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The Roles of Higher Education in a Knowledge Economy

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Introduction

Education and training, and higher education (HE) in particular, are arguably the most important policy areas that governments oversee in the knowledge-driven economy of the 21^{st} Century. Education has become the silver bullet that policymakers fire at a wide range of targets – from enhancing global competitiveness and creating and preserving high-quality jobs, to narrowing wage inequality and promoting innovation.

This short policy paper provides an overview of the multiple roles an HE system can play in a knowledge society and economy; it highlights the key role of creating and sustaining high-skill ecosystems (HSEs); it then examines the dramatic expansion of HE in the UK, and the issues that, in preparing its workforce for the knowledge economy, still remain for the UK to be world-class. The UK's experience is then compared with two different case studies of the role of HE in HSEs and economic development: Singapore and India. It concludes by exploring conclusions and lessons for policymakers.

Roles of Higher Education in a Knowledge Economy

Higher education institutions (HEIs) have traditionally played two vital roles in society and the economy: education and research. Universities educate the brightest young people to prepare them to be informed citizens, to have successful careers, and eventually to assume leadership roles in for-profit, non-profit, and government organizations; their faculties produce new knowledge that informs the education of future generations and underpins technological progress. As the global economy has become more knowledge-based, a ‘third stream’ of activities has been added to these traditional roles: outreach to the community and companies, and technology transfer to help stimulate economic development and a prosperous society. The UK Government, like its counterparts in many other countries, has focused recent attention on ways to enhance the flow of benefits from this third stream (Roberts Report, HMT, 2002).

In addition to balancing these three roles, HEIs are making a variety of other contributions to the knowledge economy. Below are a few interesting examples of new roles.

HE as provider of lifelong learning

The rate of change in technology and the organization of work means that providing a strong educational foundation for young people to begin their careers is no longer sufficient. Individuals need the opportunity to update their skills and/or retrain for new careers throughout their working lives. The UK was a pioneer in the provision of opportunities for lifelong learning through HE with the creation of the Open University (OU) in 1970. As technology has evolved, the OU has adapted to provide millions of adults, unable to access full-time, residential study, with easy, affordable access to high-quality HE. Meanwhile, a growing percentage of students across the HE sector are adults in work who missed out on HE, or are returning to augment or change their career paths.

HE as retirement community

The improvements in public health and medicine have led to a major increase in life expectancy and a rapidly ageing population throughout the advanced industrial countries. Individuals living longer and healthier lives are looking for retirement options which provide stimulation for their minds as well as opportunities for good weather and leisure activities. This has led to the development of a number of over-50s and retirement communities in close proximity to HEIs in temperate climates.

HE as a cultural hub

Richard Florida (2002) has demonstrated the vital role that the "creative class" plays in creating vibrant cities that are the main generators of wealth in the 21st Century. The scientists, engineers, and professionals that form the core of this workforce are attracted to areas where artists, musicians, designers, writers, and other members of the creative class live and work. At the core of almost all of these cultural centers are thriving universities that serve as a venue for creativity and community building.

HE as anchor tenant for economic redevelopment

Central to efforts to grow the 'third stream' has been the location of science and technology parks next to universities, so as to provide a venue for high-tech spinout companies. In addition, HE leaders and urban planners are thinking creatively about how

HEIs can be used as anchor tenants to help redevelop some of the most impoverished inner cities. Columbia University in New York and the University of Southern California in Los Angeles are two successful examples of major redevelopment efforts that have been driven by leading universities. More recently, Newark, NJ has announced an $83 million project which will move the Business School for Rutgers, the State University of New Jersey, to a large office building that was recently vacated by a major telecommunications firm on the outskirts of one of the poorest areas of the city, to try to stimulate the area's resurgence. The project includes not only the offices and classrooms for the Business School, but housing for students, staff, and faculty. Restaurants and service providers catering for this desirable clientele are following, along with other corporate tenants who believe they will benefit from co-location with a business school. The scale of these redevelopment efforts in the US, however, is dwarfed by what is now occurring in China, where whole districts of major cities have been leveled, and their inhabitants relocated, to create new college towns designed to emulate the areas surrounding leading Western universities.

