CHAPTER 11
INTERNATIONAL COMPARISONS

Science and technology indicators (STI) are frequently used, amongst others, to internationally benchmark a country's achievements in developing its knowledge base in science and technology. For policy makers, the usefulness of undertaking such an exercise is in the identification of and policy formulation to address any remaining gaps in science and technology performance. This is not merely an exercise that is knowledge for knowledge's sake as the level of science and technology knowledge base is a crucial aspect of the economic competitiveness of a country.

This chapter compares Malaysia's achievements in science and technology with those of other countries. As in the previous 2000 Malaysian Science and Technology Indicators Report, the countries that are chosen for comparison are mostly OECD countries. This decision is entirely due to data availability. Not all the indicators are comparable; hence, only selected indicators from the previous chapters are used for international comparisons.

To put the benchmarking exercise in a proper perspective, the differences between the Malaysian economy and those of OECD countries ought to be highlighted at the onset. One measure that can be used to compare Malaysia's level of economic development with other countries' is the gross national income (GNI) per capita. Malaysia's GNI per capita in year 2002 is around USD3,540. Malaysia's GNI per capita is only about one tenth to one fifth of the GNI per capita of most of the OECD countries (Figure 11.1).

There are also significant differences between the structure of the Malaysian economy and the OECD economies. The most striking difference appears in the sectoral composition of the economies. In most of the OECD economies, the services sector accounts for more than 60% of the national product (measured by gross domestic product or GDP). The agriculture sector accounts for less than 5% of GDP in most OECD economies while the manufacturing sector's share of the GDP is around 21 – 44% (Figure 11.2). In the case of Malaysia, its services sector accounts for less than 50% of the GDP while the agriculture and manufacturing sector accounts for 12% and 40% of the GDP, respectively.

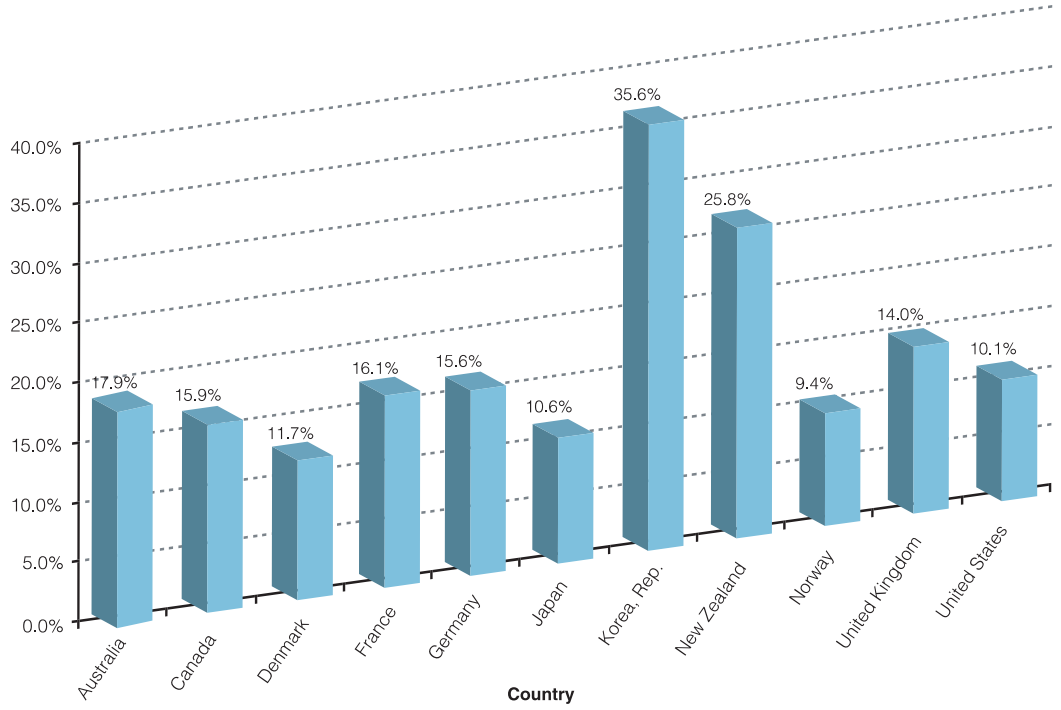

Figure 11.1: Malaysia's GNI Per Capita as a Percentage of Major OECD Countries' GNI Per Capita, 2002

