

Media Release

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Singapore's R&D Expenditure Hits a Record S\$6.3 Billion and 2.61% of GDP

Singapore, 22 December 2008 – Singapore is fast-establishing itself as an R&D powerhouse, with the nation's overall expenditure on R&D increasing by an unprecedented 26.5% to hit S\$6.3 billion in 2007, announced the Agency for Science, Technology and Research (A*STAR) that conducts the annual National Survey of R&D in Singapore.

R&D Intensity

2 Overall, the R&D activities in Singapore intensified in 2007. The gross domestic expenditure on R&D (GERD) increased from S\$5,010 million in 2006 to S\$6,339 million in 2007. The unprecedented year-on-year increase by 26.5% is a significant jump from the 9.3% year-on-year increase in 2006. As a percentage of GDP, GERD rose from 2.31% in 2006 to 2.61% in 2007.

3 Increases in private sector R&D spending have outpaced public sector R&D spending. The private sector spending on R&D increased by 28.6% from S\$3,293 million in 2006 to S\$4,235 million in 2007. Its share of GERD increased from 65.7% in 2006 to 66.8% in 2007. The public sector expenditure on R&D increased by 22.6% from S\$1,717 million in 2006 to S\$2,104 million in 2007.

4 The manufacturing sector continued to drive the growth in private sector R&D, accounting for S\$2,987 million or 70.5% of total private sector R&D expenditure.

5 Within the manufacturing sector, the electronics sector was the largest source of growth. It increased its R&D spending by 61.7% from S\$1,350 million in 2006 to S\$2,183 million in 2007. It also accounted for the bulk of the expenditure on R&D, contributing 73.1% of the manufacturing sector's expenditure on R&D. Within the electronics sector, companies in the semiconductor and infocomms & consumer electronics sectors were the largest contributor in R&D spending.

Human Capital in R&D¹

6 Singapore's research talent base continued to expand in 2007. The total number of researchers grew by 9% from 25,033 in 2006 to 27,301 in 2007, with the private sector employing 59% of all researchers.

7 In both the public and private sectors, researchers with a PhD showed the fastest rate of growth. In particular, private sector PhD researchers registered a higher percentage growth compared with public sector. New PhD hires in the private sector grew by 21.1% from 957 in 2006 to 1,159 in 2007, compared to the public sector's year-on-year increase of 14.1%.

Patenting Activities of R&D performers

8 The number of reported patent applications has shown steady increase, with a compound annual growth rate (CAGR) of 11.8% from 2000. There was a spike in 2006 at 1,886 patent applications, followed by a drop to 1,739 in 2007. The decrease occurred mainly in the private sector that reported 1,415 patent applications in 2007, compared to 1,561 patent applications in 2006. The reported number of patent awards in both the public and private sectors showed a 5.6% increase from 891 patent awards in 2006 to 941 in 2007.

International Comparison of R&D Intensity

9 With GERD at 2.61% of GDP in 2007, Singapore's R&D intensity is above the OECD average (2.26% in 2006) and Germany (2.53% in 2006), and is approaching that of the US (2.68% in 2007). We still lag behind R&D intensive economies such as Finland (3.41% in 2008), Sweden (3.63% in 2007), Japan (3.39% in 2006) and Korea (3.22% in 2006.)

Comments on the Survey Results

10 Commenting on the survey results, Ms Yena Lim, Managing Director of A*STAR, said, "The year 2007 has been exceptional. At 26.5%, the growth of gross domestic expenditure on R&D in 2007 significantly outpaced previous years' growth. It shows that Singapore is fast building a strong base of R&D activities in the country. The Government's steadfast support of R&D activities has spurred the rapid development of this sector, and encouraged investors to make significant R&D investments here."