HE as the focal point for a High-Skill Ecosystem

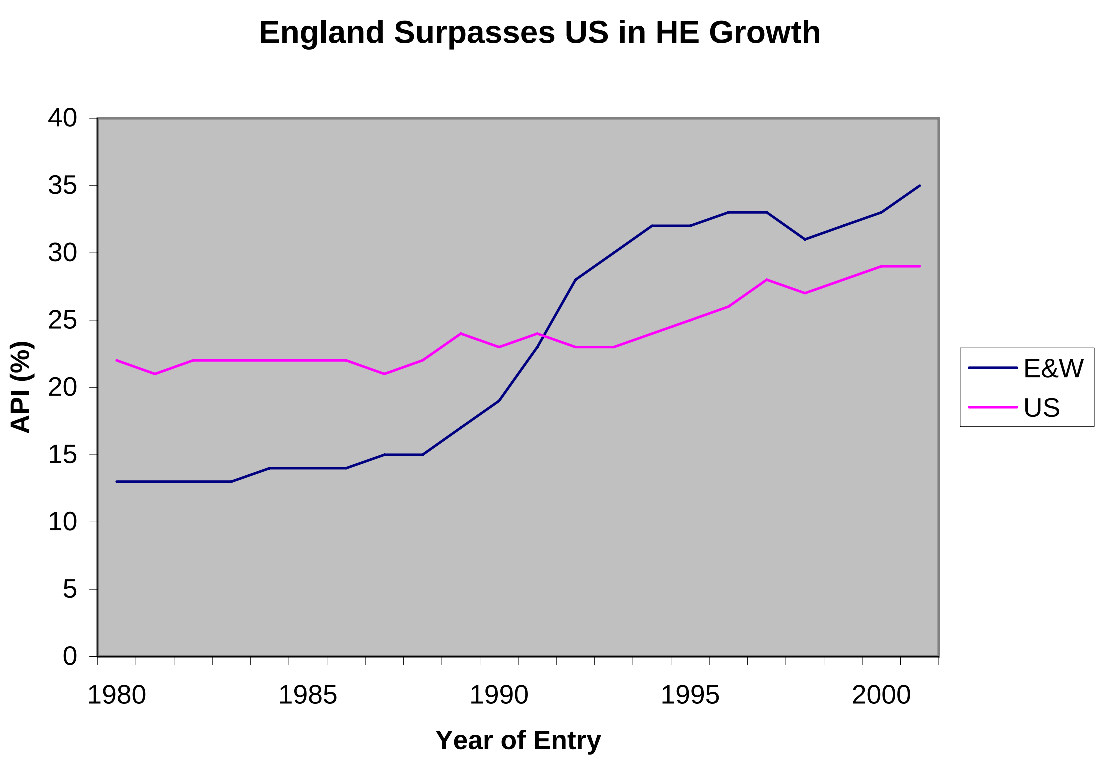
A high-skill ecosystem (HSE) consists of a dense cluster of knowledge-driven enterprises that share many of the characteristics of naturally occurring biological ecosystems (Finegold, 1999). Prominent examples are Silicon Valley, the City of London, and the biotech clusters of Cambridge, Massachusetts and San Diego, California. The modern heirs to the industrial districts described by Alfred Marshall, these HSEs are similar in four respects to natural ecosystems (HEIs may play a prominent role in each of these four elements):

1) providing the research that acts as a *catalyst* for the creation and growth of the cluster;
2) training the human capital that, along with venture capital, provides the *nourishment* to sustain the growth of high-risk enterprises within the HSE;
3) constructing the science or technology parks and laboratories that are part of the *supportive environment* needed to incubate high-tech start-ups, and attract investment from multinational enterprises which benefit from close proximity to the generators of new innovation;
4) helping to foster the *interconnectedness* among the many actors in the HSE, and between them and the wider global economy, through alumni networks, scientific advisory boards, and providing an independent, non-profit forum for the sharing of non-competitive information.

The British Higher Education Miracle

Much has been written about the weaknesses of the British education and training (ET) system and the impact this has had on British economic performance (Finegold and Soskice 1988; The Leitch Interim Report 2005). Sometimes lost in the focus on ET problems, however, is the tremendous and very rapid progress that Britain has made in expanding its HE system. In a single generation, Britain has gone from an elite HE system, where just over 10% of young people were continuing to HE in the mid-1980s, to today, where over 43% of young people are participating in HE, with roughly 30% getting a degree. This dramatic growth has come at a time when the world leader in HE provision -- the United States -- has seen only a negligible increase in the percentage of young people getting a degree (which is entirely accounted for by greater female HE participation),[1] enabling Britain to pass the US in the flow of new graduates as a percentage of the population (see Figure 1). And Britain has managed to achieve this large growth in graduates while maintaining relatively low attrition rates and low costs per-pupil. At the same time, the returns to individuals on participating in HE have remained high, and the unemployment rate for graduates has stayed low.

