Brain Drain and Brain Gain

World Wide

December 2012

Introduction and definitions ........................................................................................................... 2
Brain drain across the globe ........................................................................................................... 3
Global causes of brain drain .......................................................................................................... 6
Brain drain from Israel .................................................................................................................. 8
Why do they leave Israel? ............................................................................................................. 10
Programs and initiatives to reverse brain drain ............................................................................ 11
  China ....................................................................................................................................... 11
  India ....................................................................................................................................... 13
  Russia ...................................................................................................................................... 16
  Singapore ................................................................................................................................. 17
  Additional programs around the globe ...................................................................................... 20
Selected sources for data related to immigration and brain drain .............................................. 22
Measuring drain brain – selected methodologies ...................................................................... 23
Conclusions and remarks ............................................................................................................. 24

Written by Dr. Yael Rozen
Introduction and definitions

Approximately 3 percent of the world’s population were immigrants in 2000 (International Organization for Migration [IOM] 2005). Within this group was a significant proportion of highly skilled and educated individuals who left their country of birth and settled elsewhere. This process is referred to as the **brain drain** because the sending countries in many instances lose a significant number of their most highly skilled people\(^1\).

Brain drain can occur not only when individuals educated in their home country emigrate in search of higher wages or better opportunities, but also when individuals who studied and completed their education abroad do not return to their home country. **Brain exchange** implies a two-way flow of expertise between a sending country and a receiving country, but where the net flow is heavily biased in one direction, the terms “**brain drain**” and “**brain gain**” are used. This latter also refers to the positive impact of skilled immigration on educational choices among those who stay in the home country, but who finally do not leave (increased incentives for obtaining education), and also to the transfer of knowledge, skills, and ideas by returnees (increased skilled and internationally experienced human capital). Recently, there has been a new concept introduced into the debate, namely “**brain circulation**”, which some use to refer to the cycle of moving abroad to study, taking a job abroad, and later returning home to take advantage of a good opportunity. This form of migration is expected to increase in the future, especially if economic disparities between countries continue to diminish. **Reverse brain drain** can occur when scientists or engineers migrate to a more developed country to study in its universities, to perform research, and/or to gain working experience in areas where education and/or employment opportunities are limited in their home country, and after several years of experience, they return to their home country to start a related business, teach in a university, or work there for a multi-national company. Likewise, reverse brain drain can also occur when scientists or professionals migrate to a more developed country and then actively promote as beneficial the practice of offshoring high-tech service jobs, technology, and knowledge transfers to their home country. When the corporations of developed countries train and outsource engineering, software, and/or product design to lower cost countries such countries as China, India, and Russia - looking to reduce cost or to forestall bankruptcy - reverse brain drain can also result. These companies are, in effect, outsourcing their brains and creativity and gradually, it may erode their capacity to generate new products and services. The problem of a reverse brain drain is exacerbated by the crisis in developed countries whereby there is low interest in engineering and science, or in continuing to advanced degrees among undergraduate students of these disciplines, which leads to the widespread replacement of native-born engineers and scientists with foreign-born ones in the areas of the greatest intellectual and economic interest for developed countries. At the same time, migrants from China and India are increasingly motivated to return to their home countries, thanks to rapid economic growth, improving living standards, and increasing opportunities emerging there\(^2\).

---

\(^1\) [http://www.encyclopedia.com/topic/Brain_drain.aspx](http://www.encyclopedia.com/topic/Brain_drain.aspx)

Brain drain across the globe

Many small countries, principally in the Caribbean, Central America, and Africa, suffer from very high skilled migration rates. Countries with greater demographic potential have larger populations of skilled people, so that even with a large share of skilled people in the migrant population, their share in the entire country’s skilled population is still small. On average, among countries with more than 30 million people, the brain drain of all tertiary educated people is about 5%. The largest states, such as China, India, Brazil, Indonesia, and Russia have about 3–5% of their graduates living abroad. By contrast, in sub-Saharan Africa, skilled workers only make up 4% of the total domestic workforce, but these skilled workers comprise more than 40% of people leaving the country³.

The probability of skilled labour force migration and the probability of total labour force migration are not very different in North America (0.9% and 0.8% respectively), but in east Africa, skilled labour force member are more than 18 times more likely to migrate than unskilled workers; in Central Africa this ratio is 16, and in west Africa, almost 15. For Europe, Central America, west Asia and Australia, the migration rate of highly skilled labour is about 1.5–2.0 times higher than unskilled, while for South America it’s 3 times higher⁴.

The magnitude of the brain drain among physicians of African origin for example, appears staggering going by the statements and statistics below: There are more Sierra Leonean medical doctors in Chicago than in Sierra Leone (Emeagwali, 1999). At least 60 percent of the doctors trained in Ghana during the 1980s have left the country (Mutume, 2003). Of the over 600 medical graduates trained between 1977 and 2000 in Zambia, only 50 were still working in the Zambian public sector health service in 2000 (Bundred and Levitt, 2000). Only 10 percent of the 6,000 physicians trained in public hospitals every year remain in Kenya (Emeagwali, 2003). 120,000 of the over 640,000 African professionals in the United States alone, are medical doctors (from Nigeria, Ghana, Sudan and Uganda) (Dembele, 2007). More than 25 percent of doctors trained in Africa work abroad (WHO, 2006). Emeagwali (1999) was quoted as saying that “at the rate medical doctors are leaving Nigeria, there may eventually be more Nigerian doctors working outside Nigeria than within”⁵.

Comparing emigration rates of the highly educated — the share of a country's nationals with a university education who live in the OECD — reveals that low-income countries suffer disproportionately from the brain drain (Figure 1). In parts of sub-Saharan Africa and Central America, sometimes more than half of all university graduates migrate to OECD countries, with potentially serious consequences for critical sectors such as education, health and engineering.
In 2000, the countries most affected by skilled migration in absolute terms (number of people) were large countries: the UK (1.4 million), the Philippines (1.1 million), India (1.0 million), Mexico (0.9 million), Germany and China (0.8 million each), South Korea (0.7 million), Canada and Vietnam (0.5 million each), followed by Poland, the USA, Italy, Cuba, France and Iran. In relative terms (as a percentage of the educated labour force) the most affected regions were Central America, the Caribbean and central, west and east Africa. The top losers were small countries: Guyana (89%), Grenada, Jamaica, St. Vincent and the Grenadines (85%), Haiti (84%), and Trinidad and Tobago (79%).

