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2. THE ROLE OF ELITE UNIVERSITIES IN NATIONAL HIGHER EDUCATION AND RESEARCH SYSTEMS, AND THE CHALLENGES OF PROSECUTING THE CASE FOR CONCENTRATING PUBLIC INVESTMENT IN THEIR DEVELOPMENT IN AUSTRALIA[1]

INTRODUCTION

Around the world there is an interest on the part of governments in the capacity and performance of elite research universities within national higher education and innovation systems (Salmi, 2009). However, the level of interest and initiative varies, and for many countries, the motives are mixed and the measures vexed (Altbach and Balan, 2007).

Some countries (notably England and the United States) have well-established elite (talent rich, asset deep, prestigious) universities and research institutes, founded centuries ago in the origins of their higher education and research systems, currently performing at international heights. Other countries (e.g. China, Germany, Japan) are looking to promote some among their existing (including longstanding) institutions to become (again in some cases) world leaders. A few are appraising the international standing of their leading national universities, with some (e.g. Malaysia, India, Vietnam) building at the pinnacle of their national systems new institutions designed to become internationally reputable[2]. Elsewhere and mainly in second world economies (e.g. Australia, Canada, New Zealand, South Africa), a number of institutions are seeking to break out from national (or provincial) policy and financing frameworks that have levelled-down the performance peaks by distributing the available resources widely, in an effort to raise (or not let diminish in a period of participation growth) overall systemic quality, or for egalitarian objectives or, as in the case of South Africa, for historical redress of systemic discrimination. Another set of countries that have previously not participated at the forefront of knowledge advancement (e.g. in Latin America, and Africa) seek now to do so, alongside some former centres of intellectual and cultural distinction (and some newcomers) in the Middle East and former Eastern Bloc countries.

The divergent approaches being adopted between and within countries may reflect the interaction of several factors, including the economic strength and development position of nations, the balance of responsibilities between national and provincial jurisdictions, the general quality of their higher education systems

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and the international standing of their leading universities, and the political trade-offs that are necessary within specific national contexts, particularly around issues of equity. Hence, in some countries the state may be seen to reinforce institutional positioning strategies, and in a few cases may push for strengthening, whereas in other countries the state plays a retarding role, dampening institutional differentiation and holding back the aspirations of the national elite, or adopting the stance that the elite will prosper irrespective of the national policy settings.

A major purpose of the concentrating countries is to step up their international economic competitiveness through increased national innovativeness - not only to adopt and adapt the product of innovations developed elsewhere, but also to generate the breakthroughs that provide the foundations of competitive advantage. At the core of the interest in the relative strength of nationally elite universities, is an understanding that the bar has been raised for participation internationally in the advancement of knowledge at a level sufficient to sustain "national" economic competitiveness, or at least boost the performance of enterprises or sectors within nations. That understanding is based on some real lifters of a higher bar including the increasing complexity of research problems being addressed across disciplines on large scales with the aid of sophisticated and powerful technologies, the associated rising threshold of input costs, and the intensifying competition for intellectual talent, particularly in the aggregations often needed for big scientific breakthroughs[3].

Often the issues associated with raising the performance peaks of the leading universities in a nation are being played out amid unsettled higher education policy and financing frameworks, including disputation over the sharing of costs and degrees of tuition pricing flexibility, alongside the accommodation of changes in the volume of student participation, whether to undertake expansion in some regions or contraction in others. And these contests are taking place in a broader context of rising claims for public expenditures in health, environment, security and other areas, recently complicated in several countries by the imperative to rein in aggregate government spending over the future medium term, as a means of moving back to fiscal balance following the economic stimulus measures introduced during the 2008–09 global financial crisis.

The issues can be hotly contested. In circumstances of expanding tertiary education participation, for instance, central funders have to make broad trade-offs between scale and quality. In this context, skewed distributions for research-related functions can be seen to divert available resources, without guaranteed or proportional returns, and reduce the scope for achieving reasonable education-related compromises. With regard to the allocation of public funds for university research, the trade-offs are more narrowly contested, and the apparent tendency is for competition in a more market-like, yet prestige-driven environment, so as to emulate research universities (Van Vught, 2008). On the one hand, given the inability of any nation to afford an entire system of "world-class research universities", emulation results in second rate imitation, where efforts are focused more on improving reputation than performance, and this diverts institutions from developing the programmatic diversity needed to accommodate varying student needs and circumstances (Meek, 2000).

On the other hand, the very suggestion of greater selectivity and concentration in the funding of university research meets with strong opposition from those institutions which do not see themselves as benefitting. Although this is chiefly a battle among contending higher education institutions, such opposition can be potent as, in real politics, the relative "losers" (in reputational relegation, even if they are not financially disadvantaged) are by definition more numerous than the probable "winners" and are likely to be located in politically sensitive electorates[4]. Regardless of the complaints of governments about the perils of provider capture in prestige-driven higher education markets, their own actions can be captured by political demands to protect weak providers.

Consequently, notwithstanding demand pulls, including expectations of local communities for universities to serve their needs, governments can be reluctant to promote or support the strengthening of universities already seen to be relatively strong in the national arena, even if by various comparisons they are not strong enough on the international stage. For their part, the universities that understand how much they need to increase their capacity and raise their performance in order to stay with the international pace-setters, also know they cannot stand by idly wishing for a government to gather courage, because elsewhere others are not waiting for them to catch up.

This paper considers the policy tensions for governments and explores options for research universities. First, the paper scans the changing context for higher education and university research. Second, it reviews the traditional roles of elite universities and outlines the main characteristics of contemporary elite universities and expectations about their contributions. Third, there is consideration of the arguments for and against the main policy drivers of elite outcomes: system diversification, institutional differentiation and investment concentration. Finally, the options for government policy relating to system structure and steering mechanisms, and for university positioning are outlined.

THE CHANGING CONTEXT FOR HIGHER EDUCATION AND UNIVERSITY RESEARCH

Figure 1 depicts the range of relations that universities might have within national contexts (Clark, 1983). This is to regard higher education institutions as embedded in common frameworks of societal expectations, regulatory frameworks, and co-operative or competitive linkages (Guri-Rosenblit, Sebkova and Teichler, 2007). Notionally, the locus of power can reside in any of the four corner forces. The academy is here understood loosely as the forums through which scholarly leadership is exercised. The interaction of the academy with the locus of power may shift according to political changes, including through the alliance of different forces, such as state-civil society alliances of the traditional European bent or state-market alliances of the neo-liberal school.

A key point is that the university cannot be self-referenced, not merely because it is not self-sufficient, in that it cannot sustain itself entirely without external support, but also because its core functions require it to be socially interactive in

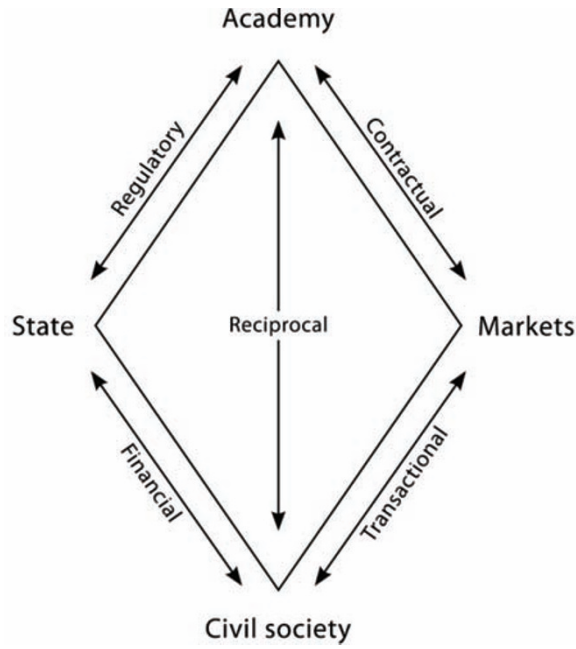

Figure 1. University relations in the national context.

its efforts to make sense of the world. Palfreyman and Tapper (2009) argue, for instance, in relation to Oxbridge that it's its "continuing ability to make itself indispensable to the dominant interests in state and society that accounts for its elevated status in the higher education hierarchy." This reciprocity can be seen from the origins of early western universities in church support[5]. The university has been a resilient institution, accommodating the shift from scholasticism to scientific method in the seventeenth and eighteenth centuries, embracing secular liberal education in the early nineteenth century, and accepting a responsibility to contribute to nation building in the aftermath of the Second World War. In contemporary terms, the relationships tend to be defined more pluralistically and include state-mediated expectations of university relevance to varying labour market and enterprise innovation needs, as a condition of continuing public support.

Various elements of civil society, including businesses and non-governmental organizations, are developing new and direct relations with universities, through joint identification and exploration of problems, community foundation funding of research, direct collaboration in research projects, and joint participation in matters relating to controversial areas of research, such as genetically modified organisms, stem cell research, climate change and research into aspects of terrorism.

Over recent decades, relations between universities and civil society have been mediated increasingly through markets for services, enabled by the state through regulatory and financial mechanisms. A preoccupation with economic contributions

has reinforced transactional relations and controls and tended to diminish the role of universities as social and cultural institutions that discover, transmit and preserve knowledge of value beyond the limits of immediate utility or preference. At the same time, universities have developed enlarged roles through the accumulation of multiple functions from state directives, market opportunities and social expectations.

Instrumentalist purposes of the state and consumerist interests of students appear to have both widened and narrowed the social expectations of universities. In this regard, contemporary universities are expected to enrol and graduate a larger and more diverse student mix in an expanding range of fields of study, so as to meet an increasing variety of occupational requirements, undertake research directed towards "national priorities" and demonstrable "end-user benefits", with more exacting public accountability for the cost-effective use of resources, and satisfy larger expectations of tangible returns from investment in higher education - individual, regional and national returns.