11 "Knowledge-based and innovation-driven activities will allow our economy to be more resilient and create high value jobs for Singaporeans. A*STAR continues to build R&D capacity for the long-term, and will focus on grooming scientific talent. It is encouraging that

¹ All data on the number of researchers is quoted on a full-time-equivalent (FTE) basis unless it is explicitly indicated that it refers to the headcount number.

researchers with PhD qualifications showed the fastest rate of growth. Demand for such highly trained PhD research manpower will likely remain strong, as we intensify R&D activities. With 1.5 PhD researchers per 1,000 labour force, Singapore is still far behind that of other R&D intensive countries such as Finland (3.6 in 2006) and Sweden (3.0 in 2005). A*STAR's scholarship programs will provide an important pipeline of R&D talent for the country in the coming years, and scholars will have very promising prospects as they return to Singapore to pursue their research careers."

12 More than 1,000 organisations participated in the 2007 National R&D survey comprising private sector enterprises, government organisations, institutions of higher education and public sector research institutes. An overview of the survey results is at Annex. The full report is at

<http://www.a-star.edu.sg/uploads/File/R&D%20Survey%202007%20Booklet.pdf>.

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About the Agency for Science, Technology and Research (A*STAR)

www.a-star.edu.sg

The Agency for Science, Technology and Research, or A*STAR, is Singapore's lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based Singapore.

A*STAR actively nurtures public sector research and development in Biomedical Sciences, Physical Sciences and Engineering. We strongly support Singapore's key economic clusters by providing intellectual, human and industrial capital to our partners in industry and the healthcare sector. A*STAR oversees 22 research institutes, consortia and centres, and supports extramural research with the universities, hospital research centres and other local and international partners. At the heart of this knowledge intensive work is human capital. Top local and international scientific talent drive knowledge creation at A*STAR's research institutes. The Agency also sends scholars for undergraduate, graduate and post-doctoral training in the best universities, a reflection of the high priority A*STAR places on nurturing the next generation of scientific talent.

About the National Survey of R&D in Singapore

The annual National Survey of R&D in Singapore is jointly conducted by A*STAR and the Singapore Department of Statistics. The survey reports from reporting year 2001 onwards and are available on A*STAR's website at www.a-star.edu.sg.

ANNEX: SINGAPORE'S R&D ACTIVITIES IN 2007

R&D Intensity

1 The reported gross domestic expenditure on R&D (GERD) increased by 26.5% from \$5,010 million in 2006 to \$6,339 million in 2007. The private sector expenditure on R&D increased by 28.6% from \$3,293 million in 2006 to \$4,235 million in 2007. The public sector expenditure on R&D increased by 22.6% from \$1,717 million in 2006 to \$2,104 million in 2007. The private sector's share of GERD increased from 65.7% in 2006 to 66.8% in 2007.

2 As a percentage of GDP, GERD increased from 2.31% in 2006 to 2.61% in 2007. The private sector expenditure on R&D increased at from 1.52% to 1.74% of GDP. The public sector expenditure on R&D increased from 0.79% to 0.87% of GDP.

Key contributors to private sector expenditure on R&D

3 Manufacturing sector. Companies in the Manufacturing sector continued to account for the majority of private sector expenditure on R&D. In 2007, the Manufacturing sector contributed 70.5% (\$2,987 million), the Services sector 29.4% (\$1,246 million) and other sectors (viz. Primary Industries and Construction) 0.1% (\$2 million), of private sector expenditure on R&D.

4 Within the Manufacturing sector, companies in the Electronics sector contributed to the majority of the growth in the Manufacturing sector's expenditure on R&D in 2007. The Electronics sector increased its R&D spending by 61.7% from \$1,350 million in 2006 to \$2,183 million in 2007. The Electronics sector also continued to account for the bulk of the expenditure on R&D; it contributed 73.1% of the Manufacturing sector's expenditure on R&D. Within the Electronics sector, companies in the Semiconductor and Infocomms & Consumer Electronics sectors were the largest contributors to its expenditure on R&D. In 2007, the Semiconductor sector contributed 74.8% (\$1,633 million), and the Infocomms & Consumer Electronics sector 11.0% (\$241 million), of the Electronics sector's expenditure on R&D.

