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### SINGAPORE'S EXPENDITURE ON R&D

A \$13.55b question

By Ivan Png

For The Straits Times

IN MID-FEBRUARY, Trade and Industry Minister Lim Hng Kiang announced Science & Technology Plan 2010 (STP2010). To quote the plan, 'STP2010 aims to sustain innovation-driven growth by strengthening R&D capabilities in both public and private sector'.

The plan set a quantitative target of raising national R&D intensity (R&D spending relative to GDP) to 3 per cent by the year 2010.

The Government itself will play a large role in raising R&D intensity. It has committed \$13.55 billion, spread among the Ministry of Trade and Industry (\$7.5 billion for economic-oriented R&D and investment promotion), the newly-established National Research Foundation (\$5 billion for long-term strategic research), and the Ministry of Education (\$1.05 billion for academic research).

As a researcher, I applaud investments in R&D. As an economist, however, I worry that the key quantitative target is an input rather than an output.

With some exaggeration, measuring R&D performance by the amount that we spend is rather like measuring a sports car's performance by its fuel consumption.

On March 1, in his summing up of the Budget debate, Prime Minister Lee Hsien Loong agreed that 'what counts is output, not input, and we must get the appropriate performance measures, because how you measure influences what people will do'.

Instead of setting an input target, we should be bold and set output targets. One possible target is to raise our growth rate of multi-factor productivity to the top quartile of the Organisation for Economic Cooperation and Development (OECD) economies.

What is multi-factor productivity (MFP) and why is it relevant? MFP measures the growth of economic output beyond increases of human and capital resources.

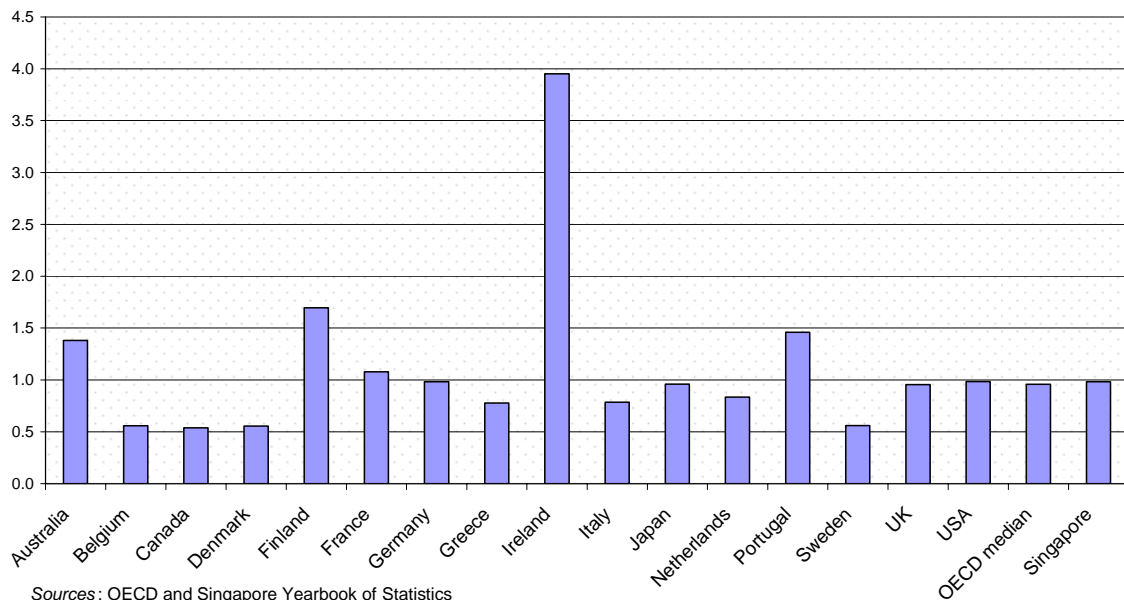
In a conventional resource-intensive economy, growth draws from workers putting in longer hours and businesses spending more on equipment. If we simply assemble things, with no contribution from science, technology, branding, or other know-how, there would be little MFP growth.