Trends in public policy, including applications of "new public management" in a context of fiscal parsimony, prioritize competition as a driver of increased responsiveness of university supply to changing demand (student demand, labour market demand, and enterprise demand for applicable knowledge and know-how). Universities, however resilient they may be as institutional forms, necessarily shape themselves to survive in the conditions of their operating environment. But the political-economic environment for universities has not been evolutionary. Rather it has been subject to sudden shifts in sources of finance, alongside ambiguous policy intentions and inconsistent incentives. Indeed, the policy tendencies of governments present a set of challenges in themselves and several common contemporary tendencies can be identified, each of them cumulatively adding layers of homogenising pressure.

The first tendency is for governments to fund teaching and research at less than actual costs. As a consequence, there are risks to quality as evidenced by increasing student teacher ratios and class sizes, and pressures on institutions to diversify their sources of income. The greatest penalties are imposed on those institutions that win most of the competitive research funding. The result is that projects are pared back and infrastructure investments are deferred, including essential capital works to bring facilities up to standards required by health and safety regulators of scientific research. Moreover, internal cross subsidization of research from funds for teaching and infrastructure erodes the institution's fabric and reduces its attractiveness in the competition for talent.

The second policy tendency is associated with a shift from elite to mass to "post-mass" or "near-universal" tertiary education participation. Public concerns about the maintenance of academic standards are raised in the communications media by parents and others, and governments are obliged to respond. Governments tend to regard the tertiary education sphere much as they regard the secondary schooling sphere: accountability for results; efficiency and productivity; quality assurance of minimum standards; an inclination to homogenization with little concern for different provider purposes. Areas traditionally regarded as matters of university autonomy are seen to be open for governments to intervene.

The third tendency, which flows from the sound policy principle of transparency and openness in decision making about the allocation of resources, is that policies and procedures are and are seen to be even-handed and non-discriminatory. A one-size-fits-all approach can be seen in the use of normative financing, such as through formulaic schemes, where all institutions receive the same unit of resource for similar activities, such as for teaching in a particular field of study. Qualitative differences are not taken into account normally, partly because they are not readily measurable or their assessment is contestable, or there is a reluctance to expose poor performance. Hence, the policy approach creates incentives for sameness (Van Vught, 2008), whereas differentiation requires discrimination, which in turn requires good information and the exercise of judgement.

The boundaries of Figure 1 can be extended to international relations, such as academic research collaboration, competition for international students, intergovernmental agreements, and university contributions to solving global problems. For centuries, international scholarly interactions have been a function of universities. However, the nature of such interactions has changed over the last couple of decades, owing to major developments in transport, communications and technology, but also driven by new purposes, including the desire of national governments to form ties internationally through trade, investment and knowledge flows, and the desire of university leaders to build scholarly relations for institutional strategic positioning. In the latter case, where universities seek to fulfil their missions in the international (and in some respects global) context, they move outside the boundaries of their national policies and regulations, and may not feel bound by them.

Ambiguity is the dominant contemporary context for universities in most countries. The ambiguities derive in part from a "turbulent, volatile and contradictory" operating environment (Scott, 2005). Uncertainties range across several dimensions, including levels and forms of demand for higher education; kinds and types of supply of higher education; influences of innovations in technology and communications on teaching and learning and research; amounts and conditions of public funding; incentives and disincentives for private funding and supply of higher education; national regulatory regimens and their interactions with international developments; expectations of university contributions and impacts socially, economically and environmentally; and the relationships between higher education and university research.

Figure 2 retains the sets of national relations discussed above but situates them in the international context, identifying the major drivers that have implications beyond national boundaries. It is necessary to see national developments within this wider international context, not least because a nation may be making considerable progress against the circumstances of its past, yet falling further behind other countries, whose efforts are much greater. At the same time, the new international dynamics pose new challenges and opportunities. Nevertheless, the context is ambiguous in several respects, in that there are conflicting signals and significant information (and communication) gaps; contradictions in the apparent developments; and there are disagreements about their manifestations, directions and causes. Hence the following tendencies are tendered (tendentiously) for consideration.

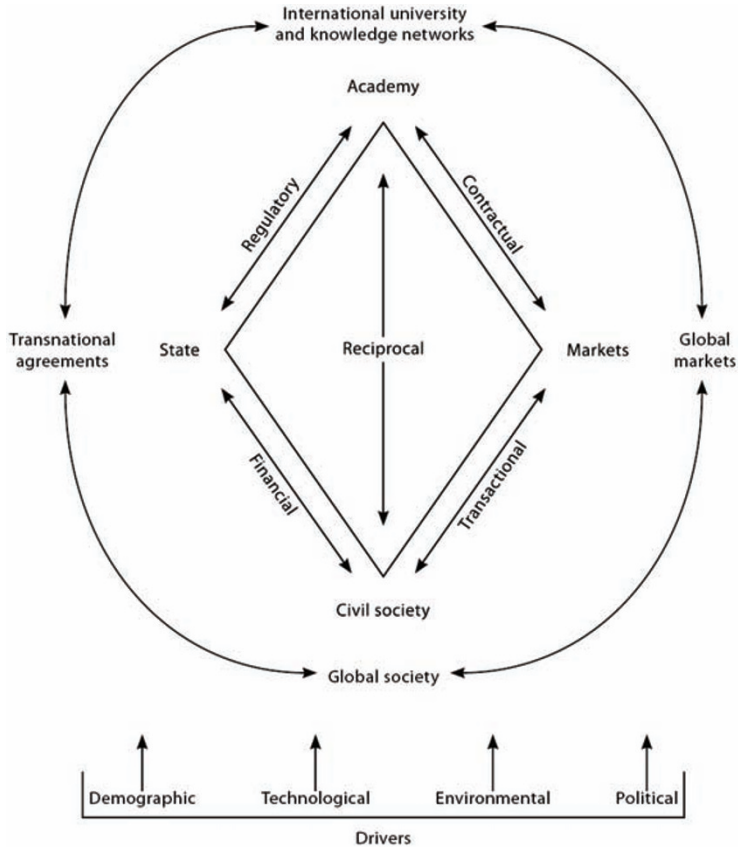

Figure 2. University relations in world context.

There is a Coincidence of Greater Community Needs, Greater Technical Capacities, and Greater Social Expectations (but not Necessarily Greater Resources)

Complex contemporary challenges require larger scale modelling and cross-disciplinary approaches to solving global problems, such as those relating to the world environment, the settlement and movement of people, pandemics, and terrorism. As the Association of Universities and Colleges of Canada has put it: "technological advances, which facilitate the development and exchange of knowledge and the generation and processing of research data, have created greater expectations that an increasingly wide range of problems can be researched and addressed in a more holistic fashion and at an accelerated pace" (Association of Universities and Colleges of Canada, 2008). As society becomes more knowledgeable, higher education comes under pressure to expand the kinds and types of knowledge it provides and to diversify the criteria by which it is judged (Bleiklie and Bvrkjeflot, 2002). The expectations are reciprocal, in that universities need to be resourced adequately

to develop the capabilities they need to play the roles expected. However, there are limits to the economic capacity of nations to meet the expectations of all universities, and priorities need to be established. No single university can meet all the expectations equally well, and it becomes necessary to promote institutional specialization in a flexible and complementary way within a national system.

Demographic Changes will Increase the Global Competition for Talent, Food, Water and Energy, while Requiring New Efficiencies in Education and Research in Developed and Developing Economies

The world's population is projected to grow from some 6.8 billion in 2009 to around 8 billion by 2025 (National Intelligence Council, 2008), with Asia and Africa accounting for the bulk of the growth. Population ageing in most of the advanced economies will coincide with youth bulges in less developed nations, predominantly in sub-Saharan Africa, the Middle East, the Caucasus and northern parts of South Asia. Through investments in education, the latter may be able to develop skilled worker bulges (*ibid*). However, the intensifying international competition for talent may lead to net drain from the poorer nations, exacerbating inequalities in development capacity. Given the population-driven growth in demand for food, water, energy and income in the third world, at a time of global environmental stress, the consequences could be disastrous. There arises a reciprocal responsibility on the part of elite institutions in advanced economies that grow stronger at the expense of weaker contributors, to assist in capacity building in the developing world.

Within developed economies where population ageing makes increasing claims on public and private resources, and where continuing investment in education, training and research is needed for underpinning the innovation necessary to sustain economic growth, there are likely to be rising expectations of improvements in learning productivity and the cost-effectiveness of research. Such expectations may give rise to incentives for specialization and collaboration, including through competitive and structural measures and performance-based funding.

Long-Term Research (both Basic and Applied) is Moving out of Enterprises and into Universities and Clusters of Universities with Enterprises.

In several industries, increasing pressure on companies to obtain revenue streams quickly, has led to declines or closures of research laboratories with capabilities for long-term research, with examples including Bell Labs, Lucent, Hitachi, HP, Exxon, IBM Research, RCA, GE Research, GM and Ford Scientific, and Westinghouse Research[6]. The short-term horizon of research in most of the remaining company labs effectively puts an end to their basic research (Natelson, 2007). At the same time, pharmaceutical corporations are maintaining significant in-house R&D capacity, whilst linking with universities and medical research institutes, globally. Leading pharmaceutical and biotech companies have undergone major R&D restructuring over the last five years, involving a consolidation of efforts through numerous acquisitions, both intra-pharmaceutical as well as purchases of biotechs by big pharmaceutical. Pharmaceutical companies are narrowing the focus of their research and development

units through a more strategic concentration on key chronic illnesses. They are also adopting a focused, streamlined global approach, which is increasingly reliant on offshore strategic partnerships, academic collaboration and outsourcing to established networks of scientific expertise (Pharmaceuticals Asia Product News, 2009).

For universities to pick up the slack or participate in the new networks, it is necessary for them to invest in major facilities and equipment, and to fund inter-disciplinary research teams over blocks of time that exceed the normal 3–5 year terms of conventional national research funding schemes. In effect, there is competition between nations in making themselves attractive to the footloose R&D investment of corporations. Nations need to weigh up, prioritize and concentrate their own expenditures to achieve competitive scale and quality, without putting all their eggs in one basket. Moreover, it is prudent to allow some opportunistic investment in yet-to-be-realized areas.