5 In the area of Biomedical and Related Sciences and Biomedical Engineering, overall R&D spending remained strong, with a 3.8% increase from \$1,101 million in 2006 to \$1,144 million in 2007. Of this, the sub-sector of Biomedical Sciences Manufacturing (viz. Pharmaceuticals and Medical Technology) saw a drop of 38.0% from \$293 million in 2006 to \$181 million in 2007. 2006 was an especially strong year for Biomedical Sciences

Manufacturing R&D, as there was substantial capital R&D expenditure by companies. Excluding capital expenditure, R&D spending in Biomedical Sciences Manufacturing increased by 78% from \$76 million in 2006 to \$135 mil in 2007.

6 Services sector. R&D spending in the Services sector increased 16% from \$1,076 million in 2006 to \$1,246 million in 2007. Within the Services sector, companies in the R&D Services sector² accounted for 38.9% (\$485 million) of the expenditure on R&D, while the Information and Communications sector contributed another 12.8% (\$160 million).

Key contributors to public sector expenditure on R&D

7 The Higher Education sector, the Research Institute sector and the Government sector each continued to contribute about a third of R&D expenditure in the public sector. In 2007, the Government sector contributed 36.6% (\$771 million), the Research Institute sector 34.7% (\$730 million) and the Higher Education sector 28.7% (\$603 million).

R&D in Human Capital³

8 The total number of researchers in Singapore grew by 9% from 25,033 in 2006 to 27,301 in 2007. The private sector employed 16,210 researchers or 59% of all researchers in 2007.

9 In both the private and public sectors, researchers with a PhD showed the fastest rate of growth among all researchers. The private sector accounted for the largest percentage increase in the FTE number of PhD researchers hired (21.1% increase over 2006 in the private sector versus 14.1% increase over 2006 in the public sector).

Researchers in the private sector

10 The number of researchers employed in the private sector increased 8.8% from 14,894 in 2006 to 16,210 in 2007. The number of researchers with degree-level qualifications increased 10.3% from 12,365 in 2006 to 13,639 in 2007. Those with a PhD showed the highest percentage increase, increasing 21.1% from 957 in 2006 to 1,159 in 2007. Those with a Master degree (as the highest formal educational qualifications) increased 9.9% from 3,178 in 2006 to 3,492 in 2007. Those with a Bachelor degree (as the

² The R&D Services sector comprised typically of corporate laboratories with solely high value efforts.

³ All data on the number of researchers is quoted on a full-time-equivalent (FTE) basis unless it is explicitly indicated that it refers to the headcount number.

highest formal educational qualifications) increased 9.2% from 8,230 in 2006 to 8,988 in 2007. The number of researchers without degree level qualifications increased 1.6% from 2,529 in 2006 to 2,571 in 2007.

11 Researchers with degree-level qualifications comprised 84.1% of the reported 16,210 researchers employed in the private sector in 2007. Those with a PhD, Master degree and Bachelor degree as the highest formal educational qualification comprised 7.2%, 21.5% and 55.4% respectively of the researchers employed in the private sector in 2007. Researchers without degree-level qualifications comprised the remaining 15.9% of the researchers employed in the private sector in 2007.

Researchers in the public sector

12 The number of researchers in the public sector (excluding the full-time postgraduate research students increased 9.7% from 6,378 in 2006 to 6,997 in 2007.

13 PhD researchers continued to make up the largest category of researchers (excluding the full-time postgraduate research students) in the Higher Education and Public Research Institute sectors. In 2007, PhD researchers accounted for 44.4% (1,388) of the researchers in the Higher Education sector; and 56.2% (1,286) of the researchers in the Public Research Institute sector. In the Government sector, PhD researchers accounted for 14.6% (231) of the researchers.

14 The number of PhD researchers in the public sector increased 14.1% from 2,546 in 2006 to 2,904 in 2007. The Public Research Institute sector registered the highest growth rate at 17.4%, increasing from 1,095 PhD researchers in 2006 to 1,286 in 2007. The number of PhD researchers in the Higher Education sector increased 12.4% from 1,235 in 2006 to 1,388 in 2007 and the number of PhD researchers in the Government sector increased 7.0% from 216 in 2006 to 231 in 2007.

15 The number of full-time postgraduate research students (enrolled at the universities) increased by 8.9%, from 3,761 in 2006 to 4,094 in 2007. The number of full-time PhD students increased 9.0% from 2,756 in 2006 to 3,003 in 2007. The number of full-time Master-level research students increased 8.6% from 1,005 in 2006 to 1,091 in 2007.