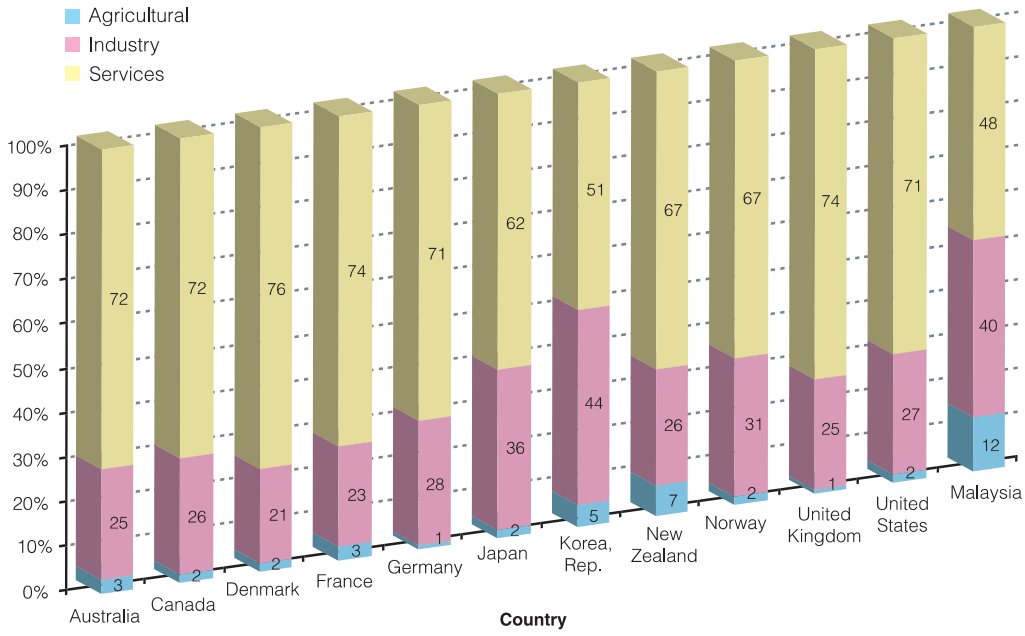

Figure 11.2: Output Structure of Selected OECD Countries, 2000

11.1 Education

One comparative indicator of education that measures the level of science and technology in a country is the share of science and engineering (S&E) tertiary degrees in the total number of new tertiary degrees granted. The measure of S&E degrees as a percentage of total new degrees (in both public and private universities) for 2000/2001 was around 26.4% in European Union countries (Figure 11.3). The corresponding figure in the Unites States was about 15.8%. Data availability in Malaysia is significantly limited to the major public tertiary institutions. The available data from such institutions indicated that the science and engineering's share of the total new degrees granted in public tertiary institutions in Malaysia was around 37.1%.