Higher Education Graduates Need to be Prepared as Generalists and Specialists for National Labour Markets and Global Citizenship

The earlier functional specialization of higher education systems, involving a diversity of institutional types, can be seen to reflect the needs of occupationally segmented labour markets, particularly when skilled workers were required for clearly specialized roles (Bleiklie, 2007). Demand for specialized graduates continues in traditional professional fields (e.g. medicine, engineering), in new graduate occupations (e.g. paramedical, marketing), and in niche areas of specialization within parts of the services sector (e.g. sports, hospitality) (De Weert, 2009). However, developments in management and administration across various industries require a broad set of generic competencies including team work skills, communication and language skills, project management skills, adaptability, problem solving, and creativity. Academic competence interacts with these other competencies, through disciplinary and cross-disciplinary knowledge and understandings, reasoning, analytical and reflective abilities.

Future higher education graduates need to be able to deal with complex challenges facing the world and have the requisite skills and understandings to exercise global options for gaining employment anywhere they choose. Ramsden (2008) sees the need to improve the preparation of future graduates, including through curriculum overhaul: “we require curricula that are transdisciplinary, that extend students to their limits, that develop skills of inquiry and research, and that are imbued with international perspectives” (Ramsden, 2008). Ramsden suggests that only such qualities will ensure graduates who are able to “embrace complexity, climate change, different forms of citizenship, and different ways of understanding individuality and co-operation”.

Horizontal Differences among Higher Education Institutions are Blurring, and Vertical Differences are becoming more Stratified

More generic occupational competencies, greater upskilling of the workforce involving people re-entering education at varying points from different backgrounds, and

cross-national mobility of students, are requiring more porous boundaries between institutional types and programmes in higher education. Increasing vertical divergences develop as the horizontal diversity reduces, giving rise to stratified systems, and "the realisation that success at the top of the system is determined in the international league of champions not the national league" (Teichler, 2006). However, concerns to provide equitable access require ladders enabling student mobility within a national system, through articulated programmes, credit transfer arrangements, and collaborative initiatives.

Higher Education Institutions are Becoming Overloaded with Multiple Missions

Universities are facing multiple expectations: producing knowledge and workforce for the needs of modern society, playing a central part in the innovation system, contributing to regional development, increasing social inclusion, and participating in the development of solutions to global problems. Governments tend to translate these expectations into roles and responsibilities, backed by specific-purpose funding or conditionality attaching to general grants. In the UK, for instance, the injection of "third stream funding" has given greater prominence to the development of university relations directly with civil society, through "engagement" as a reciprocal benefit, as distinct from "outreach" as a supply-driven "service" (Brink, 2009). Universities themselves take on wider activities, partly through societal pressure and partly in response to market opportunities. The accumulation of missions blurs strategic vision and can distract from core business and thus it becomes necessary to reassess and clarify mission goals and priorities.

Leading Performance Requires Group Capacity as Well as Individual Brilliance

In higher education and research, as in elite sports (whether golf, tennis, cycling or motor racing), individual excellence is necessary, but not sufficient, for success in the contemporary competitive environment. Aided by high technology and communications capacity, fields such as nanotechnology, biosciences, geosciences and environmental sciences, require major investments in interdisciplinary centres and related infrastructure. Concurrently with a need for highly creative individuals it is suggested that "big science of the "top-down" type (e.g. genomics and proteomics) is overshadowing individual research" (Arai, 2007). In the quest for innovation it is the ability to marshal resources, including intellectual capability, to achieve "significant advances" ahead of the competition that counts. In this regard, group productivity may be far more important than individual productivity: "scientific recognition is based on group output and the ability to capture significant attention based on quality and quantity of output, rather than output per researcher" (National Board of Employment, Education and Training, 1993).

Mass Higher Education Enables Customization

Enlargement of higher education participation increases the diversity of demand for services, in terms of curriculum content and orientation, study modes, places

and times for learning, and trade-offs between convenience, quality and price. Sophisticated supply technologies, including powerful, ubiquitous computing and networking, allows for a university's teaching and research functions to be distributed in space, and possibly in time (Wulf, 2008). Markets for higher education services can provide a premium for niche services that reflect customer segmentation and the tailoring of programmes to meet the particular needs and circumstances of individual firms, public sector bodies, and groups of learners. The scale and diversity of demand, alongside the capacity of available technologies, allows for varying combinations of physical and virtual provision and, thereby, greater differentiation among providers in their value propositions. In mass higher education systems a significant differentiating feature is the quality of the student university experience that bonds graduates belonging locally, even when they are globally dispersed, especially the capacity of some institutions to provide learning intimacy.

In the Distributed Knowledge Society Universities are Permeable and Stable Organizations

The boundaries between universities and the external world are becoming more permeable, as knowledge is produced and disseminated by multiple players in diverse environments (Nowotny, Scott and Gibbons, 2001). One aspect of increasing porosity relates to education and training, and another relates to research and innovation. With regard to higher education, much depends on the breadth of view taken about purposes and expected outcomes. A broad view would include aptitudes, proficiencies, skills and understandings developed in workplaces and social as well as educational contexts. Issues arise regarding the extent to which education programmes build in or recognize relevant learning experiences outside the formal environment of the university. With regard to research and innovation, much depends on the breadth of view taken about purposes and expected impacts of research, there is increasing collaboration between universities and other public sector and community bodies and private firms, often involving a two-way flow of knowledge and know-how. Research problems may be defined in various contexts, and solved by participants working together in different places and from different perspectives.

Some suggest that this porosity in mass higher education makes a structured national "system" and solid hierarchies out of place, requiring "soft diversity" - more fluid structures, more flexible and adaptable institutional missions - rather than "hard differentiation" (stratification), in which institutions at different levels have different missions. In this view, "increasing research selectivity relates back to neat structured hierarchies in which the position of the elite universities is strengthened" (Scott, 2005). However, while complex interrelations with civil society and markets might make classification of institutions difficult, in terms of simple, unambiguous functional or hierarchical principles (Bleiklie and Byrkjeflot, 2002), the extent to which sources of knowledge within innovation systems have become more diverse need not imply any decline in the role of universities as fundamental research centres (Mowery and Sampat, 2005). Not only are more distributed modes of knowledge production and dissemination shifting functions out from universities

to the wider society, universities also are absorbing (selectively or otherwise) the distributed capabilities and connections, thereby functioning on a wider scope. The university must remain relatively stable to continue producing the next generation of researchers and the reproduction of cultural norms (Henkel, 2002). The new challenge is in the global context where the world's leading universities "operate in an environment in which traditional political, linguistic and access boundaries are increasingly porous" (Mohrman, Ma and Baker, 2008). In that environment top universities seek out partners that have distinguishing sets of complementary capabilities.

Competitive Success Requires Strategic Collaboration

Very few institutions have sufficient capacity to compete alone in the contemporary environment in any industry. The most successful organizations collaborate with others, including their competitors, at different points along the supply chain, where they do not have distinctive competitive advantages, and can share common costs or work together to expand the scale of the market (Brandenburger and Nalebuff, 1996). The alliances within the airlines industry illustrate the advantages that accrue to the companies and their customers, through cross-travel and shared services. Advances in communications and technology offer new possibilities for university specializations and course-sharing in cyberspace - global hubs & spokes - along with cross-national institutional alliances. Partner selection involves consideration of multiple factors, including complementary capacities, reputation for reliability, and prestige.

Local Support Sustains Global Standing and Global Connections Advantage Local Communities

Simultaneously, research universities must keep up with the global pace-setters in knowledge advancement, attend to the quality of the student experience, and engage with their local supporting communities. It is the strength of local support that ultimately sustains a university, and it is a responsibility of the university to flow through to the benefit of local communities its advantage of global access to the world's knowledge networks. The means of transfer are numerous and include contributions to public policy consideration, evidence and argument; translation of research to application in practical settings; continuing development of practising professionals; and awareness raising through public communications.

ELITE UNIVERSITIES PAST AND PRESENT

In exploring the role of elite universities in the contemporary context, it is worthwhile to reflect on prior understandings of their roles and on the changing relations between them and the state, markets and civil society.

The predominant Western notion of a university derives from the nineteenth century writings of John Henry Newman in England and Wilhelm von Humboldt

in Germany. In his 1852 essay *The Idea of a University*, Newman saw the university as "a place… in which the intellect may safely range and speculate... where inquiry is pushed forward...discoveries verified and perfected, and...error exposed by the collision of mind with mind" (Newman, 1852). Humboldt envisaged learning as a mutual process between students and teachers within institutional environments, whose characteristic was that "they always treat learning in terms of incompletely-solved problems. They are engaged in a process of continuous inquiry" (Humboldt, 1810). Contemporary research universities have evolved more along the lines of the Humboldtian model of education embedded in research, following the American research university, pioneered by the University of Michigan and Johns Hopkins University in the late nineteenth century, through the incorporation of graduate education and research along with liberal education in a single institution. In Australia and elsewhere, the research function of universities did not develop until the mid twentieth century on the base of elite undergraduate education.

The second half of the twentieth century, at least for developed economies, radically redefined formerly understood roles of universities and their external relations. These redefinitions reflected the imperatives of the times, ranging from a broad nation-building agenda in the immediate post-Second World War period, through an extensive period of accommodation to demographically driven growth in demand for higher education, involving increased reliance on private financing, alongside more deliberate investment in human capital and R&D, as a perceived source of productivity growth and enhanced economic competiveness.