Patenting Activities⁴

Patenting activity

16 The patenting activity of R&D performers has shown steady increase since 2000, growing at a compound annual growth rate of 11.8%. It spiked in 2006 at 1,886 patent applications, and has fallen by 7.8% in 2007 to 1,739 patent applications. The reported number of patent awards increased 5.6% from 891 in 2006 to 941 in 2007.

Patenting in the private sector

17 The decline in patenting activity occurred mainly within the private sector. The reported number of patent applications in the private sector decreased by 9.4% from 1,561 in 2006 to 1,415 in 2007. The reported number of patent awards in the private sector increased slightly by 1.8% from 777 in 2006 to 791 in 2007. The private sector accounted for 81.4% of all patent applications and 84.1% of all patent awards to R&D performers in 2007.

Patenting in the public sector

18 In the public sector, the reported number of patent applications held steady at 324 in 2007, compared to 325 in 2006. The number of patent awards increased 31.6% from 114 in 2006 to 150 in 2007.

19 The Higher Education and Public Research Institute sectors continued to account for almost all the patenting activity reported in the public sector. In 2007, the Higher Education and Public Research Institute sectors respectively accounted for 30.9% (100) and 62.7% (203) of patent applications in the public sector, and 44.7% (67) and 52.0% (78) of patent awards in the public sector.

International Comparison of R&D Intensity

20 With GERD at 2.61% of GDP in 2007, Singapore's R&D intensity is above the OECD average (2.26% in 2006), Germany (2.53% in 2006), Denmark (2.54% in 2007), and Taiwan (2.58% in 2006). We are approaching that of the US (2.68% in 2007).

21 Singapore lags behind countries such as Sweden (3.63% in 2007), Finland (3.41% in 2008), Japan (3.39% in 2006) and South Korea (3.22% in 2006).

⁴ All data on the number of patent applications and patent awards refer to primary patents. The number of patent applications and awards from 2000-2006 has been readjusted in view of double-counting by a few institutions in the last few years.

APPENDIX

Figure 1 : Gross Expenditure on R&D (GERD) and Private Sector Expenditure on R&D (BERD), 2000-2007