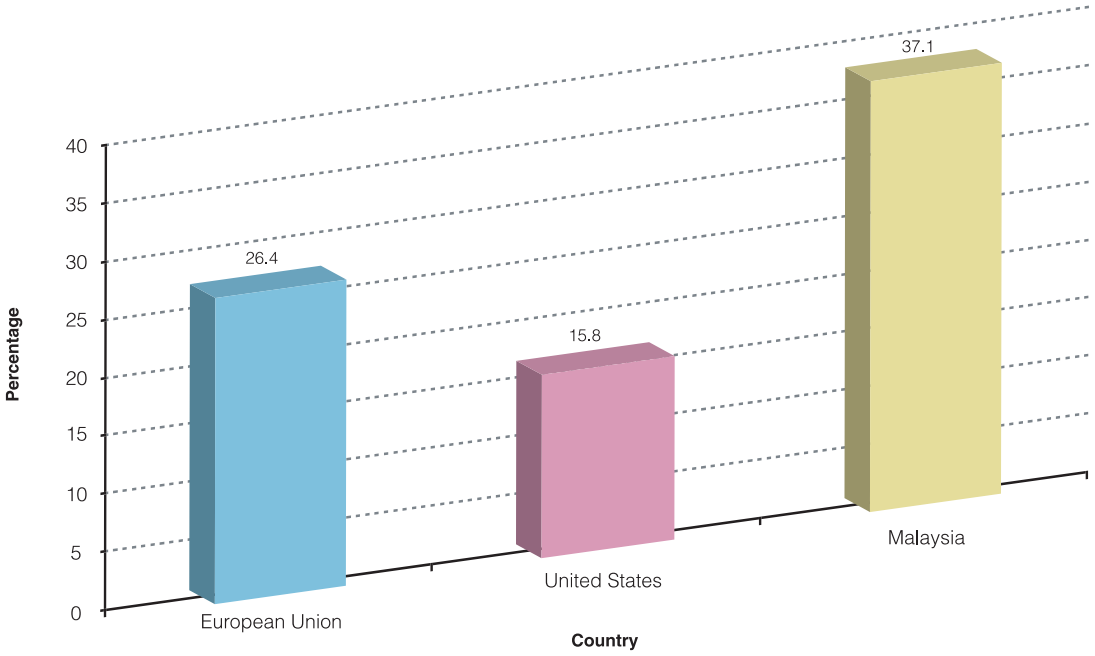

Figure 11.3: S&E Degrees as a Percentage of Total New Degrees 2000/2001

11.2 R&D Expenditure

The level of R&D in Malaysia is relatively low compared to those observed in more developed countries. The country's gross domestic expenditure on R&D (GERD) as a percentage of Gross Domestic Product (GDP) stood at 0.69 in year 2002. The corresponding figures for more developed countries was in the range between 1.5 (Australia) to 3.1 (Japan). The relatively low level of GERD as a percentage of GDP in Malaysia is consistent with its level of development. This can be seen in Figure 11.4 which plots the GERD as a percentage of GDP against Gross National Income (GNI) per capita for various countries.

11.3 Human Resources and R&D

Aside from R&D expenditure, another input type of measure of R&D effort is the number of researchers per labour force employed in an economy. The number of researchers per 10,000 labour force was around 50 to 90 in most of the OECD countries in the year 2001/2002. The corresponding figure for Malaysia for the year 2002 was 18 researchers per 10,000 labour force. This is around 20-36% of the levels observed in OECD countries. This modest achievement is also consistent with the country level of development (Figure 11.5).

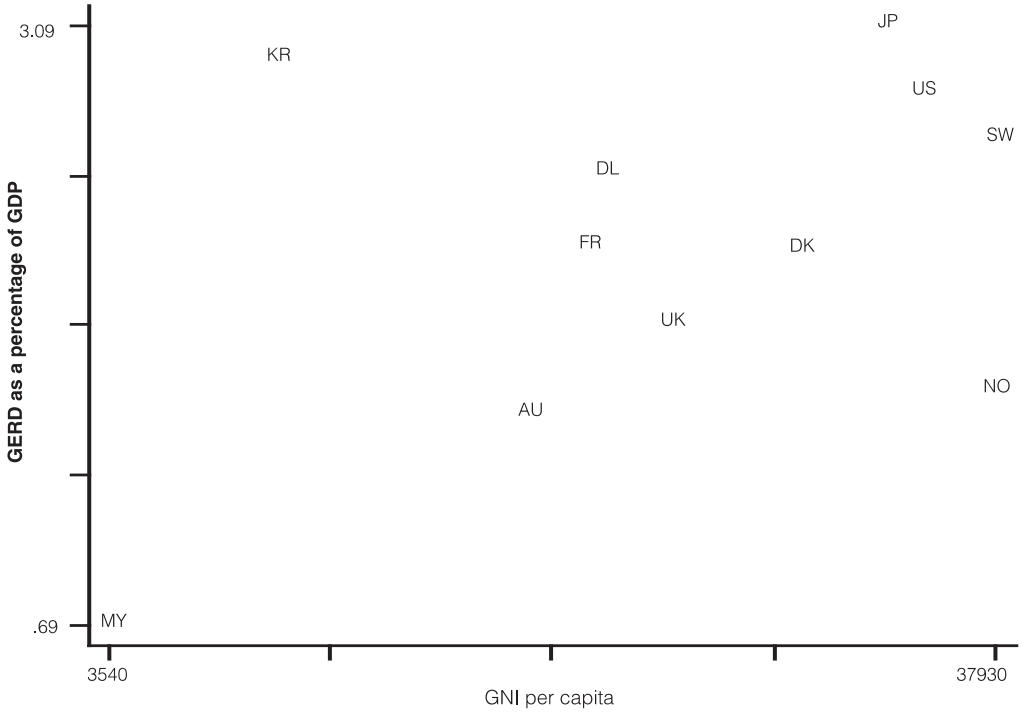

Figure 11.4: Gross Domestic Expenditure on R&D (GERD) as a Percentage of GDP, 2001/2002