When we look back at conceptions of university roles around fifty years ago, we get some sense of the extent of shift and the limits of the current discourse. In 1956, the Committee on Australian Universities, chaired by Sir Keith Murray, assessed the condition of a then elite university sector, whose primary role was seen to be the education of "the able young", with a secondary but connected role for research. The committee observed in its 1957 report that "when the student enters the university he should be entering a community with an intellectual and social climate of its own…universities have not only to teach subjects; they have also to be equipped to give young human beings an opportunity to stretch their mental powers and to learn something of their fellow human beings" (Parliament of the Commonwealth of Australia, 1957). In contrast, a current review of the Australian Qualifications Framework starts from the narrow premise that the purpose of a Bachelor degree is "to prepare individuals for professional work who apply a body of knowledge in a range of contexts and/or as a pathway for further learning." (Australian Qualifications Framework Council, 2009)

With regard to research in universities, the Murray committee understood the role of "patient capital", in terms of practical benefits arising from discoveries from research that was not necessarily undertaken for practical purposes, and the stimulation for learning that it affords:

> Advances in knowledge have come because free inquirers have been pursuing their own ideas and insights, devotedly and with great persistence, in pursuit of enlightenment for its own sake…Such men have double value. In the first place, they are necessary to keep the march of human knowledge on the move;

> and in the second place they are the men from whom ambitious and energetic students wish to learn, and from whom they should be given the opportunity to learn. Without them human discovery of basic truth would grind to a standstill, and the teaching of the able young would become stale and unprofitable.

This view echoed the advice of Vanevaar Bush in his report, *Science the Endless Frontier*, to the President of the United States in 1945:

> Scientific progress on a broad front results from the free play of free intellects, working on subjects of their own choice, in the manner dictated by their curiosity for exploration of the unknown. Freedom of inquiry must be preserved under any plan for Government support of science. (Bush, 1945)

The Menzies government, which introduced federal funding for universities, accepting the advice of the Murray committee, effectively entered into a social compact with the then established group of universities. The rationale was one of mutual dependency and responsibility, expressed in the following terms:

> No independent nation in the modern age can maintain a civilized way of life unless it is well served by its universities; and no university nowadays can succeed in its double aim of high education and the pursuit of knowledge without the good-will and support of the government and the country. Governments are therefore bound to give to universities what assistance they need to perform their proper functions; but in their turn universities are bound to be vigilant to see that they give the services to the community that are required by the necessities of the age. (Parliament of the Commonwealth of Australia, 1957)

The Murray committee also recognized that universities require a high level of independence and flexibility to fulfil their role, including where necessary revealing errors and deceits, and being critical of taken-for-granted views and policy assumptions. At the same time, the committee was clear that the public recognition and support that enables universities to prosper thrusts on them a heavy responsibility to play their part in meeting the nation's legitimate needs.

This appreciation of mutual dependency and responsibility remains valid today, but its rationale and expression are necessarily different from that of fifty years ago. On the one hand, mutual responsibility is even weightier in the contemporary era of complex global challenges. That is, contemporary universities need to draw upon their various strengths and connections in creative and vigorous ways, to help build the capacity of communities to tackle unprecedented challenges. On the other hand, there have been two major changes affecting the two core functions of universities. The first is that student participation in higher education has expanded beyond the elite "able young", and the employment destinations of graduates have extended into a wide range of areas. Consequently, society needs to find ways of accommodating the diverse growth in the best possible ways, and higher education institutions have to provide education and training appropriate to diverse student and labour market needs. The second change involves the orientation and funding of research, with a focus on ways and means of promoting direct industry access to scientific knowledge, know-how and instrumentation and an emphasis on research commercialisation and

national research priorities. This more comprehensive view than that of Vanevaar Bush recognizes that the course of scientific progress is driven not only by basic research, and that elite research universities are only one source of new knowledge. Problems set outside the university also define the research agenda, and they can be no less challenging or fundamental or important than those of intellectual interest to a university professor. Hence, the notion of a national compact between government and universities, as a group, can no longer be predicated only on the roles of the elite research universities; it must be broader or it must be replaced by a range of compacts related to varying institutional roles.

A particular difficulty is that in accommodating the enlargement of higher education, and in seeking more direct access to the tacit knowledge of researchers to solve commercial and community problems, a narrowly instrumentalist view of the contributions of universities has crowded out other views, including appreciating the need for a balance of plural capabilities to meet diverse needs. In particular, there has been an over-correction with an anti-elite sentiment, because the apparent assumption is that an elite role is no longer appropriate or useful and therefore it should be replaced or absorbed. The redefinition of the purpose of a bachelor degree in Australia is a case in point, in that if the degree is seen to be solely for the purpose of preparing individuals for professional work, where does a generalist arts degree fit? What is the worth of a degree in literature or history or philosophy under such a limited view? In a similar vein, the predecessor to the current Australian government refused funding for several research projects which had been recommended through peer review, on the grounds that they served no demonstrably useful purpose, following a campaign by a section of the media against alleged academic indulgence.

Relevance may well serve as a guiding principle for a large part of contemporary higher education and university research - whether through curriculum orientations to graduate "employability" or immediate commercial applications of research. However, relevance in the sense of demonstrable utility has swamped the policy discourse in a dangerously reductionist way. It would be an intellectually impoverished country, and one that risks limiting its capability to sustain itself, that places no value on the pursuit of knowledge in areas that have no obvious immediate usefulness. There has to be a place for the exploration of curiosity and uncomfortable thoughts, not everywhere but at least somewhere and even there not exclusively. Public policy needs to comprehend the less obvious, subtle and indirect ways and means by which some universities make their social contributions. Australia's Productivity Commission in its 2007 report on Public Support for Science and Innovation showed some understanding[7]. Similarly, in Canada a broad view has been taken about research, including basic research which is seen to serve as "a national strategic reserve" - making available the expertise needed to address unexpected events when they occur. The Canadian view is a balanced one, analogous to a financial investment portfolio[8].

In their reflective essay of 2008, *What are universities for?*, published by the League of European Research Universities, Geoffrey Boulton and Colin Lucas offer a corrective to the narrow and immediate instrumentalism of government policies

in many countries. They note a "growing tendency to see universities as sources of highly specific benefits… particularly marketable commodities for their customers, be they students, business or the state." They suggest that research universities are able to make such contributions, because they deal with the universality of knowledge:

> They seek to understand that which we do not understand; they seek to explain complexity; they seek to discover that which is hidden from us. They seek to establish what is common to all of us and what distinguishes us each from another or each group from another. These things are common to the whole of university endeavour whatever the discipline. They are not "academic" in the pejorative sense of the word, but are of profound, practical utility. They are the foundation upon which the university enterprise rests and upon which its significance for society is built. (Boulton and Lucas, 2008)

Hence they argue that governments should respect the essential core of the research university and not act to erode or circumscribe it. This is not a novel reminder, for as Derek Bok observed in 1990, universities "help in but do not determine" outcomes such as effective corporate governance, sound financial regulation, competent government, effective schools, improved health or reduced poverty. He cautioned that "we will debase our academic institutions and the work they do if we think of them merely or even primarily as means rather than ends." (Bok, 1990)

The capacity of universities to undertake long-term research is fundamental to their direct and indirect contributions to national innovation. The research literature indicates that basic research is an important source of (i) the skills (particularly those based on tacit knowledge) required to translate knowledge into practice (Salter and Martin, 2001), (ii) an enhanced ability to solve complex technological problems, and (iii) the "entry ticket" to the world's stock of knowledge, providing the ability to participate effectively in networks and absorb and exploit the resulting knowledge and skills (Martin and Tang, 2007). Additionally and importantly, basic research, or long-term research whether "curiosity-driven" or "use-inspired" which explores underlying issues, underpins disciplinary advancement.

To sustain economic competitiveness, countries like Australia must be able to generate new knowledge and understand and interpret that generated elsewhere; they cannot rely on a strategy of passive absorption of foreign technology. To benefit from the public good of world knowledge, nations have to be actively engaged in cutting edge research. Free riding on the rest of the world's research is not a realistic option - because the links between researchers are personal and they are based on informal trading in ideas, techniques and devices. To access and make sense of basic research you have to be a contributing insider to the community of international researchers in a field. Moreover, the capacity to understand and use the results of basic research performed elsewhere requires a considerable investment in institutions, skills, equipment and networks (Pavitt, 2001).

Characteristics of Contemporary Elite Universities

Today we might define a research university, in its ideal type, as a community of intelligent people, new and experienced, together searching for knowledge in a culture

of discovery and in systematic ways that are open to scrutiny and contest. Elite research universities are structured to enable intellectual conversations across the generations and across various academic disciplines (Shapiro, 2001). They are places where "the able young" can and do challenge orthodoxy and complacency, and where they learn not only content knowledge and technique, but also how to think analytically and independently. They are actively engaged with their communities, and have a special capacity to connect expert and lay views in tackling problems (Kerr, Cunningham and Tutton, 2007).

Input characteristics. Elite universities may be distinguished by five sets of inputs, that is, the quality of the students they attract; the expertise of academic faculty and administrative staff; the depth of research capability; institutional asset strength and revenue diversity; and high-cost needs.

Generally, elite universities attract concentrations of young talent through student admissions, typically the top attaining cohorts of recent school leavers, most-promising doctoral students and top tier post-doctorates. Within national systems, Moodie (2009) distinguishes between "selecting" and "recruiting" universities, noting that recruiting universities operate in a buyers' market, whilst selecting universities operate in a sellers' market (Moodie, 2009). However, within the global environment, nationally selecting universities face stiffer competition and become recruiters, needing to offer inducements to attract talent, especially graduate research students.

It is in these universities that the leading professors in their fields are typically found. These institutions also attract high-quality academic and administrative staff, through recruitment processes that are open to national and international competition.

Within nations, elite institutions are the key nodes of research capability (infrastructure + expertise). They are typically the most successful in winning competitive research grants and industry research sponsorships, and they have greater diversity than others in their sources of income through donor support and returns from research commercialization. Nevertheless, they have higher cost needs arising from the complexity of their undertakings, including interdisciplinary centres, integration of research elements in student education, and greater technological infrastructure for discovery and translation.

Activity and output characteristics. Elite research universities may be distinguished also by the nature of their activities, notably the ground-breaking work they do; their role in underpinning basic research; their leadership in the development of disciplinary knowledge; their contributions to educational innovation; their public policy inputs, analysis and critical commentary; and the conduits they provide for international scholarly dialogue.

Within the Australian higher education system, Group of Eight (Go8) universities are characterized by the emphasis they give to research and research training performed with reference to leading international standards; substantial time devoted to advanced hands-on undergraduate and graduate training in scientific theory and research methods linked to cutting-edge research; hosting of major research infrastructure and instrumentation; and strategic efforts to commercialize useful knowledge and intellectual property.