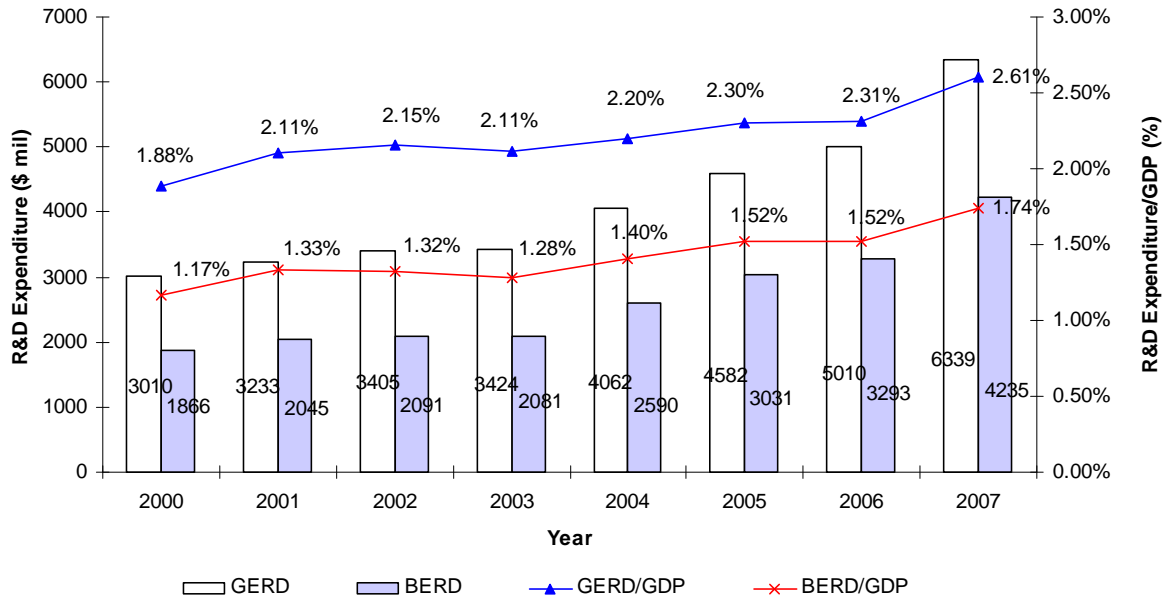


Figure 2A: Breakdown of R&D Expenditure in Private Sector and Public Sector, 2007

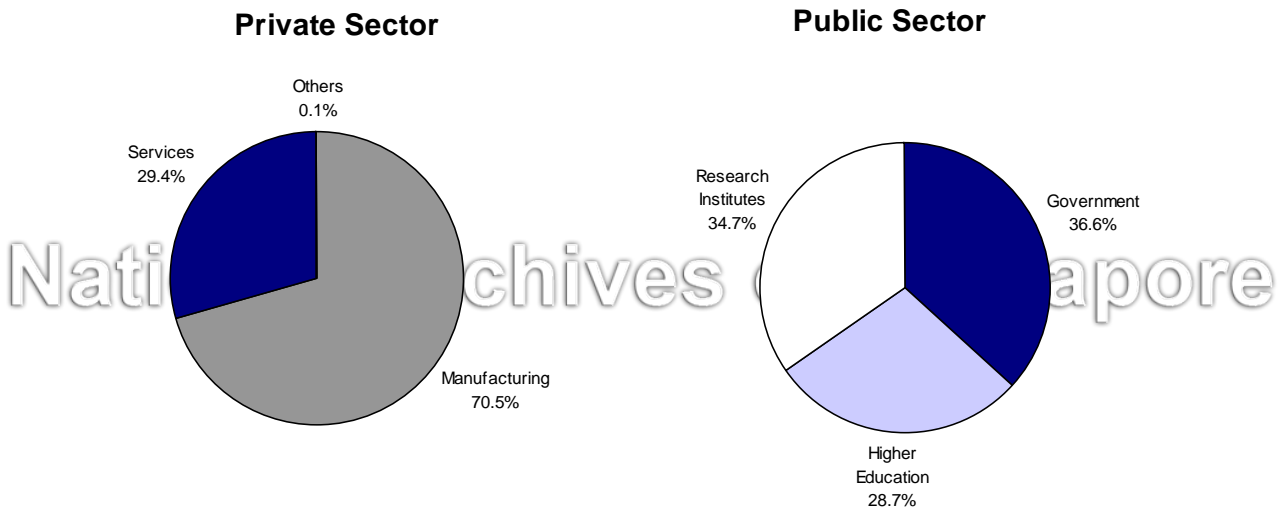


Figure 2B: Breakdown of R&D Expenditure in the Manufacturing Sector, 2007

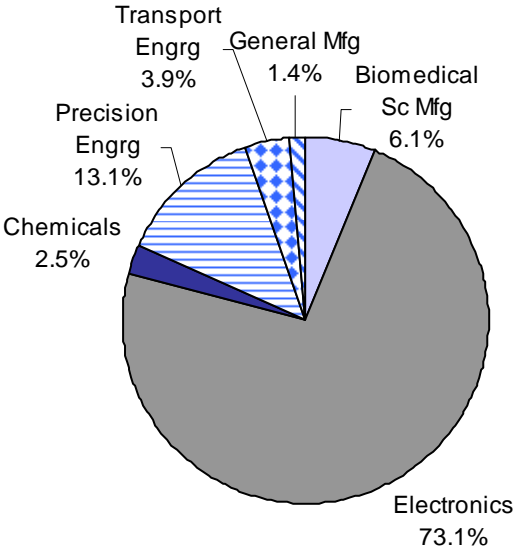
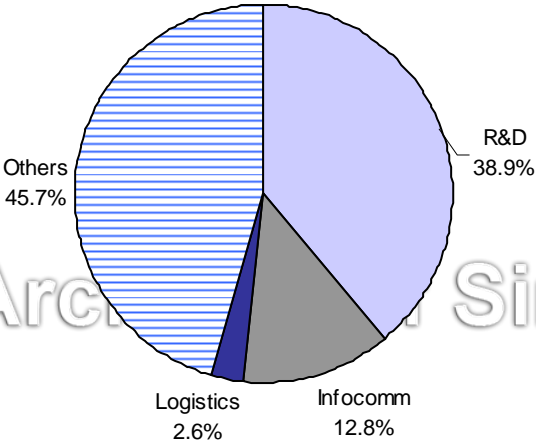