Figure 1



Several factors help account for Britain's HE growth, including:

[1] Nearly two-thirds of young people take some college courses in the US, but many either drop out or are in community colleges where they obtain an associate's degree.

- the reform of the school examination system: O-levels, designed to ration the number of 16 year-olds continuing in education, were replaced by GCSEs, which measure what young people have attained by the end of compulsory schooling;
- the diversification of provision for those seeking to remain in education after 16, to encourage more young people to qualify for HE;
- merging the polytechnics and traditional universities into a unified HE sector, thereby raising the status of the newer institutions;
- encouraging universities to grow and compete for students by channeling funding to those institutions that most cost-effectively increased their places for graduates;
- expanding the resources available for HE by adopting the Australian model: introducing student tuition fees, while, to avoid having financial resources determine whether young people attend HE, replacing upfront payments with a graduate tax that is paid back only after an individual is earning more than the national average;
- taking advantage of demographic changes in the 1990s, specifically, a sharp drop in the number of young people, which enabled a significant increase in the percentage of young people staying on in HE with a smaller growth in the number of places;

- the collapse of the youth labour market, with the decline in traditional apprenticeships and other routes, such as accounting, that had offered young people high-paying alternatives to HE.

Despite its notable success in growing the supply of graduates, Britain still has a number of issues to deal with if it is to put in place a world-class system for the whole of its workforce (Leitch Review Final Report, 2006). Among the most significant are:

- what to do for the 70% of the workforce of 2020 that have already left the full-time ET system and missed out on the dramatic HE expansion. For example, how to make it easier and more attractive for more people with full-time jobs to return to HE to get their degree part-time or through distance learning;
- what to provide for the "other half" of each youth cohort which is not participating in HE; in particular, how to reduce the relatively high percentage of 16 year-olds who leave school and do not continue in any formal ET;
- how to improve the level of, and demand for, intermediate skills (craft and technicians) vital to retain Britain's small remaining manufacturing and high-tech base;
- how to focus attention on the most advanced education provision (Level 5 skills) and to encourage and retain some of the most academically able young people to pursue careers in higher education.

Singapore

Like many Asian countries, Singapore has set its sights on developing a world-class biotechnology industry (Shahi 2004). The Government's biotechnology initiatives began in the 1980s, but only recently has it signaled its intention to make the biomedical industry the fourth pillar of the economy, with a major investment of resources (Arnold 2003). Biotechnology was given strong impetus as the government realized the risk of over-dependence on information technology (IT) and sought to take advantage of growing opportunities created by recent advances in the biosciences.

The HE system has played a crucial role in the Singapore government's efforts to develop the city-state into a major biotechnology HSE. Singapore's experience is instructive for the light it throws on a key theoretical and policy issue: to what extent can the development strategy of attracting and leveraging foreign direct investment (FDI) from global multinationals (MNCs), which has worked so well for Singapore in industries like petrochemicals, electronics, and ICT (Wong 2001, 2002), offer an alternative to the reliance on science-driven, dedicated biotechnology firms (DBFs) that has been the common pattern in other countries? Or is the business ecosystem that is needed for the biotechnology industry to thrive so distinctive that a different public policy approach is needed?

Catalysts

As with naturally occurring ecosystems, there is a strong element of historical contingency in how and where high-technology regions are formed (Arthur 1989). To trigger the development of successful high-tech enterprises, these regions require some catalysts, such as innovations produced by basic research or demand from sophisticated customers. The strong positive externalities and high level of risk associated with basic research or the development of new technologies suggest that there is a major role for the government to play in funding these catalytic activities and acting as a lead user (Arrow 1962; Cohen and Fields 1999). The large biotechnology cluster surrounding Washington, DC, for example, is a direct outgrowth of the major Federal Government investment in life science research and the wealth of manpower it drew to the DC area (Feldman and Francis 2003).

As with most aspects of its economy, Singapore's move into the biomedical sciences was strongly driven by the government. It has articulated a vision of turning Singapore into Asia's premier hub for biomedical sciences, with world-class capabilities across the entire value chain, from basic research to clinical trials, product/process development, full-scale manufacturing and healthcare delivery (Biomed-Singapore 2003). Through intensive study of other countries' approaches, it recognized early on that building a successful biomedical industry would be a very long-term project, and that its traditional model of industrial development would need to be modified to fit the distinctive requirements of the biomedical sector.