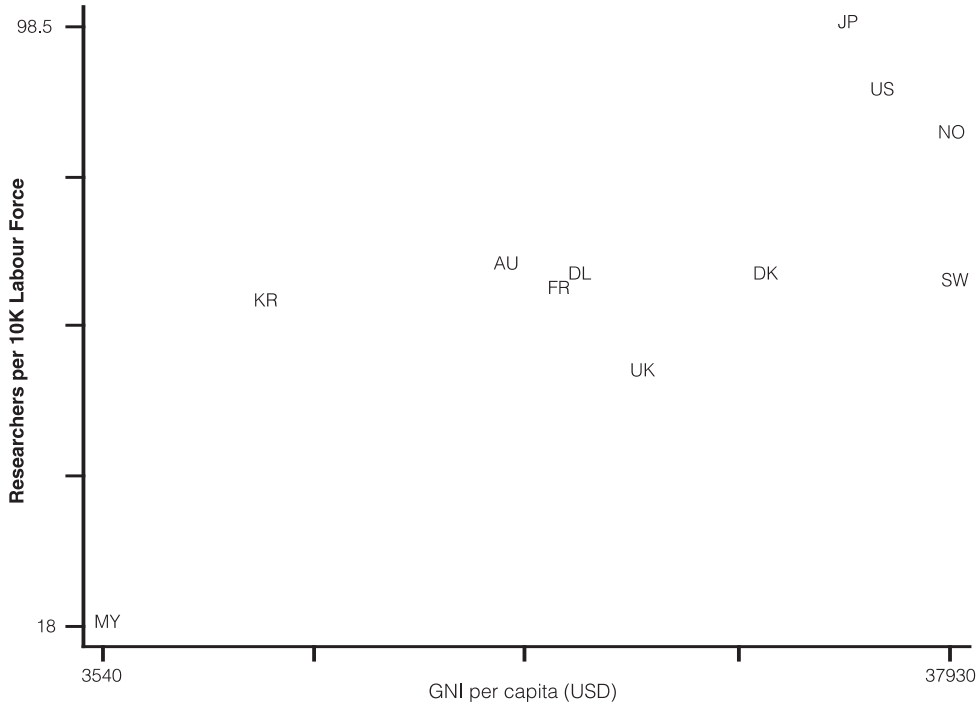

Figure 11.5: Researchers per 10,000 Labour Force, 2001/2002

11.4 Innovation

The overall level of innovation in the Malaysian manufacturing sector was slightly lower than that observed in developed countries (Figure 11.6). The percentage of innovating firms in the manufacturing sector in Malaysia (35%) exceeded that of Portugal (26%) and Spain (29%). However, the incidence of innovation in other European countries such as Ireland (74%), Denmark (71%) and Germany (69%) was significantly higher than that in Malaysia. Countries with comparable levels of innovation included Finland (36%) and Belgium (34%).

The pattern of innovation across firms of different sizes in Malaysia is similar to that observed in other countries (Figure 11.7). Firms are classified in terms of three classes: small-sized firms (< 49 employees), medium-sized firms (50-249 employees) and large-sized firms (> 250 employees). In general, large-sized firms are more innovative than their smaller counterparts. The innovation gap between large firms and medium sized firms are almost the same as that between medium sized firms and small firms.