Figure 2C: Breakdown of R&D Expenditure in the Services Sector, 2007



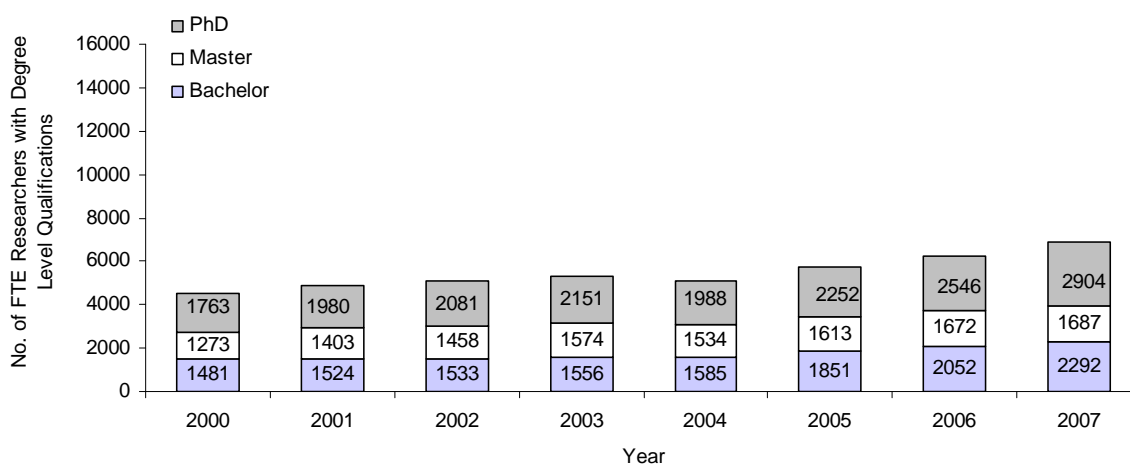
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**Figure 3: Breakdown by type of R&D Expenditure in the Biomedical Sciences
Manufacturing sub-sector, 2005-2007**

\$ mil	2005	2006	2007
Capital Costs	\$38 mil	\$217 mil	\$46 mil
Manpower Costs	\$26 mil	\$29 mil	\$39 mil
Other Operating Costs	\$26 mil	\$47 mil	\$96 mil
Total R&D Expenditure	\$90 mil	\$293 mil	\$181 mil
R&D Expenditure excluding Capital Costs	\$52 mil	\$76 mil	\$135 mil