In terms of outputs, elite universities produce highly regarded outcomes, including graduates who take up leadership roles in the professions, business and public service. They supply the bulk of the nation's future academic workforce. Elite universities are home to the major producers of high quality research publications, exhibitions and performances. Moreover, they source the major contributors to policy debates and the formation of solutions to national and global problems.

How Valid is it to Treat the University as a Whole Institution for Evaluation or Comparison?

Many universities in Australia, as in Europe and other parts of the world, are characterized by a coexistence of departments of different quality in their teaching and research. Some may claim broad parity across institutions, notwithstanding differences in specific areas, but that is a questionable view based on several assumptions, including the perspective that weaknesses in one area are offset by strengths in others. The evaluative criteria applied to "professional" fields, such as engineering, law, accounting and medicine, are specific to those fields; they differ from one another, and from those, also varied, criteria applied to the humanities and natural sciences. One university may be regarded highly for its philosophy and physics but not well regarded for its psychology. Moreover, a university may be highly regarded for the quality of its research in a particular field, say mathematics, but score poorly on measures of student satisfaction with teaching in the same field. Conversely, student satisfaction with teaching may be reasonably high in a university whose research performance in that area is relatively low.

However, acceptance of scattered mediocrity is a complacent view, and a dangerous one in a highly competitive international environment, which no longer suffices, especially where major problems call for contributions across multiple disciplines, all of which need to be strong. In universities with large shares of strongly performing areas, through the institutional culture of expectations, especially when performance is subject to rigorous evaluation against international benchmarks, there is possibly greater pressure on weaker areas to improve or be bolstered or removed. Clearly, there are many institutions with some strong areas of expertise. The distinguishing feature of elite research universities is the concentration of their expertise and the institutional culture that drives and derives from the quest to excel. One of their functions in national systems of higher education is to increase the pressure on other institutions to raise their performance, including by opening up their facilities to others and working in collaboration with them.

Thus, it is both valid and invalid to compare universities on a whole of institution basis and a mix of university-wide and field-related indicators is likely to be most informative.

THE NEED TO CONCENTRATE RESEARCH CAPABILITIES IN ELITE UNIVERSITIES

Among the various motives attributed to the movement for building up elite universities is that associated with national pride. It is argued, for instance, that relatively

low rankings on global league ladders have induced some governments to skew their investments in favour of "nation positioning institutions" (Hazelkorn, 2008). Moreover, the rankings are seen not merely as a reflection of actual drivers but as drivers themselves, defining what quality means and shaping university mission and balance of activity (Marginson, 2007), inflating the "academic arms race", inducing universities to chase ever more resources (Ehrenberg, 2004), intensifying competitive pressures, establishing as a worldwide norm the science-strong research university of the Anglo-American tradition, and giving emphasis to institutional stratification and research concentration (Marginson, 2007).

More purposefully, the movement can be understood to be driven by concerns to (a) strengthen and integrate capabilities, in order to address complex and pressing national problems; (b) increase the international visibility of national strengths for attracting talent and inwards investment; (c) open up opportunities for collaboration with universities in other countries that have a similar reputation for excellence; (d) and ensure sufficient capacity for cutting-edge research for the nation through access to world knowledge developments. These motives reflect a view of contemporary universities as engines of innovation and economic development and sources of solutions to social and environmental problems. One of the drivers of innovation is the clustering of talent and the production of new knowledge. In this regard, large research-intensive universities are among the most effective aggregators of highly qualified personnel (Usher, 2009).

In many fields of research in the natural sciences there is a "critical mass" or threshold effect, and "large, well-funded and well-led research groups produce more publications, of higher impact, and receive much higher international recognition than do smaller groups." (National Board of employment, Education and Training, 1993) There are several advantages of scale in research, as noted in a HEFCE (2000) review of research funding policy:

> A larger group of researchers adds to overall vitality, through peer stimulus, the opportunity to exchange and develop ideas, and to be spurred by visible achievement. Second, the per capita marginal costs of research (administration, clerical support, etc) are reduced when a larger group contributes to infrastructure. This factor is significantly accentuated by the high cost of major equipment and facilities in the experimental sciences. Third, larger groups make possible the simultaneous and parallel development of research themes, leading to an overall acceleration. Fourth, group size contributes to diversity of thought and of sub-discipline, increasing the likelihood of cross-fertilisation and fruitful development. Fifth, larger groups of research students provide a more supportive atmosphere for research training. (Higher Education Funding Council for England, 2000)

Concentration involves targeting new funding to build the capacity to sustain new heights of excellence. Typically, new funding is allocated on the basis of proven performance judged against international benchmarks, wherever it is to be found, and where there is genuine potential to scale-up. Additionally, concentration is one dimension of a differentiated system, and differentiation is necessary to create the diversity needed to accommodate, cost-effectively, an enlarged population of learners

and to support a wide spectrum of innovation, whether in hi-tech manufacturing, mining, agriculture, or services, including the public sector. However, achieving diversity through differentiation in higher education is a difficult challenge.

The Difficulties of Differentiation

One can consider differences among higher education institutions - what van Vught calls "external diversity" (Van Vught, 2008) and Teichler calls "horizontal diversity (different types of institutions with different functions)" (Teichler, 2004) and differences within higher education institutions - "internal diversity" and "vertical diversity (different levels of quality of inputs, processes and outputs)". When a higher education system is structured on the basis of functional specialization (e.g. nurse education colleges, teacher education colleges, institutes of technology, research universities), there is a wider variety of institutional types but the variety of activities (e.g. range of educational offerings) within an institution is more limited than in the system of more comprehensive institutions (e.g. polytechnics or universities). Hence, "internal" or "vertical" diversity involves activity differences (what is done and how much), as well as qualitative differences (how well it is done). It does not necessarily follow that a wider range of internal functions result in a greater variety of ways and means of conducting those functions within a system, nor does it follow that the quality of particular functions is either raised or lowered. The apparent trade-offs between structural specialization and comprehensiveness, have been perceived differently in those countries that have opted for distinctive institutional types and those adopting unitary systems. However, it is not clear to what extent higher education systems are becoming more integrated or dispersed, convergent or divergent, homogeneous or heterogeneous.

As a useful guide to policy options, Frans van Vught and others have pointed to the range of drivers of sameness and difference in higher education systems (Van Vught, 2008). The strong drivers of homogenization include the power of academic norms that place most value on research-based prestige, reinforced by rewards in the academic labour market (Fairweather, 2009); normative policy settings of governments, financial incentives and regulations (including at the international level); and "market mechanisms" encouraging competition for similar rewards. However, some see greater competition in mass higher contexts creating opportunities for new institutions to enter the market with new products and services, and for established institutions to take up niche positions, and the growth of various private providers around the world gives this view support.

Some suggest a reduced need for functional specialization and the concurrent development of "more hierarchical and horizontally permeable systems" (Scott, 2009). The case for greater hierarchy arises from the intensification of international competition at the top, which represents recognition of the high costs of research, and an acceptance of prestige drivers. The case for horizontal porosity arises from a number of the changes discussed earlier, including changes in labour market requirements affecting the nature of graduate supply and the need for further learning, growth in international student mobility, changes in knowledge production affecting

the conduct of research, and the multiplication of the missions of higher education institutions.

However, there are countervailing pressures suggesting the need for greater heterogeneity of higher education providers, to accommodate growth in participation of people of diverse, such as backgrounds, talents, motivations and job expectations, and to do so cost-effectively. Some contend that we are witnessing "more and more vertical and horizontal specialization, far beyond the classical divide, between teaching only and research universities" (Laredo, 2007). This development is seen to be driven by the growth of private providers, developments in educational technologies, and the integration or non-integration of new missions with teaching and research. Mission multiplication involves some over-loading of institutional responsibilities, with risk to quality and efficiency, indicating some scope for separation or at least redefinition of roles.

In structural terms, there are several options, including unitary systems of comprehensive institutions, although this is a very expensive option in view of the high costs associated with quality research; articulated links across functionally specialized institutions; or institutional federations or alliances of institutions with complementary capabilities. In strategic terms, whatever the structural composition, there is a need for mission clarity and renegotiation of resources for activities linked to missions, with the flexibility to adapt to change.

Frans van Vught (2008) defines differentiation as the process by which higher education systems diversify through the emergence of new entities (Van Vught, 2008). However, it is useful to distinguish between diversification as creating and accommodating variety, and differentiation as enabling and declaring divergence. In business terms, a company may diversify its customer mix and its product range, such as by offering high-cost and low-cost options, but differentiates itself when it offers a unique value proposition (Feldman, 2009); when it does what others don't or can't, and when it makes itself unlike the rest of its type. Differentiation as an institutional strategy that allows for price premiums above those of institutions adopting a low-cost strategy, may derive from brand image, customer service, product uniqueness, technology, facilities or accessibility (Porter, 1985). A higher education system may be highly diversified in its student mix and educational offerings, but relatively undifferentiated in terms of institutional types and distinguishable characteristics of institutions within each type, including recognition of differences in the quality of degrees.

Australia, for example, has a diverse but largely undifferentiated university system. There is great diversity in the student body, whether domestic or international, preparatory, undergraduate or graduate, in terms of age, ethnicity, prior knowledge and experience, motivations and aptitudes and mode of participation (full-time, part-time, external, virtual or mixed). There are areas where efforts can be seen as being made by these universities to differentiate themselves from one another, which include diverse criteria for student admission, differences in degree structures and requirements, and in curriculum, pedagogy and means of assessment. Moreover, there are differences in institutional research capability and orientation, the integration of research and education, the extent and nature of engagement with

communities, the operation of commercial enterprises, and levels of internationalization. For instance, the University of Melbourne with its "Melbourne Model" has departed from the Australian practice of professional specialization for the bachelor degree, and moved to a general bachelor's degree with professional preparation for the master's degree. A number of technological universities have developed graduate capabilities that align with the employability expectations of employers. The University of Western Sydney has an extensive programme of community engagement functions. Swinburne University has deliberately focused on a niche set of research fields. Monash University has a global strategy involving offshore campuses and internationalized curricula. Greater flexibility for universities to develop these various differences, according to the missions they have set for themselves, including the flexibility to offer special services at price premiums, would help achieve a more diverse and differentiated higher education system that would be more responsive and efficient than the current arrangement.