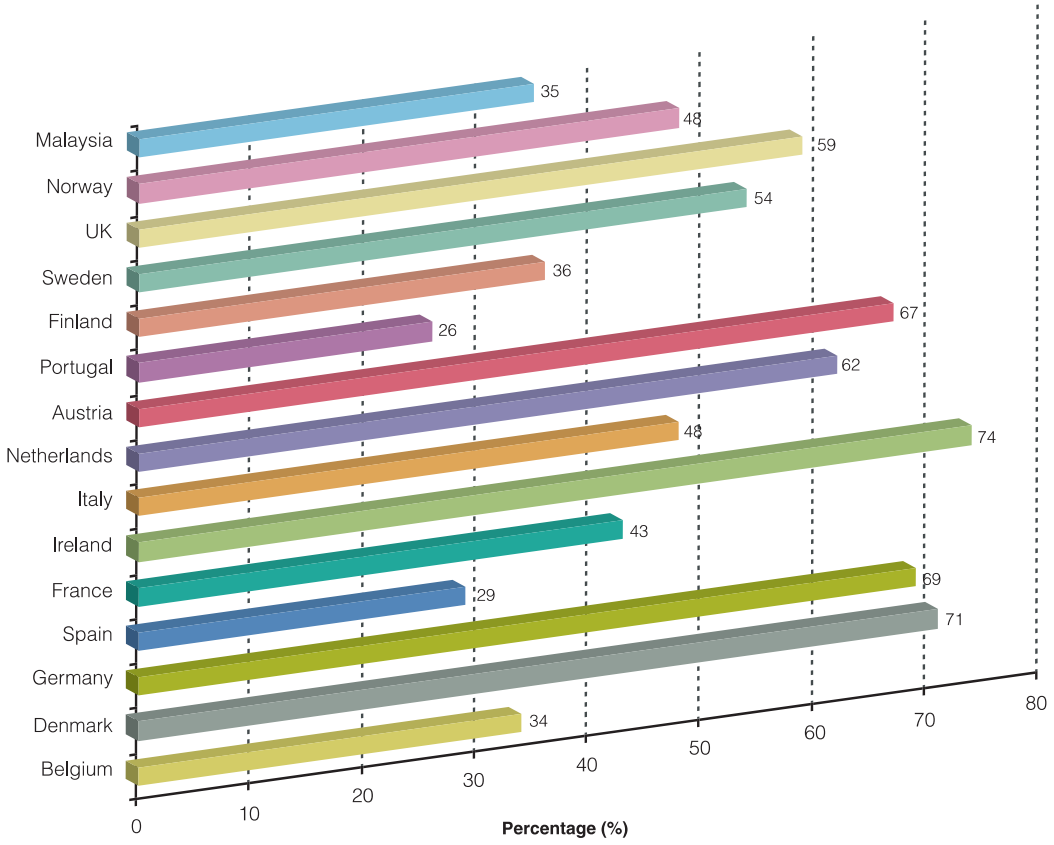

Figure 11.6: Number of Innovators in Selected Countries (%)