There are two sections of the government with responsibility for establishing the country as a biomedical science hub: the Agency for Science, Technology and Research (A*STAR), formerly known as the National Science and Technology Board, and the Economic Development Board (EDB). A*STAR has put in place policies, resources, and a research and education architecture intended to build biomedical science competencies internally under the auspices of the Biomedical Research Council. Singapore's first foray into the biomedical sciences sector was through the establishment of the Institute of Molecular and Cellular Biology (IMCB) in 1987 at the National University of Singapore. Other research institutes were subsequently set up between 1996 and 2002, including the Bioinformatics Center, the Genome Institute of Singapore, the Bioprocessing Technology Centre, the Institute of Bioengineering, and Nanotechnology. A*STAR has already invested over S$500 million in these new research centers, with another S$1 billion in funding committed through 2006. Basic research is supported by four types of grants: project grants provide seed-funding for new investigators; program grants support more extensive research programs of established investigators; co-operative grants sponsor inter-disciplinary work; lastly, core competence grants are meant for research centers to develop or strengthen capabilities in areas of strategic importance. A*STAR is chaired by Phillip Yeo who, as chairman of EDB, has overseen the implementation of Singapore's economic development strategy for the last 15 years. As the new chairman of A*STAR, he has been charged with the transformation of Singapore into a biomedical hub within five years.

EDB is responsible for bringing in investments and generating long-term economic value for the country is. In the early 1980s, EDB established a venture capital office in the US to invest in DBFs, to establish networks, and to create global visibility for Singapore among US venture capitalists.[2] The primary objective at that stage was to use venture funding, and the access it provided, to some of the leading first-generation DBFs, so as to learn about the biomedical science industry rather than to attract companies to Singapore. It was only from the late 1990s that EDB began selectively to invest in DBFs that were willing to bring key new technologies and generate higher-value-added research jobs in Singapore. For example, to create one of the most ambitious Singapore biotechnology start-ups, S*Bio, EDB formed a strategic alliance with Chiron by offering a multi-million dollar deal to transfer the US DBF's technology platform to a new drug discovery start-up in Singapore, in which Chiron was then given a significant ownership stake.

Nourishment

Once catalysed, ecosystems require a sustained flow of nutrients – human and financial capital to fuel their growth. The biomedical science industry is very capital-intensive and risky, with most new ventures failing to generate a return on their investment. With no history of home-grown, high-tech companies, Singapore has not developed a community of venture capitalists or other private investors who are knowledgeable about, and interested in, investing in biomedical start-ups. Those investors interested in this sector have tended to put their resources into US firms with more proven track records and lower perceived risk. To fill this investment gap, the Singapore government, through

[2] These include Gilead, Affymetrix, and Lynx.

EDB, has committed an additional S$2 billion to the bioscience area. Half the amount is invested in three bioscience funds: Life Sciences Investments, PharmBio Growth Fund, and Singapore Bio-Innovations, which make investments in local start-ups and Singapore-based joint ventures, and provide financial incentives to attract MNCs to Singapore. Another S$1 billion is set aside to attract from three to five world-class corporate centers of research (EDB, 1999; Saywell, 2001).

Aside from funding, another area essential to fueling the life-science industry is manpower development. Recognizing that developing world-class scientists and having them generate new research breakthroughs takes decades, the Singapore government has developed short-, medium-, and long-term approaches to building the necessary skills. In the short-term, A*STAR has offered generous financial incentives to attract internationally renowned scientists to set up research labs in Singapore. These include: Nobel Prize winner Dr. Sidney Brenner; former director of the US National Cancer Institute Dr. Edison Liu; and premier cancer researcher from Japan Professor Yoshiaki Ito. These foreign biomedical stars are seen as a way to provide immediate credibility to Singapore’s nascent research efforts, and also to serve as a magnet to attract top young scientists to work and train in Singapore. In addition to these star scientists, the government is helping firms recruit experienced scientific and managerial leaders from foreign bioscience firms to develop some of Singapore’s new start-up companies, since there is a lack of local talent with the relevant experience. The medium-term strategy involves sending the top students from Singapore to the leading foreign research universities for graduate science and technology education. The government pays for their education, provided that they return to Singapore when they complete their studies. In the long-term, the government hopes that Singapore's own universities and research institutes, bolstered by alliances with top universities such as Johns Hopkins, MIT, Duke University, Columbia and Indian Institute of Technology, all of which have established a presence in Singapore, can develop their own bioscience manpower to generate the intellectual property for future local start-ups.