The proportion of skilled emigrants in the total emigrant population was the highest in countries with rather low brain drain: in Taiwan (78%), Qatar (70%), Kuwait (68%), United Arab Emirates and the Philippines (67% each), Nigeria and Saudi Arabia (65% each), and Japan (64%). In 2000, the OECD countries with the highest net brain gain (proportion of difference between skilled emigrants and skilled migrants to the resident labour force) were Australia (+11.4%), Canada (+10.7%), Luxembourg (+7.3%), USA (+5.4%), Switzerland (+3.8%) and New Zealand (+2.9). The OECD countries with the lowest net brain gain were Ireland (-4.0%), Greece (-1.8%), Portugal and Mexico (-1.7% each), and Finland (-1.5%).

Most educated emigrants are concentrated in few regions: the USA (about 50%), Canada and Australia (together about 20%) and the UK, Germany, and France (together 15%). Only 15% of educated emigrants live in other countries. The migration of highly skilled workers depends on the country. In the USA, the largest foreign-born population 25 years and older are Mexicans (6 million), then Filipinos (1.1 million), and then Indians and Chinese (0.8 million each). The

---

http://www.oecd.org/social/povertyreductionandsocialdevelopment/migrationandthebraindrainphenomenon.htm;
percentage of migrants with tertiary education in those top countries in 2000 was very different. While 80% of Indians, 73% of Filipinos, and 54% of Chinese who migrated to the USA had tertiary education, for Mexicans the figure is only 14% (Kapur, McHale, 2005). The emigration rate of tertiary educated workers (as a percentage of emigrants) was the highest for Mexico (14%) and the Philippines (11%), and lowest for India and China (2.5%). This means that Mexico lost relatively more educated people than India, even if most Indians migrants are highly skilled.  

This phenomenon is more pronounced with the increase in the level of education. Talented researchers are being systematically funneled into a small number of countries. Among young economists in the top American universities, for example, 75% did their undergraduate degree outside the United States. The extent of the elite brain drain is considerable. Among the world’s top physicists, nearly half no longer work in the country in which they were born (Figure 2). The USA and Switzerland are per capita the largest net-importers of elite scientists. The researchers estimate that 20% of top researchers tend to leave their country at each professional stage. An example for this global problem was demonstrated by Showkat A. et al., 2007, with an example of elite scientists taken from the ISI’s list of highly cited physicists on www.isihighlycited.com. Of 158 highly-cited scientists, 70% were born outside the USA. At the BSc level of their education, that had fallen to 57% of these people being outside America. By the year they came to do their PhD, the majority of these scientists were in the United States. The 70% had become 45%. Finally, when we observe where they work today, only 34% are working outside the United States. 

Figure 2. – Highly cited physicists - researchers funneled to the U.S.

---

Experts affirm that knowledge workers migration causes positive and negative consequences both for “source” and “purpose” countries (see Table 1). Intensity of knowledge workers migration depends on probability to migrate; if the result of migration is positive, we speak about brain gain; otherwise – when country feels the loss of human potential, it is affected by brain drain. The source countries usually are interpreted as brain drain countries or source countries and the effect of knowledge workers migration from these countries is obviously negative.

Table 1<br>

<table>
<thead>
<tr>
<th></th>
<th>Effect for “source” country</th>
<th>Effect for “purpose” country</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dis-advantages</strong></td>
<td>Loss of investments in education of individuals</td>
<td>Declines the ambitions of local inhabitants to seek for the highest qualification</td>
</tr>
<tr>
<td></td>
<td>Loss of high competence specialists</td>
<td>Possibility to lose the know-how potential.</td>
</tr>
<tr>
<td></td>
<td>The negative changes considering demographic situation</td>
<td>Knowledge workers invest in competence as well as in adaptation to new life circumstances</td>
</tr>
<tr>
<td></td>
<td>Decline of producing amounts.</td>
<td>Growth of GDP</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Return of migrants with new competence, new relations with foreign partners</td>
<td>Growth of investment in R&amp;D</td>
</tr>
<tr>
<td></td>
<td>Decline of unemployment level</td>
<td>Total growth of economy.</td>
</tr>
<tr>
<td></td>
<td>The growth of average wages.</td>
<td></td>
</tr>
<tr>
<td><strong>Dis-advantages</strong></td>
<td>Decline of financing of social security</td>
<td>Loss of resources</td>
</tr>
<tr>
<td></td>
<td>Rapid growth of wages in those sectors where the shortage of workforce because of migration is obvious.</td>
<td>The consumption of immigrants is minimal as they expect to return to the “source” country.</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td>Decline of unemployment level</td>
<td>Growth of GNP</td>
</tr>
<tr>
<td></td>
<td>Return of knowledge workers with new competence.</td>
<td>Payment of taxes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Occupations which are not popular between local inhabitants are occupied by immigrants.</td>
</tr>
</tbody>
</table>

Global causes of brain drain
The general causes indicated as factors influencing brain drain include:

**Low Salaries and inefficient Working Conditions:** Most the skilled laborers who are not well paid in their country tend to move to other countries where their skills can be fully recognized by increase in salaries or allowances in the place of work. For instance, in developed countries, researchers are provided with funds and necessary equipment to carry out study. (Talash, 2010). Additional relevant migration drivers includes underemployment of graduates in specific field with a parallel demand in other countries, job satisfaction, promotion prospects, misplacement of trained personnel, disregard for local talent, and lack of academic freedom.

**Higher standards of living:** Social security and benefits, cost of living, reduced tax, poor healthcare services.

**Political Instability:** Political instability in home countries makes people to lose confidence in their governments and future prospects for a better life. These are individuals who may have difficulties because of their ethnic, cultural, religion belongings or being a member of opposition

---

political groupings in their home countries. Political turmoil is mainly linked to the failure of economic development. As pressures of poverty, rapid population growth, disease and illiteracy and environmental degradation mount, they produce a volatile cocktail of insecurity resulting into war, civil strife, riots and other forms of political violence and a high level of crime. This leads to the displacement of large numbers of people as migrants, refugees, or asylums to other countries. According to Papadimitriou both internal and regional conflicts, often based on religion and ethnicity, are precipitating unprecedented high levels of brain drain (Gordon, 1998).

**Search for further quality education:** Brain drain occurs mostly where individuals from undeveloped countries move to the developed countries in need to expand their studies. Consequently, most of these learners opt not to return to their countries but decide to dwell in the foreign countries and work after gaining the adequate skills. Lack of proper systems in the education sector has also resulted to the inadequacy of school facilities that offer abstract ideas on what the learners intend to achieve at the end of a lesson.\(^{10}\)

Brain drain from Israel

Emigration from Israel is a part of a global phenomenon and apparently is expected to increase in the future. Based on numbers gathered on the decade of 1990-2000, concentrating on 28 countries including western economies (that are a better comparison with Israel than poor countries), the average measure for college graduate immigrants per 10000 residents is 12.41 while the Israeli number is higher than three times of this number 41.45 (Table 2). Considering the fact that many of the Israeli emigrants were not born in Israel, it is estimated that these numbers are higher.11

Table 2. Measures of immigration to the U.S from 28 countries.