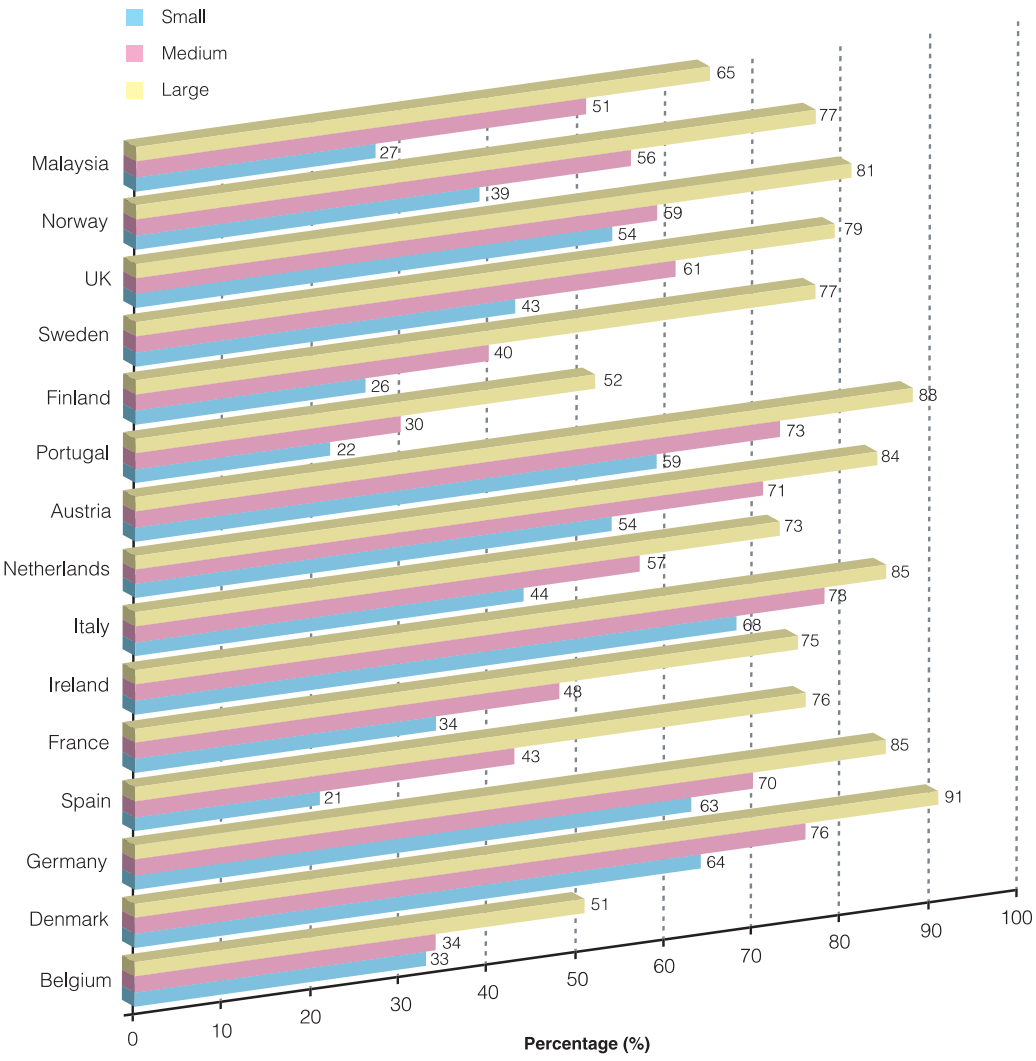

Figure 11.7: Number of Innovators (%) by Firm Size in Selected Countries

11.5 Trade in Technology

The link between a country's achievements in science and technology and its export competitiveness is partly reflected in the manufacturing export shares of high-technology and medium-high-technology manufacturing industries. Figure 11.8 shows that the manufacturing export shares of high technology of the manufacturing industries in Malaysia (at 40.4%) was comparable to that observed in some of the developed countries such as France (25.4%), Germany (20.6%), Japan (30.8%), Republic of Korea (32.4%) and the United Kingdom (40.3%).

Figure 11.8: Export Shares of High-Technology and Medium-High-Technology Industries, 2001/2002

11.6 Publications and Citations

The quantity of science and engineering (S&E) publications is a useful measure of the stocks and flows in a country's knowledge base in science and technology. Malaysia's per capita output of S&E articles at 21.9 during the 1999-2001 period was significantly below that observed in more developed countries such as Japan (445.6), United States (722.2) and United Kingdom (821.9). However, there are indications that even after adjusting for the level of development, Malaysia's per capita output of S&E articles is low. For example, whilst South Africa's income per capita is lower than Malaysia's, its per capita output of S&E articles at 55.8 was higher. A comparison of these figures in the context of different levels of development (measured by GNI per capita) shows some relationship between the per capita level of S&E publications and the level of economic development (Figure 11.9).

11.7 Public Awareness and Attitude Towards S&T

The general level of public awareness and understanding of knowledge in science and technology is an important broad measure of the stock of general knowledge in S&T. Surveys are usually carried out to ascertain the level of this knowledge via a series of questions. Overall, the level of public awareness of S&T related terms and concepts are lower in Malaysia compared to those in Europe, Japan and the United States (Figure 11.10). However, there were a few instances where the Malaysian public's understanding was comparable to that observed in developed countries.