Supportive Environment

As in biological ecosystems, there is a need for a supportive rather than a hostile environment, if the population and individual species are to grow. A region or a nation's regulatory and cultural regime may either attract and develop or discourage bioentrepreneurs or existing firms from taking the risks needed to turn scientific innovations into successful businesses. Three characteristics of an environment that supports a biomedical HSE are: a specialized infrastructure; a climate attractive to knowledge workers; regulatory policies that protect IP and support risk-taking. In addition to excellent general infrastructure (efficient transportation, high-speed internet network, a safe and clean city), Singapore has gone one step further by building the Tuas Biomedical Park for bioscience manufacturing, and the Biopolis, an ambitious city within a city that specifically caters to the unique research needs of the biomedical sciences, such as a large vivarium to house the mice essential for pre-clinical studies. Opening its first phase in June 2003, the Biopolis is a S$300 million project with 190 hectares of buildings located near the National University of Singapore. Besides having A*STAR's five biomedical research institutes as the anchor tenants, Biopolis is intended to attract biomedical MNCs, start-ups, and support services such as lawyers and patent agents to locate there. The government hopes that creating such a cluster, which will include plenty of restaurants, social spaces and some living-quarters, will create informal networks for knowledge-sharing and accelerate the growth of a critical mass of biomedical expertise in Singapore.

Singapore also has put in place a regulatory environment that is broadly supportive of biotechnology. The Bioethics Advisory Committee was formed in 2001, at the time of the US stem cell controversy, to develop recommendations on the legal, ethical and social issues of human-biology research. The government accepted the Committee's recommendation that human cloning not be permitted, but doing stem cell research or the use of cloning as a therapeutic tool is to be allowed (Kong 2003). This early and clear legal support for stem-cell research, plus government financial support, has helped Singapore create several stem cell companies, including ES Cell International that hired Alan Colman from Scotland, where he was one of the lead scientists in the cloning of Dolly the sheep. Singapore stem-cell researchers have followed strict international guidelines, which require seeking consent from couples and using only excess embryos from IVF treatment (Chang 2001). Because of this, the US National Institute of Health has allowed the US federal government to fund research that uses Singapore-produced stem cells.

Singapore also offers strong IP protection, a prerequisite for establishing research-based biotechnology firms, and one of the weaknesses of some of its leading potential Asian competitors (especially China and India). But while the general legal framework for IP clearly supports biotechnology development, the way in which IP will be administered within state-funded institutions may not be as favorable. In 2002, A*STAR launched Exploit Technologies, a new vehicle to commercialize IP generated by the national research institutes. It functions as a centralized technology transfer office for IP management, licensing, and commercialization. Centralization of IP ownership runs directly counter to the path the US took with the landmark Bayh-Dole act in 1982, which gave universities the freedom to commercialize federally funded research, and is widely credited with helping kick-start the biotechnology revolution. Retaining central control of IP is to risk stifling creativity, but is more in keeping with the Singapore government's traditionally direct involvement in economic development (Vig 2003).

The absence of risk-taking in Singapore impedes the development of an entrepreneurial culture. It is not possible to make progress in biotechnology and to create new firms without many failures and mistakes, and without a free exchange of ideas among those with different viewpoints; these characteristics are not yet well incorporated into Singapore's culture, as shown in this example from a job interview conducted by a manager at Lilly Systems Biology with a Singapore scientist:

> One standard question we use in US interviews is, "Give me an example where you made a mistake and what you learned from it." A common response [in Singapore] is, "I don't make mistakes." Once, when probing further, I was told, "Yes, I made one mistake: I had a different opinion from my boss and told him." When asked what was the mistake in that,

[the interviewee] said, “I learned not to have another opinion.” This is a true story and he was a PhD.”

