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Innovation capacities in advanced economies: Relative performance of small open economies

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ABSTRACT

This paper offers an empirical examination of the determinants of a nation's ability to produce commercially viable innovations, measured as Patents Granted across a sample of 23 advanced economies. The approach employed is based on estimating National Innovative Capacity that focuses on the long-run ability of economies to produce and/or commercialise innovative technologies, in the spirit of Furman et al. (2002). The time period of our analysis covers 1993 to 2005 and employs panel estimation.

Motivated by differences in the rate of innovation between economies with different economic structures we examine the Small Open Economies (SOEs) in our country sample to assess whether there is a significant difference between the determinants of Innovative Capacity in SOEs and the other larger developed economies.

We find that advanced SOEs and larger economies do not differ substantially in their determinants of producing innovative technologies and, notwithstanding the limitations of Patents as measures of innovative activity, we conclude that policy choice and variation plays a key role in determining the productivity of R&D, when measured as patenting activity.

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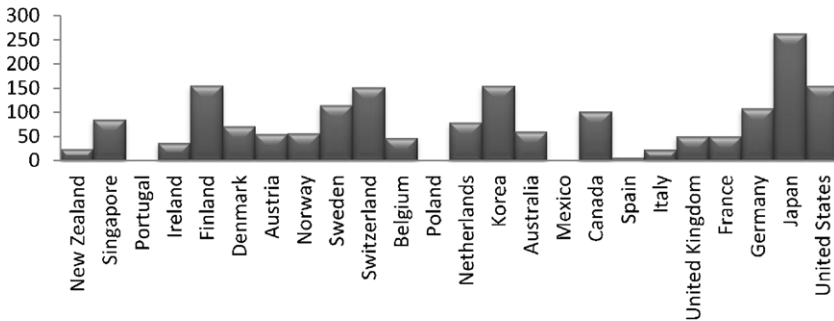
1. Introduction

Innovative capacity lies at the heart of factors affecting every nation's future competitiveness particularly for advanced modern economies, since under a Solow (1956) type growth framework such economies are likely to have exhausted their ability to generate increased output from further

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**Patents Granted per Million Population
(2008), Ranked by 2008 GDP (\$)**



Source: IMF WEO, USPTO

Fig. 1. Patents Granted per Million Population (2008), Ranked by 2008 GDP (\$).

Source: IMF WEO, USPTO.

investments in capital. In this paper we assess whether the factors that drive this vital innovation in Small Open Economies (SOEs) are significantly different to that of larger economies.

We use Patents Granted by the United States Patents and Trademarks Office (USPTO) as a measure of national innovative output. As with any economic definition of success, innovative success requires elaboration and explanation. Undoubtedly Patents Granted are an imperfect proxy of the innovative capacity of an economy, yet they represent the only directly observable and comparative measure of innovative output over time suitable for the analysis conducted here for the sample of countries considered over the time period selected for consideration. Their suitability and a fuller definition of the measure are discussed in more detail in Section 4.1.

Our method employs the National Innovative Capacity framework developed by [Furman et al. \(2002\)](#) which uses (i) a country's infrastructure, (ii) the prevalence of industrial clusters and (iii) the quality of links between the two to examine determinants of innovative capacity. This provides a model of how a country can produce commercially valuable innovation over the long term, drawing together earlier work by [Romer \(1990\)](#), [Porter \(1990\)](#) and [Nelson \(1993\)](#) to inform the three constituent elements.

The variation in the ability of countries to produce new-to-world technologies is striking. Some countries consistently outperform others by a large margin. For example, Canada, the US, Finland, Switzerland and Japan produced well over 100 patents per year per million of population in 2008, while most other advanced economies average approximately 60 patents per million and still others such as Spain, Portugal, New Zealand and Italy all may be considered to 'underperform' with less than 25 patents per million.

Such variation in patenting outcomes is not explained by larger economies performing better or smaller, more nimble economies generating better results. There is, nevertheless, a strong patenting bias in those countries which have a history of patenting such as the US and Switzerland (due to path dependency and the importance of the history of resource commitments). However, other 'new' innovative countries' rates of growth in patents per million have been nothing short of phenomenal: Singapore, for example, has an average annual patent growth rate of 30% between 1981 and 2008, going from just over 1 patent per million in 1981 to 84 in 2008 ([Fig. 1](#)).

Such performance begs analysis and raises the question for us in this paper as to whether smaller economies are supported or hindered by their relatively low scale, or low critical mass in economic terms, in achieving innovative success. We also examine whether an SOE's innovative capacity is optimised by an emphasis on certain factors or if the same basic mix of factors is found to be effective offering findings of relevance from a policy perspective.

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