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Number of immigrants age-30-50</th>
<th>College graduate rate</th>
<th>Collage graduate number</th>
<th>Country of origin population</th>
<th>Immigrants per 10000 residents</th>
<th>College graduate immigrants per 10000 residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>10,275</td>
<td>52%</td>
<td>5,329</td>
<td>5,368,854</td>
<td>19.14</td>
<td>9.93</td>
</tr>
<tr>
<td>Finland</td>
<td>8,170</td>
<td>55%</td>
<td>4,487</td>
<td>5,172,033</td>
<td>15.80</td>
<td>8.68</td>
</tr>
<tr>
<td>Norway</td>
<td>9,030</td>
<td>55%</td>
<td>4,943</td>
<td>5,183,545</td>
<td>17.42</td>
<td>9.54</td>
</tr>
<tr>
<td>Sweden</td>
<td>17,174</td>
<td>56%</td>
<td>9,584</td>
<td>8,876,744</td>
<td>19.35</td>
<td>10.80</td>
</tr>
<tr>
<td>United</td>
<td>307,694</td>
<td>42%</td>
<td>128,600</td>
<td>59,778,002</td>
<td>51.47</td>
<td>21.51</td>
</tr>
<tr>
<td>Ireland</td>
<td>55,877</td>
<td>34%</td>
<td>19,061</td>
<td>3,883,159</td>
<td>143.90</td>
<td>49.09</td>
</tr>
<tr>
<td>Belgium</td>
<td>12,034</td>
<td>53%</td>
<td>6,397</td>
<td>10,274,595</td>
<td>11.71</td>
<td>6.23</td>
</tr>
<tr>
<td>France</td>
<td>89,213</td>
<td>47%</td>
<td>42,323</td>
<td>59,765,983</td>
<td>14.93</td>
<td>7.08</td>
</tr>
<tr>
<td>Netherlands</td>
<td>34,318</td>
<td>49%</td>
<td>16,691</td>
<td>16,067,754</td>
<td>21.36</td>
<td>10.39</td>
</tr>
<tr>
<td>Switzerland</td>
<td>17,295</td>
<td>60%</td>
<td>10,300</td>
<td>7,301,994</td>
<td>23.69</td>
<td>14.11</td>
</tr>
<tr>
<td>Greece</td>
<td>70,825</td>
<td>27%</td>
<td>19,366</td>
<td>10,645,343</td>
<td>66.53</td>
<td>18.19</td>
</tr>
<tr>
<td>Italy</td>
<td>147,789</td>
<td>27%</td>
<td>39,532</td>
<td>57,715,625</td>
<td>25.61</td>
<td>6.85</td>
</tr>
<tr>
<td>Portugal</td>
<td>100,044</td>
<td>10%</td>
<td>9,700</td>
<td>10,084,245</td>
<td>99.21</td>
<td>9.62</td>
</tr>
<tr>
<td>Spain</td>
<td>46,546</td>
<td>39%</td>
<td>18,020</td>
<td>40,077,100</td>
<td>11.61</td>
<td>4.50</td>
</tr>
<tr>
<td>Austria</td>
<td>15,936</td>
<td>43%</td>
<td>6,877</td>
<td>8,169,929</td>
<td>19.51</td>
<td>8.42</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>19,990</td>
<td>41%</td>
<td>8,230</td>
<td>10,256,760</td>
<td>19.49</td>
<td>8.02</td>
</tr>
<tr>
<td>Germany</td>
<td>429,158</td>
<td>34%</td>
<td>145,130</td>
<td>83,251,851</td>
<td>51.55</td>
<td>17.43</td>
</tr>
<tr>
<td>Hungary</td>
<td>20,498</td>
<td>39%</td>
<td>7,969</td>
<td>10,075,034</td>
<td>20.35</td>
<td>7.91</td>
</tr>
<tr>
<td>Poland</td>
<td>176,737</td>
<td>27%</td>
<td>47,587</td>
<td>38,625,478</td>
<td>45.76</td>
<td>12.32</td>
</tr>
<tr>
<td>Romania</td>
<td>48,294</td>
<td>43%</td>
<td>20,877</td>
<td>22,317,730</td>
<td>21.64</td>
<td>9.35</td>
</tr>
<tr>
<td>USSR/Russia</td>
<td>271,364</td>
<td>53%</td>
<td>143,202</td>
<td>144,978,573</td>
<td>18.72</td>
<td>9.88</td>
</tr>
<tr>
<td>China</td>
<td>709,415</td>
<td>55%</td>
<td>387,300</td>
<td>1,284,303,70</td>
<td>5.52</td>
<td>3.02</td>
</tr>
<tr>
<td>Japan</td>
<td>225,484</td>
<td>48%</td>
<td>108,981</td>
<td>126,974,628</td>
<td>17.76</td>
<td>8.58</td>
</tr>
<tr>
<td>Korea</td>
<td>388,783</td>
<td>45%</td>
<td>173,128</td>
<td>70,548,195</td>
<td>55.11</td>
<td>24.54</td>
</tr>
<tr>
<td>Thailand</td>
<td>57,773</td>
<td>35%</td>
<td>19,987</td>
<td>62,354,402</td>
<td>9.27</td>
<td>3.21</td>
</tr>
<tr>
<td>India</td>
<td>667,434</td>
<td>65%</td>
<td>432,037</td>
<td>1,045,845,22</td>
<td>6.38</td>
<td>4.13</td>
</tr>
<tr>
<td>Israel/Palestine</td>
<td>57,589</td>
<td>43%</td>
<td>24,994</td>
<td>6,029,529</td>
<td>95.51</td>
<td>41.45</td>
</tr>
<tr>
<td>Turkey</td>
<td>39,649</td>
<td>45%</td>
<td>17,974</td>
<td>67,308,928</td>
<td>5.89</td>
<td>2.67</td>
</tr>
</tbody>
</table>

Table 3 indicates that immigration to the U.S. from Israel of college graduates is more than twice of less educated Israelis\textsuperscript{12}.