Connectivity

To be successful, innovations need more than an initial spark, abundant resources and a supportive environment. R&D-intensive, high-technology-orientated firms need rich, multi-layered, and cross-border networks to be successful (Cooke, 2003; Wolter, 2002). As in the IP area, the government appears to exercise strong, centralized control over most aspects of Singapore’s biomedical industry development. Characteristic of the top-down, government-led strategy for industrial development that it has successfully used in the past, the Singapore Government has orchestrated the entire biomedical development effort, starting with the establishment of a Life-Science Ministerial Committee (chaired by a deputy prime minister) to oversee long-term strategy formulation, followed by instituting a highly coordinated implementation approach involving EDB, A*STAR, and the Ministries of Education, Manpower, and Health. While this top-down, coordinated approach has worked well in the past to accelerate the development of competencies in new industrial clusters (e.g. the hard-disk-drive industry (see Wong 2001), and may be particularly advantageous in terms of long-term resource development for an industry like biotechnology (e.g. manpower development), it runs the risk of stifling alternative approaches and marginalizing non-conforming groups. In particular, a company that is outside of this community may find it difficult to secure resources, such as funding. This may have hampered the development of independent biomedical start-ups, because very little funding exists that is not of government origin.

Another area of weakness is that informal cooperation between firms and research institutes has been relatively limited so far. For example, one firm we interviewed mentioned broaching the possibility of collaboration with a research institute in the same building, beginning with a request to use an expensive piece of equipment in a lab that had excess capacity. It was unable to interest the lab in partnering, however. Several factors may explain this. First, other than IMCB, the institutes are very new, and focused on getting their research programs up and running. In addition, the academic culture of research institutes focuses on basic research and publishing and the researchers are relatively well funded by the government; thus the advantages of collaboration with firms, such as securing additional research funding or the opportunity to spin out a company, are not a high priority for the research staff. Finally, as noted above, the culture among research scientists and managers in Singapore appears to be risk-averse; consequently, collaboration and sharing of information may be perceived as risky, and inter- and intra-organizational collaborations are not the norm (Stein 2003). For further details on Singapore see: (Finegold, 2004)

India

At first glance, India represents a potential challenge for the HSE framework. It has created 400 biotech firms, most of them in the last 15 years; this is in spite of the absence of many of the supposed prerequisites for the success of the Silicon Valley model of high-tech clusters found in the US and other non-coordinated market economies, namely, large government investment in basic research leading to patented research breakthroughs that are then commercialized using venture capital (Finegold, Shakti and Shahi 2004). Potentially, India represents an alternative path for creating a biotech HSE better suited to developing nations. While India differs dramatically from the US in the specifics of biotech development patterns, our research indicates that it has developed functional equivalents to the key elements of HSE, and these have enabled successful biotech enterprises to grow.

India's many highly qualified, English-speaking university graduates have taken advantage of the internet to become part of the global value chain in the bioscience industry. Emulating the success of their software and call center counterparts, India's bioentrepreneurs have pioneered the research process outsourcing (RPO) business model. These firms use the talents and global experience of the well-educated workforce to provide a wide range of fast, responsive, relatively low-cost research services to bioscience multinationals. This enables Indian start-ups to become profitable quickly, while building their own internal capabilities and external relationships. For more details on the Indian case: (Finegold, 2005)

While India's rapid success in entering the world's highest-skill industry is a hopeful sign for developing economies that invest in their own HE sectors, its experience also provides some cautions for policymakers in other nations. The growth in demand for

India's well-trained, relatively low-cost graduates has already outstripped the supply available from what will soon be the world's most populous nation. As a consequence, labour turnover rates are high, labour costs are rising rapidly, and some of India's leading employers, such as Infosys, are already offshoring thousands of high-skilled jobs to other nations, such as Paraguay.

The greater issue for India is the political unrest the country is facing as a result of the education system's inability to meet the growing demand from individuals for access to higher education and the unprecedented economic opportunities it can provide. A majority of India's rural population still do not enter secondary education, much less university. But the costs of providing universal secondary education are currently far beyond the means of the Indian Government. Instead, the government has altered higher education admissions policies, setting aside nearly half (47%) of all places for lower caste and socio-economically disadvantaged groups, up from the previous 20% quota. The large and growing middle class has reacted with dismay to this decision, staging large protests - including public immolations – to try to reverse this sharp cut in the HE slots for which they can compete.

Conclusions and Lessons for Policymakers

Higher education is likely to continue to play many increasingly important roles for countries competing in the 21st Century knowledge economy. Each government, however, will need to shape its HE policies to the particular circumstances and institutional context of its nation.

