Implications of world university rankings for national and institutional research strategy of small developed nations

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“More of our universities should aim to be within the top 100 internationally and I would like some of our universities to aspire to the top 10.”

The Honourable Julie Bishop, MP
Australian Minister for Education, Science & Training
August 30, 2007
“Small economies such as Singapore, Australia and Switzerland can’t compete with giant economies. In the global economy, small means you have to be focused and nimble, find a niche and work with partners.”

Professor Shih Choon Fong (2007)
President, National University of Singapore
The purpose of this paper

To test whether small nations are in a position to develop elite research universities (Top 20, SJTU)

To determine whether individual universities from small nations should aspire to achieve elite research university status

To translate the implications of these findings for national and institutional research strategy of small developed nations
Methodology

The Shanghai Jiao Tong University (SJTU) Academic Ranking of World Universities (ARWU) 2007 has been chosen as the basis for analysis.

14 small nations* analysed:

Australia, Austria, Belgium, Denmark, Finland, Hungary, Ireland, Israel, the Netherlands, New Zealand, Norway, Singapore, Sweden, and Switzerland

* Populations <25 million, GDP <2.0% of world GDP, Universities in SJTU Top 400
The Problem

As a group, universities from small nations are amongst the best performers on the SJTU index represented evenly in all clusters, yet only three of these universities are represented in the top 50:

<table>
<thead>
<tr>
<th>SJTU cluster</th>
<th>top 100</th>
<th>101-200</th>
<th>201-300</th>
<th>301-400</th>
<th>401-500</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. universities (14 small nations)</td>
<td>18</td>
<td>23</td>
<td>21</td>
<td>17</td>
<td>18</td>
<td>97</td>
</tr>
<tr>
<td>% of Total (97)</td>
<td>18.5%</td>
<td>23.8%</td>
<td>21.7%</td>
<td>17.5%</td>
<td>18.5%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Survival is much tougher at the top
Small nations: Highly Cited researchers and Nobel Laureates (1901-2006)

Includes Peace Prize, excludes organisations (e.g. Médecins Sans Frontières, Belgium)

<table>
<thead>
<tr>
<th>Nation</th>
<th>Highly Cited researchers</th>
<th>Nobel Prize winners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>Australia</td>
<td>108</td>
<td>10</td>
</tr>
<tr>
<td>Belgium</td>
<td>37</td>
<td>9</td>
</tr>
<tr>
<td>Denmark</td>
<td>30</td>
<td>14</td>
</tr>
<tr>
<td>Finland</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Hungary</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Ireland</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Israel</td>
<td>47</td>
<td>8</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>95</td>
<td>18</td>
</tr>
<tr>
<td>New Zealand</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>Norway</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Singapore</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Sweden</td>
<td>61</td>
<td>28</td>
</tr>
<tr>
<td>Switzerland</td>
<td>111</td>
<td>25</td>
</tr>
</tbody>
</table>
The Scientific Wealth and Impact of Small Nations

On measures of relative performance, such as papers per person or citations per person, smaller nations outrank the G7 nations apart from US and UK.

*Robert May, (1997), Science*

Return for research spending demonstrated by King in 2004 by comparing scientific wealth to economic wealth. This highlighted the role that small nations play in the global knowledge economy – and the barriers faced.

*David King, (2004), Nature*
Hi-Ci Researchers by country (per 1% of World GDP)

Mean Large nations incl. USA

Mean small nations

Mean Large nations without USA
The Competitive Disadvantage of Small Nations

Institutions from small nations perform strongly on output measures such as:

- *Science Citation index, SSCI, AHCI*
- *Nature/science articles*

Only 12 universities from small nations make the SJTU top 100 for the HiCi indicator. Small nations struggle to attract elite academic talent. Strategies and policies aimed at maximizing number of high quality outputs will probably yield better results.
The Policy and Institutional Response to Rankings (and globalisation of research)

Large Nations:
China – 985 Higher Education Project
Germany – development of 10 elite universities
Research quality assessment in UK and Germany
Formation of super leagues of research universities such as LERU
Mergers successful – e.g. Manchester (89th in 2003, 48th in 2007)

Small Nations:
Research quality assessment exercises in Netherlands, Australia, New Zealand, Hong Kong, and Ireland
Active involvement in global consortia such as LERU and IARU
Mergers under consideration in Denmark to achieve “poles of excellence”
Can ETH Zurich make the top 20 (SJTU)?

Swiss Federal Institute of Technology (ETH Zurich)
• ranked at #27 in world (SJTU ARWU 2007)
• 1,805 Thomson ISI indexed outputs in 2006

University of Tokyo
• ranked at #20 in world (SJTU ARWU 2007)
• 6,944 Thomson ISI indexed outputs in 2006

Total ISI indexed outputs for Switzerland – 17,089 (2006)
Australia – could what worked for Olympic sport also work for higher education?

Australian Institute for Sport – largely responsible for Australia’s 4th place on medal tally (Athens 2004)
Cost = USD$102.7 million per year

To bring ANU into top 20 would require 68% improvement in performance – another 16 HiCis, 1,292 additional Thomson ISI articles every year, and 48 more Nature/Science articles every five years
Cost = USD$550 million per year
Field rankings provide hope

- ETH Zurich – 15th in Natural Sciences & Mathematics
- University of Zurich – 29th in Life & Agricultural Sciences, 26th in Clinical Medicine
- Karolinska Institute – 9th in Clinical Medicine & Pharmacy, 16th in Life & Agricultural Sciences
- University of Leiden – 35th in Clinical Medicine & Pharmacy
- Australian National University – 38th in Natural Sciences & Mathematics, 44th in Life & Agricultural Sciences
Conclusions

Appropriate policy options for small nations include those designed to concentrate research in identified areas of excellence, maximise their collaboration with major players, and enhance their capacity for innovation which often provides first mover advantage.

In addition there are six rules which small nations ought consider carefully when framing research policy in response to rankings and globalisation.
Conclusions

Rule 1
Return on research investment is achieved in a greater proportion of universities in small nations than in large nations – the highly concentrated approach to research funding favoured by large nations is not necessary.

Rule 2
World-class university systems can be developed in small nations by taking either a ‘balanced’ or ‘focused’ approach.

Rule 3
Developing an elite comprehensive research university is beyond reach.
Conclusions

Rule 4
Small nations should aim to enhance partnerships with global research powerhouses.

Rule 5
Small nations are at a major disadvantage in the competition for elite academic talent.

Rule 6
Outsource basic research from research institutes to universities.
Recommendations for Rankings Agencies

Rankings by field provide institutions within small nations more opportunity to shine.

Introduction of more relative quality indicators would ensure less emphasis on size.

Consider publishing rankings down to top 1,000 (even without scores and in blocks of 100).

Improve information provided to end users – not just about methodology but also strategic use of the data.
Questions and discussion?