Table 3. Education level of Israeli emigrants in the U.S.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>College Graduates</td>
<td>Less than College</td>
</tr>
<tr>
<td>Married</td>
<td>2.65</td>
<td>1.17</td>
</tr>
<tr>
<td>Not Married</td>
<td>2.25</td>
<td>1.79</td>
</tr>
</tbody>
</table>

The brain drain from Israel is indeed a part of a global phenomenon; however, the rate of academic emigration from Israel to the U.S. is unparalleled in the western world. Just the number of Israelis in the top 40 American departments in physics, chemistry, philosophy, computer science and economics, as a percentage of their remaining colleagues in Israel, is over twice the overall academic emigration rates (at all levels) from European countries. The 1,409 Israeli academics residing in the States in 2003-2004 represented 24.9\% of the entire senior staff in Israel’s academic institutions that year – twice the Canadian ratio and over 5 times the ratio in the other developed countries (Figure 3)\textsuperscript{13}.

Figure 3.

\textsuperscript{12}Gold A. and Moav O. 2006, ”Brain drain from Israel” Shalem center. \url{http://www ima.org.il/Ima/FormStorage/Type7/brichatMochot.pdf}

Why do they leave Israel?

Gold and Moav, presented a results of a questionnaire attempting to prioritize the reasons for emigration among Israeli’s in the U.S. Table 4 demonstrates the importance of work and working conditions to this decision rather than the higher salaries.

Table 4. The relevancy of different factors to the decision to emigrate from Israel

<table>
<thead>
<tr>
<th>Factor</th>
<th>highly relevant</th>
<th>relevant</th>
<th>not relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work (partner)</td>
<td>71%</td>
<td>6%</td>
<td>21%</td>
</tr>
<tr>
<td>Unemployment in Israel</td>
<td>81%</td>
<td>12%</td>
<td>6%</td>
</tr>
<tr>
<td>Interest in work</td>
<td>34%</td>
<td>28%</td>
<td>37%</td>
</tr>
<tr>
<td>Salary</td>
<td>43%</td>
<td>21%</td>
<td>34%</td>
</tr>
<tr>
<td>Tax</td>
<td>65.6%</td>
<td>15.6%</td>
<td>18.75%</td>
</tr>
<tr>
<td>Cost of living</td>
<td>75%</td>
<td>12.5%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Education</td>
<td>43%</td>
<td>25%</td>
<td>31.25%</td>
</tr>
<tr>
<td>Quality of school</td>
<td>75%</td>
<td>6%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Political and safety issues</td>
<td>65.5%</td>
<td>21.8%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Regulation</td>
<td>81%</td>
<td>12.5%</td>
<td>6%</td>
</tr>
</tbody>
</table>

The increased brain drain of academic researcher as compared to the entire educated population was reviewed by D. Ben-David, 2008. Among other factors, the most astonishing one is that since the mid-1970s, the absolute number of senior academic staff positions in Israel’s universities has remained nearly unchanged – and has actually declined in its leading universities (Figure 4). This despite a 355% increase in the number of degrees conferred per capita.

Figure 4.

Ben David is concluding that the steady multi-decade per capita reduction in faculty positions (even when including the non-research colleges), the constant erosion in salaries and stagnation fed by an absence of strategic vision at the national level, combined with a pervasive culture of micromanagement, are all part of a massive policy breakdown that has resulted in one of the greatest academic brain drains on record – this, from a country with no natural resources and existential threats to its national security.  

Programs and initiatives to reverse brain drain

The challenge of redirecting the loss of skilled workers into “brain circulation” is to find ways of creating opportunities at home. Potential nuclei for development could be established by focusing on research and development that is based on national priorities and niches of opportunity. The requirements necessary to achieve this include:

1. Implementing educational strategies that support and nurture these nuclei through both targeted national programs and training abroad;

2. Investing in infrastructure for research and development and creating conditions that foster the growth of public-sector and private-sector demand for research results, technological development and innovation;

3. Building an enlightened leadership and enabling national scientific community with opportunities for coherent development of scientific and technological capacity.

Several governmental programs as well as researchers and opinion leaders in countries who suffer brain drain are addressing this issue. Some examples are listed below. The most ambitious program was presented recently by the Chinese government.

China

Investing in for research and development, high education system infrastructure and human resource are exemplified herein.

PROJECT 211 - With the goal of developing a network of comprehensive research universities able to produce world-class research and compete for the world’s brightest minds, the Chinese government initiated a priority-funding policy that channels extra money to the nation’s top universities. In addition, specialist institutions were encouraged to merge to create a number of large, comprehensive universities focusing on both teaching and research.

First announced in 1993 by the government of then President Jiang Zemin and implemented in 1995, Project 211 gave existing universities and newly merged institutions the opportunity to bid for nearly US$20 billion in priority government funding. In all, approximately 100 universities

---


have been approved to receive additional funding to improve facilities and curriculums within some or all of their academic departments. It is hoped this network of institutions will train the next generation of high-level professional manpower in the sectors key to China’s future social and economic development. The government is developing through the network 80 key academic disciplinary areas and 602 specializations that will not only train China’s future cadre of decision-makers and academic leaders, but also serve as a model for other universities and academic departments around the country. Particular emphasis has been placed on programs that will positively affect the country’s social and economic development, scientific and technological advancement and national defense system. Of the 602 specializations identified by the government for 211 funding, 255 (42%) are in engineering and technological sciences, 89 (15%) in the exact (fundamental) sciences, 66 (11%) in health and medicine, 62 (10%) in the humanities, 57 (10%) in law and economics, 42 (7%) in environmental sciences and 31 (5%) in agricultural sciences. Other key measures associated with the 211 Project include the commercialization of research findings, reform of university administration and management and strengthening of international cooperation and exchanges.

To aid information sharing among universities and academic departments, three entities have received additional funding: the Chinese Education and Research Network (CERNET), the Library and Documentation Support System (LDSS) and the Modern Equipment and Facilities Sharing System (MEFSS). They will act as central and regional repositories and dissemination centers for information and documents serving all universities in China. Based at Tsinghua University, CERNET is the country’s first Internet-based education and research network, with a series of regional nodes at key universities across the country. The network can be accessed at the majority of China’s institutions of higher education, giving faculty and students access to papers and documents from universities across the country and also offering a vehicle for international collaboration.