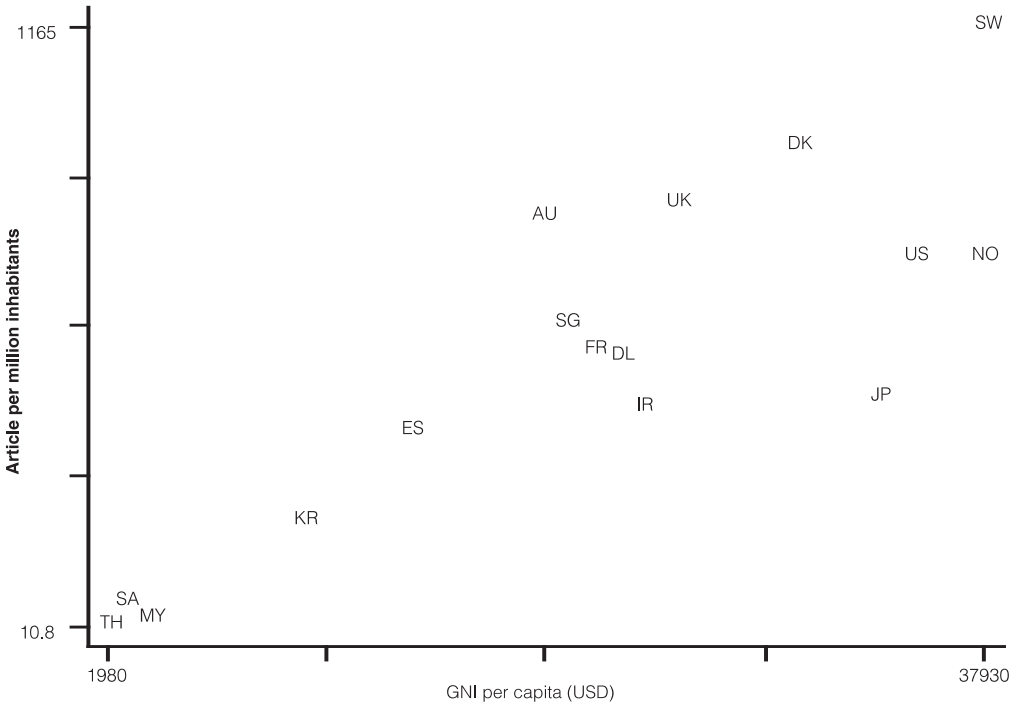

Figure 11.9: Per Capita Output of S&E Articles (1999-2001) and GNI PerCapita (2002)

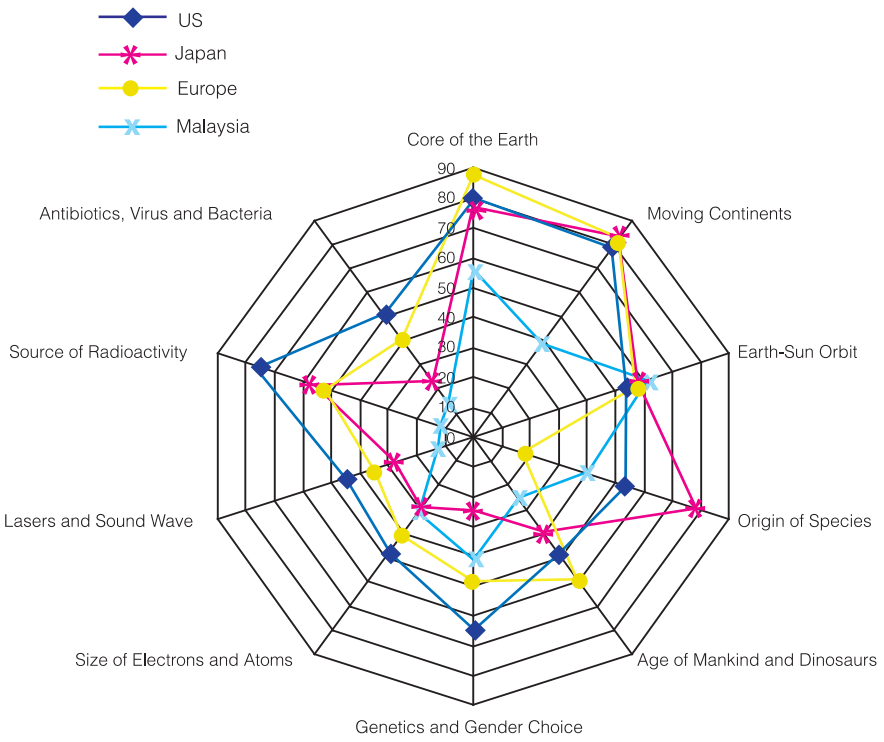

Figure 11.10: Percentage of Correct Answers for S&T Terms and Concepts