British policymakers start with a number of advantages when considering the options for the future of their HE systems and the roles they can play in society and economic development. Among these are:

- the dramatic success in raising HE participation with relatively low attrition rates;
- the ability of British universities to attract, from around the world, many of the brightest students, who provide additional revenue (through higher international student fees) and a supply of talent that can help create new high-tech enterprises in Britain, or serve as partners for British businesses operating globally;
- operating in English, which is likely to continue to be the global business language for decades to come;
- the Government's ability to treat HE as a long-term investment, as witnessed by the recently completed Leitch Review, charged with developing a skills policy for Britain through 2020, a timeframe rarely considered by many of its competitors;
- the state's capacity to implement policies quickly once decisions have been reached, as evidenced by the relatively rapid, systemic reform of the almost exclusively public HE system.

While it is beyond the scope of this paper to provide a comprehensive analysis of Britain's HE policies, I will conclude by suggesting some options policymakers may wish to consider to address the questions identified earlier.

Recognizing the Tensions Among the Different Roles HE Plays -- One of the greatest challenges facing actors within the HE system is how to satisfy simultaneously the multiple roles that their institutions are being asked to play. In Britain, universities have dramatically expanded their student intake without a proportionate increase in faculty; at the same time, the Research Assessment Exercise has led to much greater pressure on faculty to publish, and the emphasis on third-stream activities has encouraged much greater emphasis on commercialization of university research. The result has been an intensified workload and competing demands on faculty, with an accompanying decline in the attractiveness of academic careers relative to other, higher-paying options for the most academically able young people. To avoid losing the next generation of professors to burn out or the 'brain drain', Britain should consider establishing research fellowships similar to those operating in Canada and Australia: these reward the top faculty in all disciplines with enhanced salary, personal and flexible research funding, and greater time for research.

Developing a Level 5 Policy – As more advanced industrial nations establish mass HE systems, the basis for competitive advantage is shifting from which countries have the highest-quality knowledge workers to which can generate the most effective knowledge creators. As a consequence, a bachelor's degree is increasingly the minimum qualification for participating in the knowledge economy, while advanced degrees are needed to prepare individuals for the professions or to generate new research breakthroughs. Yet the British Government does not pay close attention to this distinction, setting broad targets for HE participation and Level 4 (first degree) qualifications and above, while failing to track systematically the supply of individuals obtaining advanced degrees, and what types of degrees they are attaining. Greater policy focus is needed to make Britain a world leader in the provision of advanced degrees. Development of an advanced skills policy, however, may not entail large additional state resources, as the returns on this investment – at least for professional degrees – are among the highest for individuals.

Expanding Access for Non-Traditional Students – The growth in young people entering HE in England has stalled at around 43% of the youth cohort, while Scotland, after reaching a higher level, has seen a recent decline in HE participation rates. This suggests that the Government will not reach its target of 50% of the age group participating in HE through existing routes. At the same time, much of the existing adult workforce missed out on the opportunity for HE when they were completing full-time education. Britain should build on the pioneering success of the Open University and further expand access for adults to obtain initial or additional HE qualifications, or to retrain for new occupations. The resources to encourage adult participation in HE could come from a three-way partnership: individuals devoting their time and energy to completing further qualifications on top of full-time employment; firms reimbursing the tuition costs for those individuals making good academic progress (a common policy among large US employers); the government subsidizing the retraining of the unemployed or those who did not complete a degree, and providing a tax incentive for firms that offer broad-based tuition reimbursement to their workforce modeled on the R&D tax credit.

Addressing Skill Demand as well as Supply – The sustained high rates of return to individuals who complete a degree suggests that demand for university graduates has been keeping pace with the rapidly expanding supply. The concern for Britain is that this upgrading of the skill base does not appear to have translated into levels of productivity comparable to its main competitors. In part, this reflects the fact that, while the flow of new graduates has improved, the change is much more gradual in the overall stock of existing skills in the workforce, where Britain still suffers from a deficit relative to the US, France, and other leading economies. It also reflects the very high concentration of British employment in the service sector, where productivity growth tends to be slower and harder to measure. But at least some of the problem appears to be the failure of British management to restructure their organizations and invest in research to take full advantage of new technologies and a more educated workforce. Recent comparisons by Michael Porter and others suggest that too many British firms are still competing on the basis of cost, rather than innovation, speed, and quality, a strategy that is likely to be difficult to sustain against growing pressure from China and other low-cost competitors. To help companies restructure into high-performance organizations that will empower and gain full value from an expanded graduate workforce, Britain needs to bring together its many programs into a comprehensive package.

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