**PROJECT 985** - Supplemental to 211 funding are three-year grants that were made available to a smaller group of universities under what is known as the 985 Project. Some observers believe the introduction of the 985 Project suggests that the Chinese government recognizes it may fail to develop 100 universities of world-class standing in the near future as the money has been too thinly spread. When it was first announced in 1998, funding was made available to an elite group of 10 universities, including Beijing, Tsinghua, Fudan, Zhejiang and Nanjing. Both Beijing University and Tsinghua University, the top two ranked universities in China, were granted US$225 million each over five years, while Nanjing University and Shanghai Jiaotong University each received US$150 million. The second phase of the 985 Project, launched in 2004, widened the number of universities to 36. In addition to developing new research centers and improving facilities, much of the 985 funding is being used to hold international conferences, attract world-renowned faculty and visiting scholars, and to help Chinese faculty attend conferences abroad. Through these international networking opportunities Chinese universities are exploring ways to partner with top institutions around the world. As a result, dual-degree programs and joint-venture campuses are now becoming increasingly common and foreign institutions are more aware than ever of the need to engage with China and Chinese academia. The ability to offer competitive salaries will be critical for Chinese universities in attracting top international faculty. If they can lure and retain top academic talent then Chinese
China’s strategies to reverse the brain drain began in the early nineties'. In order to sustain its economic growth, China has been pursuing a number of policies aimed at recovering its expatriate brain power by encouraging scholars living abroad to return. While local government authorities compete to recruit returnees, the central Government has introduced various policies to facilitate repatriation and resettlement, including preferential treatment for housing and research, financial benefits (fellowships), better dissemination of information, etc. The author concludes that these efforts have not been in vain, but notes that few of those who have returned have given up particularly successful careers abroad to do so18.

Among the programs offering financial support for Chinese with academic education who return to China is The Thousand Talents Program. The national talent plan also launches 12 talent programs or projects covering all aspects of talent work in China. One program that has received a lot of attention is the Thousand Talents Program, which calls for China to attract 2,000 high-level overseas rencai to move to the PRC in the next five-to-ten years. By May of 2010, 662 people had been recruited under the program, which gives priority to leading scientists and entrepreneurs who are able to make breakthroughs in key technologies, develop high-tech industries and lead new research areas. Over 80 percent of them are foreign nationals, with most of them originally from China19. Specific examples, criteria and financial incentives can be found in another publication20. Recent reports indicates that this strategy is successful or at least increase the awareness of the world to this reverse brain drain or brain gain of China21.

Use of diaspora. China has created an institutional and legal apparatus to court its citizens abroad. However, in order to utilize more efficiently its diaspora, it has widened the scope of its policies by including all ethnic Chinese abroad, by engaging overseas students and by trying to directly influence overseas communities. China has created an institutional apparatus targeting the diaspora, the Overseas Chinese Affairs Office (OCAO) demonstrating that overseas Chinese became a national matter. China has extended the official diaspora by gradually embracing all the ethnic Chinese regardless of their nationality. China also attempts to directly fashion abroad its diaspora to make it sympathetic to PRC’s objectives but also capable of defending China’s interests overseas22.

India

Policies that some developing countries have adopted from time to time to deal with brain drain, or the emigration of human resources in science and technology (HRST), can be divided into

17 http://www.wes.org/ewenr/06oct/practical.htm
18 http://spfind.ust.hk/spfind/Record/999-6626
22 http://www2.lse.ac.uk/economicHistory/Research/CCPN/publications/Dissertations/DissertationsCCP/72190.pdf
four broad types: restrictive, compensatory, restorative and developmental. India has experimented with almost all of them at various points in time.

*Restrictive policies*- India generally does not have a restrictive policy for emigration of highly educated, trained and experienced personnel. From time to time various restrictive measures to contain the problem have been conceived, but there has never been a consensus except in the case of the medical sector – where India has certain restrictions. But these also originated as India’s *quid pro quo* response to the highly restrictive US regulations for entry of medical personnel into the US geo-economic sphere.

*Compensatory policies*- There is no formal compensatory mechanism to compensate for the losses that India incurs because of migration. There is a policy in terms of incentives offered to the NRIs (Non-Resident Indian) for sending funds to India through the official channels – remittances, investments in bank deposits, occasionally floated development bonds, securities of Indian companies, joint ventures and so on. Most of the incentives are in the form of higher rates of interest and lower rates of taxes for the NRIs as compared to their counterpart residents in India. Most of these schemes have attracted financial transfers to India, but have faced the scrutiny of efficacy in terms of going into conspicuous consumption or what Krueger and Bhagwati would call “Directly Unproductive Profit-making (DUP) activities”.

*Restorative policies* - Restorative policies are aimed at encouraging return migration to India, either permanently or temporarily on specific assignments. The best known schemes under this category have been the Pool Officers Scheme for permanent returnees launched by the Council for Scientific and Industrial Research (CSIR) of the Government of India, and the TOKTEN-INRIST scheme for temporarily returning scientists launched by CSIR in collaboration with the UNDP. Both schemes have been quite ineffective – due to poor offers and poor implementation respectively. Private initiative was only through the TOKTEN-INRIST, where private industrial establishments were encouraged to offer placements to the returning/visiting NRIs in their R&D units. The private firms were, however, frustrated and disillusioned with the bureaucratic style of functioning of the CSIR as it implemented the TOKTEN programme in India.

The University Grants Commission started a scheme to attract Indian scientists abroad with offers of placement in Indian universities at levels parallel to lecturer, reader and professor in the early 1980s, with substantial research grants in addition to their salaries. The scheme took-off well, but ran into trouble because of the dilution of standards by accommodating unemployed scholars from within India in all disciplines. It also led to dichotomies in the universities, where the research scientists were treated as ‘second-class citizens’ by the permanent faculty. To get over this, the UGC turned the appointments, initially made for five year renewable tenures, into permanent appointments. However, subsequent groups were not treated the same, first of all because their appointments were temporary and non-renewable after the first tenure of five years. In addition, in the original scheme, there were provisions for promotion from one level to another after every five years, subject to evaluation of progress of work, which was not offered to later entrants in the scheme. The UGC finally ran into budget trouble, and the scheme was withdrawn some time in the mid-nineties for fresh appointments, when phasing out of the old non-renewable positions started as well.

The Government of India has, through official notification, introduced what is called the *PIO-Card* for persons of Indian origin who have obtained foreign citizenship by surrendering their Indian citizenship. The PIO scheme was announced by the Ministry of Home Affairs in the
Gazette of India dated 30 March 1999. With the exception of those who now hold citizenship of Pakistan, Bangladesh and other countries that may be specified from time to time, the scheme is directed at any holders of Indian passports in the past; the children, grandchildren, and great-grandchildren of those who were born in India and were permanently resident in India as defined in the Government of India Act, 1935 and other. Bhagwati and Partington (1976)

Transfer of Knowledge and Technology through Expatriate Nationals - Interface for Non-Resident Indian Scientists & Technologists (TOKTEN-INRIST).