Nevertheless, Australia, like the German and Scandinavian systems, has a formal framework of "parity of esteem" in the equivalence of qualifications, and government policy and financing frameworks treat all universities on the same basis. This approach can be seen to reflect a former period of horizontal specialization of higher education institutions, before the closure of the binary divide, when the advanced education sector was presented as "equal but different" in comparison with the university sector.

Australia, in 1986, set out on the Dawkins' agenda to collapse the binary divide and create an undifferentiated "unified national system" of universities. Subsequent allocations of public funding for teaching and research have been premised on the basis of a "fair-go": an Australian virtue of unimpeded opportunity for new players who are willing to make an effort, alongside even-handedness and transparency in the rules of the game. The Dawkins approach led to an evening-out and eventual normalization of funding rates per student place by field of study, across old and new universities. It provided targeted funds to encourage teaching staff to obtain higher degrees and, through a "clawback" from established universities, provided funds to promote research in the newer institutions.

The outcome has been flat. More specifically, the 19 pre-Dawkins universities, which together accounted for 90.26% of total research income in 1995, had a reduction in their share to 87.35% in 2005, a loss of 2.91 percentage points. This 2.91% shift went to the 11 smallest research performers of the post-Dawkins' institutions, which together gained 1.91 percentage points, taking their combined share to 3.8%. Four of the previous institutes of technology increased their share, with the net rise for the five new technology universities being 1.11 percentage points, and bringing that group to a combined share of 7.5%. The Go8 share stayed at around 70%, notwithstanding some shifts within the group. The biggest declines were among the pre-Dawkins post-1950s universities. This policy of spawning tadpoles, while forgetting to feed the frogs, has bogged down the nation's capacity for making great leaps forward.

Subsequent policy implementation, across party-political boundaries through the 1990s to the present, including the formulation of national protocols for university

status, has seen the continuation of an even-handed, non-discriminating approach. In the provision of government funds for scholarships, for instance, a "base" grant is made automatically to all universities, with additional numbers typically scaled to enrolment size. Where performance-related measures have been included in funding formulae, they have often been implemented with buffers and caps, in order to smooth the distribution of gains and losses. This was the case with the former block schemes for research infrastructure (IGS) and research training (RTS). Moreover, the smoothing approach has been continued with their replacement schemes: the SRE (formerly RIBG) provides a higher indirect cost rate for competitive research grants, but the JRE (formerly IGS) has removed competitive grants from the income metric in the allocation formula. Hence, the institutional shares of total SRE +JRE funds in 2010 are unchanged from the shares of total IGS +RIBG in 2009. With all boats rising this is perceived to be a clever domestic outcome politically.

Governments have difficulty in formally marking institutional differences and treating institutions differentially. Further, there are no readily acceptable ways for institutions to describe what they are if they are not a research university, that is, are they teaching-intensive, business-facing, regionally engaged, equity-dedicated, technological, innovative and/or regional? With respect to this, there should be status in teaching well, developing professionals, translating research, and contributing to regional community development and policy and financing ought to permit some institutions to do a few things very well rather than having to do a lot of things reasonably well.

Martin Trow identified, some time ago, that it is unreasonable, unfair and inefficient to place expectations on institutions to become what they are not set up to be:

> A central problem for higher education policy in every modern society is how to sustain the diversity of institutions, including many of which are primarily teaching institutions without a significant research capacity, against the pressure for institutional drift toward a common model of the research university - the effort alone shapes the character of an institution to be something other than what it is - a prescription for frustration and discontent. (Trow, 2003)

The US and Japan have higher education systems, which are hierarchically differentiated, (e.g. within research institutions there are clear differences in prestige and quality). Interestingly, the German Excellence Initiative is seen to represent, in policy terms, "a termination of the longstanding fiction of a qualitatively homogeneous higher education system supported by de facto legal homogeneity" (Kehm and Pasternack, 2009). The question arises as to whether, or to what extent, non-structural and non-formal understandings of qualitative differences among institutions might promote differentiation.

Arguments against Special Treatment for Elite Institutions

Within national contexts, claims favouring elite universities can be contentious because their acceptance implies and may produce institutional differentiation within national systems. Several lines of counter argument can be identified.

The first institutionalist rejection of concentration is quibbling and it is that the advocates of concentration are simply self-interested in the promotion of their institutions, as if the opponents are indifferent.

A second line of argument, and one that is able to be tested to some extent against evidence, is that concentration is inherently unfair - it favours those institutions that have accrued advantage; if others were to be given equivalent treatment over time they would achieve (eventually) at least commensurately; and balanced investment should have regard to future potential as well as past performance.

At the time of debate about the closure of the binary divide in Australian higher education in the late 1980s, the then central institutes of technology argued that they were undertaking research of community value that was neither properly recognised nor funded, and that elevation to university status would enable them to develop their potential for the benefit of the nation. As it turned out, some twenty years later, the share of research performed by that set of institutions has increased only marginally, notwithstanding a major shift of government funding towards application-oriented research. However, the combined effect of a large number of small gains on the part of the many newcomer institutions has resulted in no change in the share of the top performing eight universities. They have much increased amounts of research funding, in absolute terms, but have not moved ahead in relative terms, whereas in many other countries the performance gap has been widening between the top universities and the system average.

Selectivity (supporting the best wherever they are found) and concentration (targeted funding to strengthen capability), were expressed in 1987 as the dual principles to guide the funding of higher education research in Australia. However, the subsequent course of policy development has been driven by selectivity alone. Some argue that concentration is an outcome of selectivity[9], but that is not the apparent outcome in Australia. A continuing reliance on a policy of selectivity alone would effectively hold back the leading universities, just as a reliance on concentration alone would thwart the emergence of new research areas. The combination of selectivity and concentration allows for a balance of opportunities.

Some will assert that provision needs to be made for new and emerging areas, and that institutions with the potential to build up strengths should be aided to do so. Moreover, some will add that a failure to enable new areas to develop effectively entrenches the privilege of institutions that were given assistance many years ago when they were at the fledgling stage. Without doubt, emerging strengths should be fostered, particularly in areas (both in fields of inquiry and in institutions) that promise national benefits. However, potential is more than promise and it does not grow without roots. That is, disciplinary and cross-disciplinary breakthroughs are normally not made by novices and new areas of strength have emerged in Australia, historically, on the back of a track record of performance validated by academic peers.

A third line of argument is that preferential treatment of internationally-referenced elite institutions undermines the dynamism of the system as a whole, leading to complacency, ossification and diminution of research of national, regional and local relevance that is highly valued by users[10]. On the one hand, notwithstanding the benefits of agglomeration, there are off-setting benefits for a society

through having competition among talented researchers from different locations. In this regard, where resources and talents are too concentrated, inquiry can be subject to too much "group think" (Litan and Mitchell, 2008). On the other hand, there are inefficiencies associated with encouraging all flowers to bloom:

> We are creating congestion in the pipelines of knowledge, and this has become a liability. It gets in the way of scientific advance. We have to become more selective about true knowledge creation. In fact, we need to devise a system of incentives that will promote self-selection and specialization, so that those with a comparative advantage in knowledge creation will not be crowded out by those with a comparative advantage in preservation and transmission (including, but not limited to, teaching), and vice versa. (Trajtenberg, 2008)

A fourth line of argument is that support of the elite is anti-egalitarian; it reduces equity of opportunity for students and reproduces inequality. This argument is sometimes put in the context of equating elite (best) with elitist (privileged), with all its connotations of snobbery and anti-democratic sentiment. Nevertheless, the problem of the reproduction of social disadvantage must be addressed, for it is both inequitable and inefficient to deny individual access to opportunity and bar society from the benefits of broader contributing capacity. Rothblatt (2009) has observed with regard to advanced western economies, the tendency to invest discriminatingly in elite universities stands somewhat at odds with "the long recent history of government efforts to promote more egalitarian educational opportunities and, with such actions, to mitigate the effects of social and historical privilege". Moreover, the entrenchment of highly selective access to the top universities can mean that "the screening value of admission is likely to increase more than the intrinsic educational value", with the perceived advantage of elite institutions becoming more exaggerated, with negative implications for democratic societies (Geiger, 2009).

Taking a long view, elite universities around the world have moved beyond places of passage for the privileged to the more academically talented. Contemporary elite universities are academically elite; they are no longer socio-cultural finishing schools for the modest performer, even if demonstration of merit reflects socio-economic background and opportunity (Palfreyman and Tapper, 2009). In this regard, Palfreyman and Tapper (2009) note the shift towards merit-based selection on the part of Oxford and Cambridge, and Geiger (2009) reports similar shifts for the US Ivy League, along with the shift from teaching to research, in determining institutional reputation. This is neither to accept that the status quo is sustainable nor Trow's assumption that massification would lead to expansion and diversification of the system, thereby providing an automatic protection for elite institutions, resulting in them not having to change their values (Trow, 1973). Elite institutions have continuous responsibilities to seek ways of widening access, a matter that is considered further below.

Importantly, as Morhman et al. (2009) have noted, the predominant theme of policy discourse in recent decades has been the transition from domestic elite to mass participation in higher education. Less noted has been the imperative to participate internationally in the formation of research-based universities that provide knowledge

for all, not just for elites (Mohrman, Ma and Baker, 2009). The global community benefits through the public good contributions of high-end research that improves understandings and makes breakthrough discoveries. Individual nations also benefit from the ability of their leading universities to participate in this global advancement of knowledge.

Finally, it is argued that concentration of research capability relegates some institutions to "second-class" or inferior status, with resultant disservice to their communities. This concern is heightened by the prospect that elite institutions might only cooperate with one another, nationally and internationally, in such matters as research, student exchange, and recognition of qualifications. That is, in this line of advocacy there can be a conflation of institutional interests with student and social interests.

