innovative aspect of this study will be empirical. Firms that undertake R&D are self-selected and extant analysis suffers from an endogeneity bias. I will make use of a treatment effects methodology to overcome this self-selection endogeneity bias. A model that 'predicts' the type of firm that should undertake R&D will be estimated and compared to those firms that actually undertake R&D. Such a model is absent in the R&D literature. Consequently it is difficult to establish whether Australian firms do or do not undertake sufficient R&D. This research will provide greater insight into an area of substantial public policy interest.

◆ **Description of Approach**

Empirical Model

I hypothesise that the relationship between firm value and R&D can be described as follows

$$V_i = \mathbf{x}'_i \beta + \delta RD_i + u_i \quad (1)$$

where V_i is a measure of the value of firm i , \mathbf{x}_i is a vector of firm characteristics, and RD_i is a measure of R&D activity. The analysis is complicated by the fact that R&D may be an endogenous variable.

A treatment effects model can be used to model the decision to undertake R&D. Firms do not undertake R&D at random. Therefore it is not appropriate to compare the sample mean of firm value for firms that undertake R&D, and firms that do not, and conclude that the entire difference between the two sample means is the R&D premium. Naturally I expect other variables to determine firm value in addition to R&D and it would be reasonable to expect that these characteristics might be more concentrated amongst firms that undertake R&D expenditure.

A consistent estimate of the effect of R&D implies adopting a latent variable approach employing the probit specification given by equation (2). Equation (2) models the latent propensity associated with the decision to undertake R&D. I will employ a maximum likelihood estimation of Heckman's (1978) dummy endogenous variable model.

$$RD_i = \mathbf{z}'_i \gamma + v_i \quad (2)$$

In this context RD is an observed measure of the latent propensity to undertake R&D and \mathbf{z}_i is a vector of characteristics that are thought to determine whether a firm undertakes R&D. These characteristics may overlap with \mathbf{x}_i however a robust estimation requires that at least one variable be unique to \mathbf{z}_i . The latent propensity to undertake R&D, defined as RD^* , is only observed for those firms that report positive R&D expenditure in a given year. I define the binary indicator for a firm that is found to undertake R&D as follows

$$DRD_i = \begin{cases} 1 & \text{if } RD_i^* \geq r \\ 0 & \text{if } RD_i^* < r \end{cases}$$

where r is a threshold latent propensity to undertake R&D.

Equations (1) and (2) will be estimated for a sample of economies and the value-relevance of R&D will be estimated in each economy. Furthermore, the latent propensity to undertake R&D will be estimated for each economy. (By including industry effects, I may be able to estimate the latent propensity to undertake R&D by industry and economy; this will allow a direct test of the argument that Australian industry structure impedes greater R&D activity).

Data

Data will be collected from the Osiris Database for high-income economies where firms report R&D expenditure, and that data are included in the database. Australian data will be collected from the IPRIA database. Osiris is one of a suite of databases owned by Bureau van Dijk. Bureau van Dijk standardizes accounting information with the explicit objective of achieving uniformity and allowing international comparison and cross-border analysis. Bureau van Dijk claim that the standardized information have been approved by accounting bodies and practitioners in each economy and the data entry procedures include rigorous checking with many data fields subject to automatic validation.

Most research into R&D activity is undertaken using US or UK data. The data for these economies are easily available and, in particular, R&D activity is reported in the annual financial statements. R&D coverage for other economies is less comprehensive with voluntary disclosure being the norm. Those papers that do employ international data have to rely on voluntary disclosure. This may introduce selectivity bias into the results. Hall and Oriani (2003), however, report that many (and even most) European R&D firms report their R&D activity. A second source of “international” bias is the difference in accounting conventions across economies. Some economies allow for expensing or, in some specific instances, capitalization (Lev 1999). I follow Bhagat and Welch (1995) in arguing that differences in accounting convention have to be tolerated.

I already have access to both databases and have used them before in previous R&D studies. I am not applying for funding for databases.

◆ Nature of expected outcomes

The project would give rise to at least one academic paper. This project, however, has implications beyond simply publishing academic papers. Australian policy makers appear to have some concern that Australian firms are ‘under investing’ in R&D, in particular that more firms should be doing R&D. This project would provide some evidence in that regard. The results would form the basis of a submission to the Productivity Commission’s inquiry into public support for science and innovation, and also the basis of an op-ed piece for the *Australian Financial Review*.