**Figure 4: Breakdown of Private and Public Sector FTE Degree Level Researchers
by Educational Qualifications, 2007**

Public Sector



Private Sector

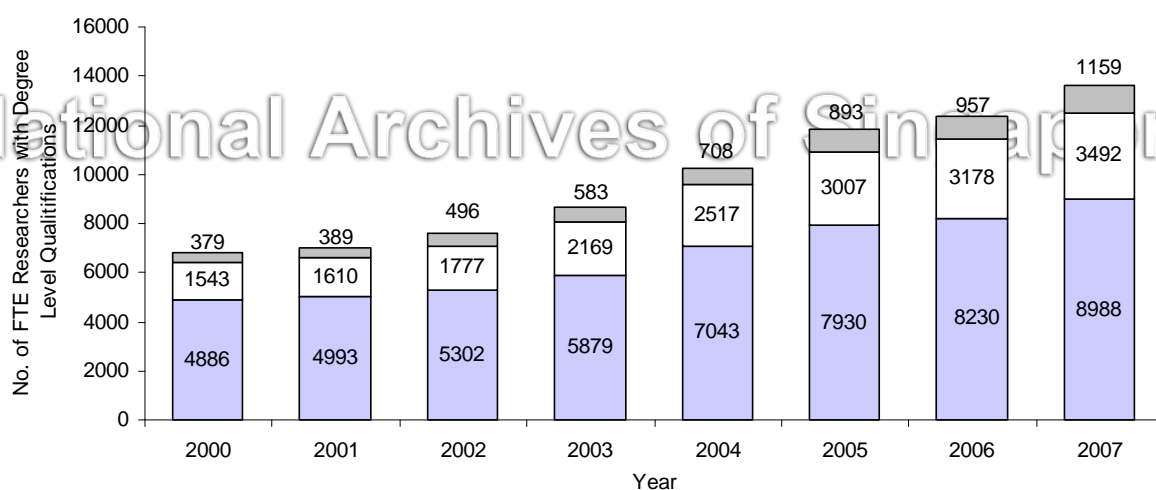


Figure 5A: Patents Applied by Sector, 2000-2007

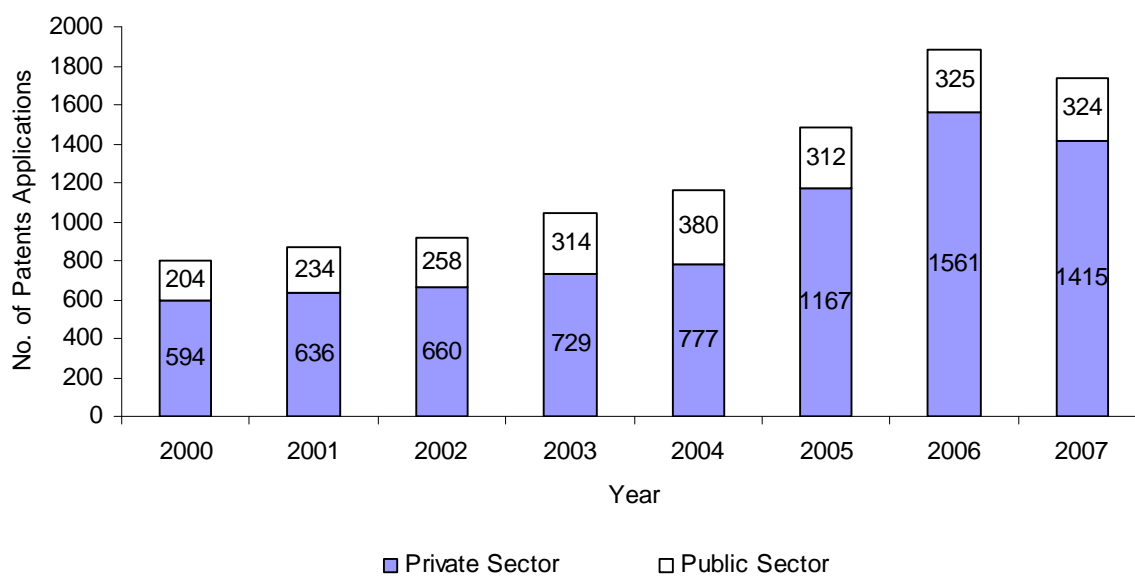
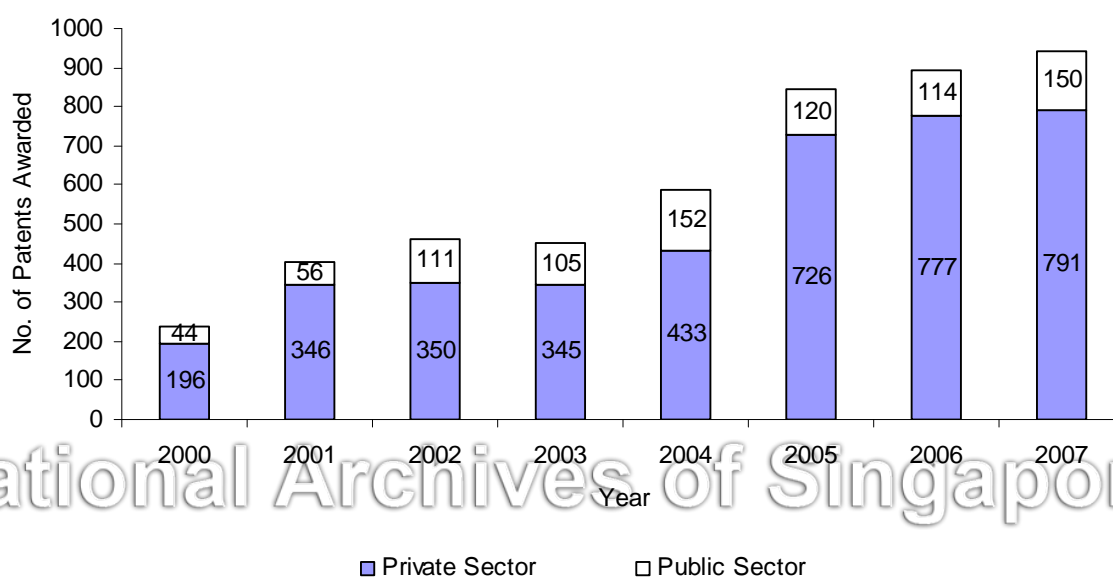