Nevertheless, a difficult issue that needs to be addressed is that of the mission and position of those higher education institutions that are not in the elite club. As noted earlier, academic norms and the structure of incentives prioritize research, and horizontally different institutional types are inevitably seen in vertical relationship to one another, at least by the academic community, even if not by the lay. Strengthening of the top implies that institutions elsewhere in the system will have to carve out what will be perceived as middle and lower positions, being defined as teaching-intensive, regionally-engaged, and variously contributing to expanding opportunity, second-chance learning, professional education, innovation take-up, or modification of existing knowledge solutions. This matter is also considered further below.

These various counter arguments may be rebutted in part, for instance, by reference to international imperatives, with other countries intensifying investment in their leading institutions, in the context of increasing international competition for talent and the need for scale for contemporary research into complex problems. That is, countries needing a step-change in their research competitiveness cannot afford a step-by-step dilution of their research investment. However, the counter arguments cannot be dismissed entirely and the question is not whether to sustain elite strength, but how to balance that purpose against other aspects of the national interest.

The elite institutions themselves have to be sensitive to that requirement. Indeed, they are by definition in the minority, and governments are bound to their political constituencies to have regard to the mainstream majority of institutional needs and aspirations, without being captured by them. Most important is the mutual responsibility that flows from the support the community gives to elite institutions. Sheldon Rothblatt, following Martin Trow, observes that elite legitimacy derives from the viability of other types of institutions serving important needs, and that they have an obligation to serve inclusively:

> The world-class research university is underpinned by a great variety of other types of tertiary educational institutions upon which its legitimacy, indeed its very success, depends. They serve an immense variety of public needs and provide the opportunities for upward mobility that any generous-minded and decent nation requires. Those institutions possess talent - talent very often

> originating within the famous universities. They are engaged in the noble task of uncovering student ability where it might otherwise be neglected. Universities that have scaled the heights in a new environment of fierce rivalries retain an obligation to give creative thought as to how an entire national system can thrive without being partitioned into haves and have-nots, and riven by ruinous jealousies (Rothblatt, 2009).

OPTIONS FOR GOVERNMENT POLICY

The policy challenge is to cater cost-effectively at an acceptable level of quality for education of the general population, while ensuring sufficient capability to participate at the forefront of knowledge formation. The policy objective is to achieve coherence within the national higher education system through a balance of complementary capabilities that work together, not apart, in meeting society's needs. It may well be the case that the bulk of resources need to be dedicated to those institutions which serve the bulk of the demand, and that they should be resourced sufficiently to be good at what they do and build up distinctive strengths. Concurrently, without "cementing-in" any institution or accepting without evidence its claims for special treatment, it is necessary to achieve system-wide development of acceptable quality, without diminishing the outcomes of the elite performers.

What strategies and tactics might be adopted to ensure that countries can sustain and benefit from their elite institutions? In relation to governmental strategies for higher education expansion and university research concentration, ten broad options may be identified, ranging from soft to hard, or from "hands-off", through "hands-hovering" to "hands-on" interventions. Some options can be combined; the magic option is the right combination.

Drift Option

Drift options involve letting concentration or dilution happen. They can be lazy, through avoiding the hard decisions, or they can be deliberate, without declaring any explicit intention or preferred outcome, in the context of other policies and incentives. Such deliberate approaches may be more or less overt (e.g. selectivity in research funding or open competitive funding for centres of excellence, or preferential funding for certain institutions as part of broader initiatives, such as in energy or health policy) in the expectation that things will sort themselves out eventually on the merits or otherwise. This "muddling through" (Lindblom, 1959) rather than "grand plan" approach. has the advantage of being low-risk politically and of leaving developmental options open rather than closed off, but has the disadvantage of low predictability of outcomes.

Increased Autonomy and Operational Flexibility for Institutions

In systems with high levels of central control, or where degrees of autonomy differ among institutional types, university responsiveness and adaptability may be improved through greater devolution of responsibilities. The assumption is that the

increased institutional flexibility will give rise to diversity of institutional ways and means, if not missions, given a relaxation of the state controls that produce conformity. However, as indicated earlier, autonomous institutions are free to mimic others, and in a culture of prestige-driven norms can be expected to pursue an emulation strategy. Hence, some boundaries need to be set and incentives established to encourage diversification. Nevertheless, without institutional autonomy, there can be no differentiation, because this is a strategy uniquely determined by each institution; autonomy is essential to any combination of policy options.

Specific-purpose Programme

In order to provide incentives for different institutions to focus on different areas and develop different strengths, governments may provide specific funds, such as for widening participation, regional engagement, translation of research, teaching excellence, collaboration or other activities. This approach is more likely to produce differential outcomes when the allocations (or, in a harder variant the eligibility to participate) for different funding streams, whether reward-based or improvement-based, are limited to a few rather than shared among all institutions. However, pressure typically mounts for such programmes to be systemic, and institutions can be creative in playing to the rules of the game, so the differentiating impacts of the measures are reduced. Nevertheless, there need to be incentives, other than research-related ones, to encourage higher education institutions to play to their strengths.

Competitive Funding

Competition for major grants (such as for centres of excellence, major equipment, research clusters) or tenders for the provision of services (such as contracts for professional development programs, or regional delivery of educational services) can help to promote diversification and differentiation. Competitive schemes have the advantage of being open to multiple contenders against transparent criteria. However, they can tie up institutional resources unproductively in bidding processes. The tiered competition approach of the German Excellence Initiative, alongside its openness, has several attractions - everyone knows the criterion standards; no institution is arbitrarily excluded; many can win something; but only a few can clear the height of the bar necessary for top-up funding for excellence. However, the bigger the competitive stakes the more attention needs to be given to options for the unsuccessful bidders (and non-bidders).

Performance-based Funding

Performance-based funding approaches reflect a view that institutions should be funded, not for what they are, but for what they do. They are typically related to a set of quantitative indicators measured over intervals of time, and funding flows in accordance with improvements in the measures. They may be used to encourage some institutions to expand their level of activity in particular areas, whether in

terms of student mix, types of community engagement or contributions to innovation. Their effectiveness in promoting differentiation depends on clarity of purpose and the selection of indicators.

Quality Assessment

Distinct from "quality assurance" - a process that encourages tick-a-box compliance and which itself promotes standardization - quality assessment is concerned with outcomes and how good they are. In terms of educational quality, assessments may affect accreditation to offer programmes, or funding for institutions and programmes. In terms of research, assessments may affect eligibility for funding of doctoral students or participation in particular programmes. Referencing qualitative assessments to international benchmarks can be difficult, and given the limits to available international metrics (relating predominantly to research), it becomes necessary to rely on peer judgements or other subjective indicators of esteem, about which there are predictable challenges, relating to cultural differences in respect of education, and perceived conflicts of interest through associations in respect of research.

Classificatory and Reporting Schema

Governments may seek to provide more nuanced signals to the community about the relative strengths of institutions (within a nation or group of nations) than those conveyed by rankings, against a single metric or limited set of variables. Such information might include comparative descriptors and ratings against multiple criteria, at the institution-wide and field of scholarship levels (e.g. student mix, progress and satisfaction, curriculum breadth and depth, amenities and services, graduate destinations, research performance). Nevertheless, too great a number of descriptors add to costs and confusion. Harder variants of this approach include placement of institutions into typological categories and rankings within typologies. The advantages of typologies are that they enable understanding of institutional orientations and characteristics, improve the information available to guide student choice, provide pointers for businesses seeking to collaborate with institutions, help identify possible partners, and assist the process of policy formulation. However, limits on the availability of comparable data sets, especially across nations, can reduce the meaningfulness of comparisons. Moreover, classificatory approaches need to be fluid rather than fixed, and revised periodically to reflect changes in institutional positioning. However, as with the US Carnegie classification, the modifications build extra complexity with implications for their usefulness to students and others. Point unclear Furthermore, typologies may expose similarities and differences but they do not reveal qualitative performance differences.

Structural Designation

Governments may create or designate institutions to function at different places in the structure of higher education systems. There is a range of possibilities, according to level of educational qualification awarded; breadth by field of scholarship;

balance between teaching and research; extent of research concentration; regional catchment and service; orientation of educational programmes; mode of educational delivery and provision for certain categories of learners. Many institutions cross several such categories, and should be permitted some flexibility to adapt to changing demands and opportunities. Rigid and static structural forms, as discussed earlier, can lead to ossification. It can be difficult to obtain the consent of established institutions to limit their scope and coercive use of accreditation and funding mechanisms, especially to force mergers or takeovers, can create strong resistance. Moreover, designation by government bodies carries a heavy political risk, particularly where institutions that feel they are relegated seek to exert leverage through political influence to advance their position.

Market Mechanisms

Governments may move the higher education industry, including public institutions, into a more demand-driven, competitive environment. This might involve funding (government subsidies and loans) that follows student choice, in respect of teaching, along with institutional tuition pricing flexibility. This approach assumes that competition will stimulate differentiation and innovation in product range and service. It has the advantage that structural outcomes are seen to be the result of market drivers rather than government decisions, although that does not mean that government will be exonerated and thus saved from claims for compensation. As discussed earlier, competition in status markets may not result in significant institutional differentiation, but can lead to loss of diversity through closure of offerings in areas of low student demand. Further, deregulated approaches, particularly involving tuition prices, typically meet with organized community opposition.

Mission-based Funding Negotiations

Market failure may be mitigated and institutional differentiation promoted through mission-based funding compacts between government and individual institutions, and perhaps involving other community interests. Such compacts could extend beyond performance-based funding agreements and cover mission diversity, educational profiles, research focus and linkage, community engagement, collaboration with business and industry, differential funding rates and pricing flexibility, regulation proportional to risk, and performance levels related to standards. An advantage of the compacts approach and its focus on mission is that it can act as a complementary mechanism to aligning institutional goals with the incentives provided through the use of some combination of the other options above. In contrast to the option of structural designation by government, or the use of principal-agent models of service purchasing, the compacts approach allows for mutual agreements. However, much depends on the authority and flexibility of the negotiators.