The STP2010 aims at 'innovation-driven growth'. This would propel us closer towards being a knowledge-based economy, where everyone 'works smarter'. The measure of how much smarter is the growth of MFP.

International and national agencies, including the OECD, the US Bureau of Labour Statistics, and our own Ministry of Trade and Industry, track MFP carefully.

How well have we performed in terms of MFP growth? As Chart 1 shows, between 1990-2001, the median growth of MFP among the OECD countries was 1 per cent. We achieved exactly 1 per cent. Considering that we started from a lower base, and that we were not bound by inflexible labour laws or onerous regulations, this result seems disappointing.

Figure 1: Average MFP growth, 1990-2001



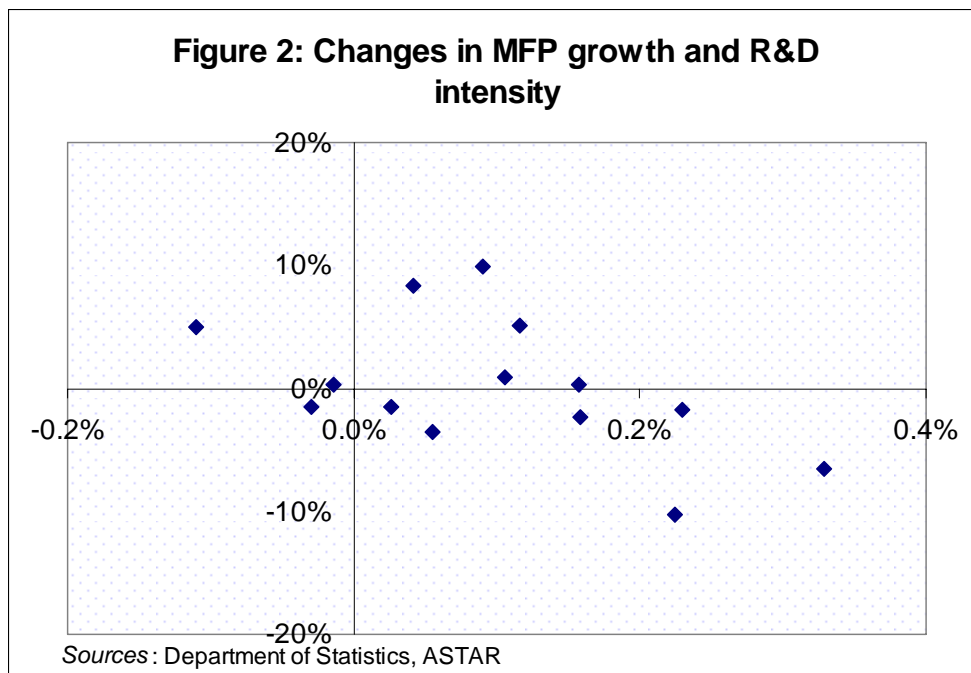
OECD economists have justified a focus on R&D intensity by an empirical correlation between increases in R&D intensity and growth of MFP. Countries that raised R&D intensity achieved higher MFP growth.

Indeed, there is an empirical correlation between a sports car's performance and its fuel consumption. But does one drive the other, or are both driven by other factors? What has been our experience?

In our own experience, the link between R&D intensity and MFP growth has been somewhat tenuous. STP2010 is already the fourth national R&D plan. It follows the National Technology Plan (\$2 billion from 1991-1995), the National Science and Technology Plan (\$4 billion from 1996-2000), and the S&T Plan 2005 (\$6 billion from 2001-2005).

For the period 1990-2004, Chart 2 shows the relation between changes in our R&D intensity (on the horizontal axis) and changes in MFP growth (on the vertical axis). Superficially, it appears that increases in our R&D intensity were associated

with reductions in MFP growth. However, with suitable statistical adjustments, there was actually a positive correlation between increases in R&D intensity and MFP growth.



In light of all this, we should be very careful of targeting R&D intensity. Wouldn't it be more reasonable to focus on productivity growth, and specifically MFP growth? Let's aim to raise our MFP growth from the median to the top quartile of the OECD.

We should also consider other output targets - such as the growth in GDP among the R&D-intensive industries. With strong performance on output measures, we will truly belong to the ranks of knowledge-based economies.

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