UNDP has sponsored the TOKTEN programme in many developing countries experiencing brain drain. Indian citizens are not eligible for dual citizenship except for those living in 16 selected countries who are now offered the option of dual citizenship as a follow up to the announcement made on the Second Indian Expatriates Day on 9 January 2004.

The card allows a waiver on visas for entering India; exemption from the requirement of registration for stays up to 180 days; and parity with NRIs in respect of all facilities available to the latter in the economic, financial and educational field, except for acquisition of agricultural/plantation properties. The card does not give any political rights. The PIO Card scheme was designed to strengthen the link of the expatriates of Indian descent, including Indian-born naturalised American citizens, with India. A large number of PIOs had, in fact, been asking for dual citizenship from India so that they could keep their contacts with the home country with ease. The PIO Card was the second-best offer the Indian Government could provide, because the proposal for dual citizenship was not acceptable for reasons of national security, and other possible abuses by anti-national and anti-social elements. The PIO Card scheme however failed to evoke an enthusiastic response. With the recent celebration of the “Overseas Indians Day” (the Pravasi Bharatiya Divas) on 9 January 2003 and 2004, the announcement of granting dual citizenship by India to Persons of Indian Origin in selected countries, mainly the west, was finally made, but it is too early to comment on the outcome of this new policy instrument.

**Developmental policies** - Developmental policies are not specifically aimed at brain drain per se, but supposedly at the causes of brain drain in terms of bridging the development gap between the developing sending country and the developed receiving country. Examples are the proposal for the setting up of science parks where wages will be comparable to international standards and working conditions will not be repressive, Export Processing Zones (EPZs) where tariff barriers will not exist for undertaking certain production activities, and so on.

A successful example for reverse brain gain can be demonstrated by the two industrial cities, Bangalore and Hyderabad. Since the early 2000, there is evidence that reverse brain drain is occurring, as U.S.-trained Indian professionals are returning to their home country in increasing numbers to take advantage of new growth and employment opportunities. Both cities became magnets for returning IT, finance and management professionals for a number of reasons. In response to globalization, many cities develop specific cultures to woo high-tech professionals, investment and businesses. This is the case with Bangalore and Hyderabad, where local governments, private and public sectors and skilled personnel converged to develop the economic bases, infrastructure and cultures necessary for their transformation and development.

---

23 [http://www.oecd-ilibrary.org/docserver/download/5lgejhy7kbv.pdf?expires=1355743640&id=id&accname=guest&checksum=1514C7B231052EA003C771957E26955C0]
The cities have acquired ‘‘trade recognition’’ as hubs in the Indian and global IT industry. There has been a rapid increase in the number and strength of the financial, industrial and commercial linkages between firms and institutions in Bangalore and Hyderabad and those in the developed world, in part due to the efforts of state and city governments, which offered incentives to business enterprises and institutions to locate in their city. Tax breaks, the setting up of special economic zones and the development of suitable infrastructure made the cities attractive to prospective IT firms. With the shifting of many Research and Development (R & D) centers of American technology firms to India, there has been a renewed emphasis on developing local technical, scientific and professional institutions. R & D units in India have proliferated. No longer considered merely locations for cheaper call center operations and back office work, Bangalore and Hyderabad have developed into important R & D sites.

India’s strategy to use its diaspora

Before the reforms in 1991, India did not seek to exploit the potential of its diaspora. However, progressively especially after 1991, India began to engage its diaspora in order to support its development. It has set up an institutional apparatus to cope with overseas Indians, created incentives for them to invest and conducted a rhetoric strategy to bind them emotionally to India.

Russia

In the years following the collapse of the Soviet Union, hundreds of thousands of scientists, researchers and technology workers either emigrated from Russia or moved to other fields. According to a UNESCO World Science Report, 400,000 scientists left the profession between 1991 and 1995. By 2002 that figure had topped half a million.

On 2006, Russian President Vladimir Putin issued a decree initiating an ambitious six-year program designed to facilitate the voluntary repatriation of some of the estimated 30 million Russians living abroad, both in the CIS and further afield. The program, meant to counter Russia’s demographic crisis. A website called remigrant was established. This website includes relevant information for Russian emigrants interested in returning to Russia such as explanations regarding the program, documentation required, social benefits offered for returnees etc.

The problem of academic under-funding and low pay is being tackled by the Russian government. In 2006, the government entered into an agreement with The Russian Academy of Sciences which aimed to raise and standardize the salary of research scientists. When the program was put forward the average monthly salary for a researcher was 17,000 rubles. That figure is raised to 19,000 rubles, and there are plans to raise it to 30,000 rubles by the end of

---

24 http://www.academia.edu/221127/From_Brain_drain_to_brain_gain_Reverse_migration_to_Bangalore_and_Hyderabad_Indias_globalizing_high_tech_cities
26 http://www.remigrant.ru/
27 http://www.google.co.il/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&ved=0CEEQFjAD&url=http%3A%2F%2Fwww.neaman.org.il%2FNeaman2011%2Fuserdata%2FSendFile.asp%3FDBID%3D1%26LGID%3D2%26GID%3D2214&ei=a6PEUNVsEOOsIQmOvGQAw&usg=AFQjCNbTgEqn7DIjYH46jwpocRQccFR8R7aDfjapj-WsKSNg&sig2=FCfjg_5eP4_25AT_LL0_hlg
28 http://rbth.ru/articles/2012/10/01/russia_interested_in_the_russian_diaspora_living_abroad_18739.html
2008. The hyped "reverse brain drain" of the early 2000s brought many qualified workers back into the country. A 2003 survey compiled by the Kelly Services recruitment agency showed Russian IT workers "flowing" back from the West to the East. The newly stabilized economy also opened up many more management and accounting positions which were soon filled by Russian "repats."  

However, it seems that the trend has changed again, with a large increase in the number of young scientists who are leaving Russia. According to Russian scientists, this is in accordance with the government decrease in the budgets provided for scientific research in 2009. In its defense, the government has made efforts to stem the flow. One of the most ambitious scientific projects, a large scientific complex near Moscow meant to be a Russian Silicon Valley, was built precisely to entice scientists to stay in their home country. And since 2010, the Ministry of Education and Science has held a competition for mega-grants. Each winner of a mega-grant receives $4.8 million to establish a world-class laboratory in Russia. The government doesn't hide the fact that it hopes this will help lure back scientists who have left the country. Regardless, Russian graduate students prefer just about any small, unknown laboratory in Europe over the brand-new Russian scientific complex. According to interview with a young scientist, the reason is less related to the lack of financing for scientific projects, but general quality of life.  