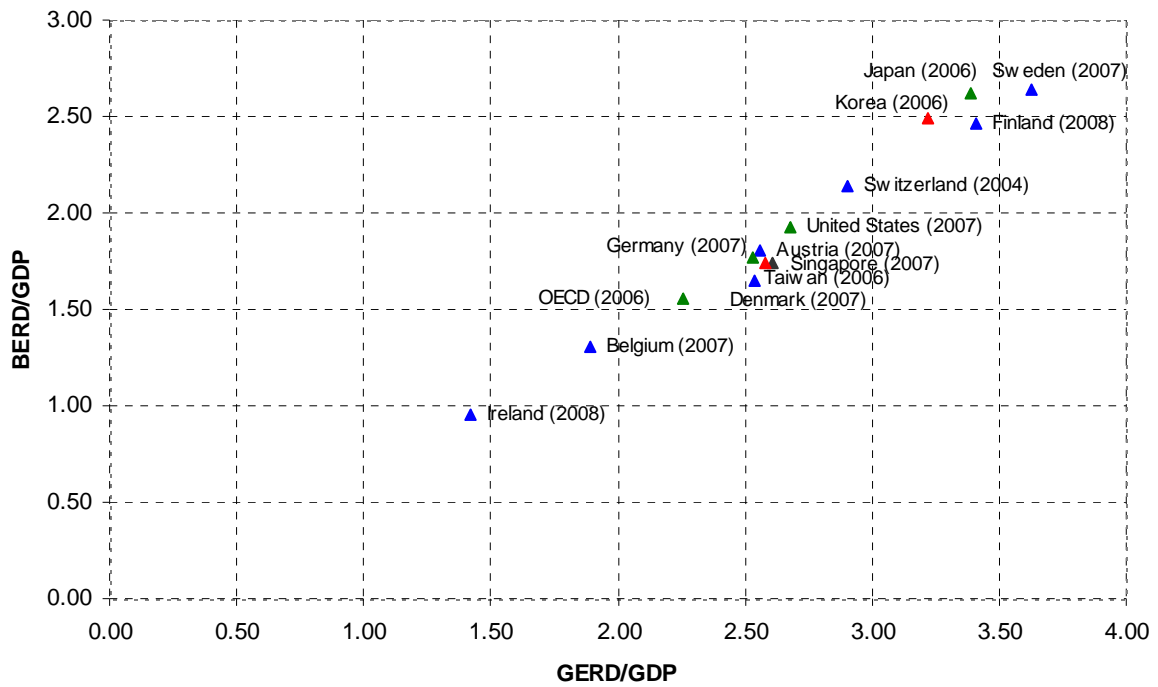


Figure 5B: Patents Awarded by Sector, 2000-2007



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Figure 6: Comparative GERD/GDP and BERD/GDP Data for Selected Countries



Source: OECD, Main Science and Technology Indicators, December 2008

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