Russia strategy as for its diaspora  

The population of Russia numbers 143 million. The Russian Diaspora and the Russian expats worldwide number 30 million, including 10 million in countries outside the former Soviet Union. These figures emphasize the cultural and geopolitical importance of building ties between Russia and the Russians who are based abroad. Overall, Russia’s policy towards its Diaspora and expats is aimed at helping these people defend their rights, retain their ethnic identity and build ties with Mother Russia. A key challenge is to preserve ethnic and cultural identity and to strengthen the position of the Russian language in other countries, especially in the former Soviet Union. According to president Putin, this is the aim of The Russian Language federal programme, adopted for 2011-2015. The concept entitled The Russian School Abroad is currently being drafted. The Russkiy Mir Foundation extends financial support in the form of grants to Russian educational programmes.  

Singapore  

The measures that the Singapore government has applied to attract and retain talent in science and technology (S&T) contributing to the development of Singapore’s was reviewed by T. M. Heng and J. B. divided to four different strategies.  

Strategy 1 - Augmenting Support Activities in the Value Chain  

Singapore’s local enterprises form a significant portion of its manufacturing sector and play a major role in supporting about 7,000 local enterprises and multinational corporations (MNCs). In
turn, the substantial size of the manufacturing sector, which continuously contributes more than 20 percent of GDP, provides the bedrock for innovation and employment in S&T manpower. High quality domestic links and support systems, including logistics and finance, enable on-time delivery of high quality inputs by local suppliers, assisting MNCs’ efforts to maintain international competitiveness in the global value chain. As competition among MNCs intensifies and “time-to-market” becomes more important, MNCs look for sites where “higher-tier” suppliers provide them with cutting-edge technologies and production capabilities that they urgently need but do not have time to implement. Competition from emerging economies and rising costs associated with limited domestic endowments has increasingly hampered the price competitiveness of lower-tier suppliers. The creation of higher-tier suppliers or upgrading of lower-tier suppliers becomes all the more important as they are complementary assets to maintaining competitiveness. Foreign S&T manpower is also a necessity to complement and supplement local cohorts to achieve objectives.

Singapore’s government plays a complementary role in supporting the upgrading process. One of the government’s initiatives to augment business support in the S&T value chain is the establishment of focused Centers of Innovation (COIs). The centers allow local enterprises to approach A*STAR2 (the government agency in charge of R&D) to seek specific technological assistance and expertise. This helps local enterprises upgrade their capabilities, acquire advanced manufacturing expertise and gain access to strategic manpower training. Another government initiative is the Growing Enterprises with Technology Upgrade (GETUp) program—a proactive holistic and integrated approach aimed at boosting the global competitiveness of local technology-intensive enterprises. It leverages the existing schemes of EDB, SPRING Singapore and IE Singapore, as well as the technical capabilities of the A*STAR research institutes (RIs), to address the financial, human resource and technology constraints that enterprises face.

Strategy 2 - Public Private Partnership & Industrial Clustering

Infrastructure is the most immobile location specific factor. Arguably, world-class research infrastructure and a national innovation system consisting of well-equipped research institutes and universities are key determinants to whether a location can be a global nexus for scientific talent. Singapore has built such assets over the last 30 years. In particular, from 2005 to 2010, Singapore’s government made significant investments to bolster R&D, allocating S$13.55 billion to various agencies. The R&D funding is further raised to S$16.1 billion in the latest 5-year National Technology Plan.

In the 2000s, the Singapore government built two iconic infrastructure projects—“Biopolis” and “Fusionopolis”—to provide the necessary foci for clustering of enterprises, S&T manpower and ideas. Biopolis provides world-class biomedical R&D facilities with shared research resources and services to promote collaboration among biomedical science (BMS) research institutes and corporate labs in Singapore. Fusionopolis is dedicated specially to research and development in information and communications technology, media, materials sciences, data storage, microelectronics, high performance computing, and manufacturing technology. Equipped with state-of-the-art infrastructure and facilities, these complexes provide ideal environments to foster synergistic collaborations, experimentation and consultations between public and private research institutes. About 3,000 researchers and scientists from some 50 countries work in these complexes.

Strategy 3 - Nurturing Talent & Encouraging Repatriation
The local talent pool is another location-specific factor that enables activity for local and foreign MNCs. Without a talent pool, the value chain would not be complete and value creation by corporations would not be feasible. Home-grown Singaporean talent is relatively immobile compared to foreign talent because of binding family and social ties. Top local PhD talent in S&T helps determine the quality of the domestic value chain, and functions as an essential asset that anchors the “stickiness” of more mobile international talent. For example, David Lane at A*STAR’s Institute of Molecular and Cell Biology; Par Norlund, a renowned structural biologist; and Axel Ullrich, an eminent cancer scientist; are all assisted by homegrown scientists who graduated from top US and UK universities with government scholarships. Singaporean scientists from public research institutes are seconded to various companies like Genentech and Lonza as well. Renowned scientists also brought with them other scientists who had collaborated with them—helping to further enrich the pool of researchers in Singapore.

To augment the local talent pool in research institutes, A*STAR has funded a series of PhD scholarship programs from 2001 to increase post-graduate studies. The goal is to have a pipeline of 1,000 Singaporean students in the engineering and science PhD programs of local universities by 2020. Upstream in the talent development spectrum, A*STAR and the RIs continue to work with the Singapore Science Centre and schools under the Youth Science Program to encourage and stimulate talented youths and early stage scientists to develop deeper interest in S&T. Science scholarships, together with research attachments, science competitions and fora, are available to junior college and upper secondary students, thus installing a next-generation pipeline of exceptional scientists. Efforts are also being made at the international front to attract international PhD students in S&T to work in Singapore upon graduation. Those who have the credentials and potential are offered Scholarships like the Singapore International Graduate Award, and opportunities via the A*STAR Research Attachment Program and the Singapore International Pre-Graduate Award to join Singapore’s vibrant R&D community through research internships and PhD research attachments at A*STAR labs, in partnership with local and overseas universities.

Lastly, another channel of “brain gain” is encouraging return migration of overseas Singaporean talent. Singaporeans working or studying overseas are contacted by the Overseas Singaporean Unit of the National Population and Talent Division to keep them updated on developments and opportunities in Singapore.

**Strategy 4 - Making Singapore a Distinctive Global City**

The literature suggests that diversity plays a key role in the attraction and retention of the kind of talent required to support high-tech and generate regional growth. Zachary (2000) notes that the United States’ competitiveness in high-tech fields is directly linked to its openness to outsiders, while the relative stagnation of Japan and Germany is tied to “closedness” and relative homogeneity.

The Singapore government has always championed openness to foreigners. For example the 2010 Economic Strategies Committee report recommended that Singapore must continue to attract top quality people from around the world, even as the country curbs its overall dependence on foreign workers. Singapore’s future must rest on being a global city to attract diverse and high quality talent from Asia and around the world. Most notably, Singapore planners have exercised creativity in combining entertainment, casinos, theme parks, conventions and recreation—into building two integrated resorts in Singapore. These add to the
style and aesthetics of Singapore’s products and services, and attract foreign talent in the high-technology industry. In a recent study by human resources consultancy ECA International, Singapore ranks as the world’s most livable city for Asian expatriates. It tops the table due to its consistently good air quality, world-class health care, excellent infrastructure and low crime rate.

Another potent strategy to add to the openness and diversity of the Singapore economy is through Contact Singapore, which has offices in the Asia-Pacific region, Europe and North America. It partners with Singapore-based employers and industry players to organize career fairs and networking sessions in cities across the world, and provides updates on career opportunities and industry developments to individuals.

Additional programs around the globe

UNESCO programs for bringing professionals back for short or extended periods to academic institutions in their home countries.

Mali: University of Mali TOKTEN project (UNESCO). The Transfer of Knowledge through Expatriate Nationals program at the newly established University of Mali (TOKTEN TALMALI) filled the urgent need for qualified teaching and research personnel in a number of key areas by bringing Malian academics living abroad back to their home country on short term contracts.

Yugoslavia, Project Brain Drain - The main idea behind the Brain Drain Project, organized by Education Forum, a Serbian non-governmental organization, is to treat brain drain as an opportunity for positive economic change and stabilization of South East Europe and a catalyst for Yugoslavia's successful integration into the European and global communities. The two main objectives of the project are to establish strong professional ties between the young professional Diaspora from South Eastern Europe and their colleagues who have remained, and build on these contacts in order to strengthen links between institutions in the region and their counterparts abroad.

Albania - Brain Gain Program aims to support Albanian government to create laws and institutional structures that enable talented scholars to return in Albania. This program helps universities and public administration to employ qualified individuals who have been graduated abroad and are selected through a transparent competition. The return of people with a higher qualification is an integral part of the Government Strategy for migration in order to include the Albanian Diaspora in the economic, scientific and administrative development of the country.

Africa – Set of recommendation to reduce brain drain. Governments should give highest priority to science and technology education and the health sector by budgetary allocations. Military spending should be reduced to a level that would curtail the continent's appetite for wars. Governments should provide necessary infrastructure, good communication efficient power supply, and state-of-the art facilities for promotion and sustenance of knowledge networks in

34 http://www.asia.udp.cl/Informes/2012/singapourbraingain.pdf
35 http://www.unesco.org/education/studyingabroad/highlights/brain_drain.shtml
36 http://www.unesco.org/education/studyingabroad/highlights/brain_drain.shtml
research, teaching, training, and service delivery are not only important but urgent. Recommendations on the way forward\textsuperscript{38}. Another approach proposed for Africa and already implemented in India is to persuade multinational companies to move their operations to nations in Africa. These high-tech jobs include those in call centers, customer service and help desks - all of which are suitable for unemployed university graduates\textsuperscript{39}.

**Philippines** – The Department of Labor and Employment (DOLE) initiated a multi-sectorial brain-gain program to further improve the skills and provide entrepreneurship opportunities for returning overseas Filipino workers (OFWs). The program will provide a package of services, including training, investment, savings and entrepreneurship assistance to OFW returnees. It will also provide the OFWs real time information on available jobs and labor market developments, accreditation, and permits for reemployment. "The DOLE will engage local government units (LGUs) in implementing the Skills Registry System (SRS) for skills profiling of their constituents, including OFWs, to identify those who may be invited to conduct technology transfer and those who are in need of skills training and entrepreneurship assistance\textsuperscript{40}.

\textsuperscript{38} N. Mbanefoh, Ebonyi State University, Abakaliki, Ebonyi State, Nigeria. http://www2.aau.org/corevip07/papers/sec-docs/Nkechi%20Mbanefoh.pdf


\textsuperscript{40} http://www.abs-cbnnews.com/global-filipino/04/28/11/brain-gain-program-returning-ofws-developed abs-cbnNEWS.com, 'Brain gain' program for returning OFWs developed, Posted at 04/28/2011
Selected sources for data related to immigration and brain drain

Source for Data for and information regarding population, migration, education and research related to the brain drain phenomenon can be found in the scientific literature which is mostly based on data accumulated by the following national and global organizations:

The Organisation for Economic Co-operation and Development (OECD)-
http://www.oecd.org/migration,
http://www.oecd.org/migration/migrationatthedevelopmentcentre.htm


General business environment information:

Measuring drain brain – selected methodologies

Studies of brain circulation have traditionally drawn on the following methodologies:

1. **Census or migration data** - this source of information enables the measure of education gap between emigrants as compared to the country population.

2. **Surveys of researchers** - researchers are identified by scientific papers citation number, list of top universities in the U.S./world, top students of specific country and then surveyed for their nationality and residence through their life.

3. **CV analysis** - After identifying the pool of subjects of interest a web based work is conducted to reveal the CV and course of work of the selected subjects.

4. **Combination of methods** - Some studies combine several measure methodologies.

---

Conclusions and remarks

Several policies were suggested to deal with the drain brain phenomenon in countries where it is clearly identified as negative.

1. Restrictive policy – usually relevant and associated to non-democratic countries.
2. Compensating policy- activities aimed to "use" the diaspora for the benefit of the country of origin (e.g. short term summer courses and thereby compensate for their "lose").
4. Development policy – investment in economic development, education, infrastructure, health, technology so to decrease the motivation for emigration and increase immigration, return and retention of skilled workers.

The latter option requires a long term commitment of the governmental leadership. The governmental policy should address foreseen global and national trends of education and demand for educated workforce.

For example, issues such as lack of high quality students in exact sciences graduating the Israeli education system and limited industry in fields of highly developed academic research such as life sciences can be addressed by prioritization of grants, scholarships, incentives for school teachers, selective increase in academic positions and establishment of additional institutes in the fields that will contribute most to Israel economic development.

A few of the suggestions for dealing with the Israeli brain drain of researchers and generally educated populations include: establishment of wide database to characterize the problem, increase of the technological education in schools, fostering talented students, establishment of new technological universities, allocation of generous scholarship to fields of priorities, encouragement of immigration and tightening the relations with the Israel scientific diaspora, establishment of industries in identified important fields such as biotechnology and nanotechnology.