In contemporary circumstances, the most coherent combination of options for public universities are autonomous institutions operating in a market environment, with mission-based funding compacts as a means of safeguarding public good interests. This combination allows the universities the flexibility they need to be

competitive and responsive, noting that the competition nationally and internationally involves private institutions and public-private partnerships.

POSITIONING OPTIONS FOR ELITE UNIVERSITIES

Today, there are great expectations that research universities will help the community address many complex economic, social and environmental problems, whether on a local, national, regional or global scale. It is crucial that universities contribute actively, and it is essential that they preserve the conditions that enable them to do so. Elite universities are unlikely to gain the support they need to that end, if they do not demonstrate their benefits to the communities that sustain them and contribute visibly to broad national objectives.

The foregoing considerations suggest seven imperatives for the sustainability of elite research universities:

Integrity

The first relates to the essence of being a research university, and involves safeguarding the things that matter to a culture of free inquiry. In the continuous search for sources of revenue, and the too frequent tendency of funders to attach compromising conditions on their contributions, the important thing is for a university to be true to itself, to know what it stands for and to stand up for truth. To some this may sound old-fashioned, and it is, but no less relevant today than in the past.

Intensity

The second requirement relates to the combination of focus, persistence and scale that enables knowledge advances in the contemporary research environment. This involves concentrating on those things a university can do best, dedicating sufficient resources to build and sustain strength (critical mass of expertise and high-capacity technology as required by the field), and being able to devote time to task (capacity for long-term research).

Contributing to Inclusiveness

Elite universities have the responsibility to play their part and pull their weight in the social inclusiveness agenda of a nation. For instance, the Group of Eight universities recognize they have a distinctive role to play in ensuring Australia's higher education system meets broad community goals and needs, and provides opportunities for all those with academic potential. The universities aim to reflect in the student and staff bodies the different educational and cultural backgrounds of Australian society. Based on the key capabilities of Go8 universities, the main ways in which they can contribute to a more socially inclusive higher education system are to:

– Increase aspirations and readiness for those with the capacity to succeed in higher education;

- Provide multiple pathways for access, including through structured arrangements with other post-secondary education and training institutions;
- Improve access to graduate level courses for those from under-represented groups to facilitate better outcomes in research, the academic workforce, and professional pathways;
- Contribute to the body of knowledge on improving educational attainment, retention and success, and social inclusion of people from disadvantaged backgrounds; and
- Undertake research that reflects the broader needs of the society and looks to find solutions to current and future issues facing all Australians, in particular indigenous Australians.

Contributing to Innovation

Societal expectations are that leading research universities will have significant constructive impact on national and regional economies. The major contributions of research universities, in this regard, are through the production of highly capable graduates and the generation and translation of knowledge that is useful for private firms and public sector agencies. Research universities need to be open to and accessible by business and initiators of cluster relations with enterprises and other mechanisms to enable entrepreneurial firms to obtain the know-how necessary for them to respond competitively to market opportunities.

Intra-national Collaboration

Elite universities are likely only to gain the ongoing support they need when they contribute to the wider social benefit and are seen to do so, by such actions as enhancing the capacity of other educational and research institutions. In this regard, in the contemporary world of plural higher education systems, some very good performance is to be found in multiple places. Thus, concentrations of expertise and infrastructure should be accessible by researchers in other universities of a country, and elite universities should be inviting others to share in and contribute to their work.

International Partnerships

Few countries alone can afford the scale of infrastructure that is needed for big science. Australia, for instance, as a southern hemisphere continent, is very aware of the expanding research capacity across the northern hemisphere and its inability to replicate it. Hence, it becomes necessary to network with the world's major centres for high-end research, and collaborate in the management of the huge datasets generated in an instrumented world, whether down on the seabed or up in a spacecraft. However, entry tickets are distributed primarily through the recognition of academic performance and thus it is essential to ensure that the nation's leading researchers are internationally reputable, as the hi-tech centres are themselves expertise-seeking.

The last decade or so has seen an expansion of research university networks, e.g. the Association of Pacific Rim Universities (APRU); Canada 13; the Coimbra Group; the Committee on Institutional Cooperation (CIC); the Consortium of Nine Research Universities of China (C9); the Group of Eight (Go8), the International Alliance of Research Universities (IARU); the League of European Research Universities (LERU); the Russell Group; Universitas 21 and the Worldwide Universities Network (WUN). These networks provide complementary bases of capability. More recently there is the development of networks of networks (e.g. Go8/C9) opening up collaborative opportunities for students and academic staff, internationally, within prestige frameworks. Some strong universities (e.g. Harvard) stand outside such groupings and collaborate bilaterally.

Independent Verification of Performance Quality

Finally, research universities need to have robust evaluative processes, so they know how good they are and for maximum credibility, their own evaluations need to be subject to independent, external validation against international benchmarks.

These seven pillars may be regarded as the foundation needed by a nation's elite research universities in contemporary circumstances, but the institutions have to adapt continuously, as many have long done.

NOTES

[1] The views expressed in this paper are those of the author personally and do not necessarily represent the views of Go8 University Vice-Chancellors.

[2] The following countries have specific policies and measures for building 'world-class universities' or centres of research excellence that meet international cutting-edge performance criteria: Botswana, Brazil, Canada, Chile, China, Denmark, England, Finland, France, Germany, India, Indonesia, Japan, Korea, Malaysia, Portugal, Russia, Singapore, South Africa, Sweden, Thailand, Vietnam.

[3] Exponential growth in knowledge, increasing cross-disciplinary research, internationally co-authored articles, and expanding use of digitization and computational capacity are not recent developments, but the pace and scale of their expansion raises the participation cost threshold in many fields. The expansion of high performance computing has facilitated the processing of larger and more complex data in various fields of inquiry, such as: particle physics, astrophysics, biochemistry, nanotechnology, climate modelling, aerospace, genomics, proteomics and financial markets. Universities around the world are experiencing an increasing emphasis on the need for effective data management and stewardship to underpin the changing research environment, as research becomes more dependent on data in digital form, as computers and networks proliferate. Electronic networks provide the infrastructure by which researchers are increasingly able to communicate, access data, information and software in cyberspace, allow them to share and control remote instruments, and link distant learners to virtual classrooms and campuses. [Revolutionizing Science and Engineering Through Cyberinfrastructure: Report of the National Science Foundation Blue Ribbon Advisory Panel on Cyberinfrastructure. (January 2003) ES 2. Available at http://www.communitytechnology.org/nsf_ci_report/]. Enabling greater access to information of all kinds: published and unpublished, text and non-text, the Internet and the Web, have also greatly enhanced collaborative, inter- and multi-disciplinary research, and access to large shared datasets. These developments simultaneously enable more distributed research and require larger nodes of capacity and talent. [OECD (1998),The Global Research Village: How Information and Communication Technologies Affect the Science

System. OECD, Science, Technology and Industry Outlook 1998]. Houghton, J. W. et al. (2003), Changing Research Practices in the Digital Information and Communication Environment. Department of Education, Science and Training, Commonwealth of Australia].

[4] Elite universities tend to be located in "economically vibrant, culturally interesting, and socially progressive parts of the relevant country, and often the capital (cities)". Palfreyman, D. and Tapper, T. (2009) What is an "Elite" or "Leading Global" University?, in Palfreyman, D. and Tapper, T. (Eds.). Structuring Mass Higher Education: The Role of Elite Institutions. Routledge. N.Y.

[5] "In western Europe (following the collapse of the Roman Empire) the only people left with any of the skills to run society in an age of huge political instability were the priests of the Christian Church… university, in the middle ages, referred to a universal course of studies recognised throughout the Christian world. You would learn what a pagan Roman would have learned about logic and music and mathematics, about good and bad arguments and about the nature and proportion of harmony in different contexts, but then you would move on not only to philosophy but to theology, in which you were shown how to trace the connections and harmonies in the text of the Bible, so as to defend the consistency and rationality of doctrines taught by the Church...Anyone emerging from the courses of a "university" institution was regarded as competent to teach in any other institution." Archbishop of Canterbury (Dr Rowan Williams) (2006). "China - what is a University?" Speech given in Wuhan. http:www.archbishopofcanterbury.org/698.

[6] John Wiley, chancellor, University Madison-Wisconsin (2007). The future of research universities. Science and Society Interviews. EMBO Report Vol. 8. No. 9.

> "Responsibility for long-range research has been defaulted to America's research universities. Back in the 1960s, when I graduated in physics, essentially all the consumer electronics companies, all the telecommunications companies, all the auto manufacturers, most of the basic materials companies - probably most of the Fortune 500 companies in general - had basic research laboratories and hired scientists, engineers and mathematicians to conduct long-range research. Today almost none of those private sector research laboratories exist anymore. The few that have survived are pale shadows of their former selves, and are tightly focused on near-term goals. Most of today's economy was born in those earlier research laboratories. Most of tomorrow's economy is being born today in university research laboratories."

[7] Productivity Commission (2007). Public Support for Science and Innovation, Research Report. Canberra. Page xxiii.

> "Universities' core role remains the provision of teaching and the generation of high quality, openly disseminated basic research. Even where universities undertake research that has practical applications, it is the transfer, diffusion and utilisation of such knowledge and technology that matters in terms of community wellbeing… Apparent cultural barriers between universities and businesses may reflect, in part, the preferences of researchers, who can be more motivated by curiosity and excellence than commercial opportunities. Addressing any cultural 'barrier' requires prudence because it poses risks for the research functions of universities and some of the motivations for science career choices".

[8] Association of Universities and Colleges of Canada (2008), Momentum: the 2008 report on university research and knowledge mobilization. Ottawa.

> "Insofar as investments in university research can be considered a university 'R&D portfolio for Canada', investments in 'blue chip' basic research across the full spectrum of disciplines essentially provide, collectively, assurances of dependable and stable returns of research outputs that are less susceptible to market and other fluctuations and more likely to provide longer-term gains. Conversely, strategic investments in highly targeted research entail greater risks, given the potential for failure due to scale or global competition, but the returns, when successful, can potentially be secured more quickly. Using this analogy, one can pursue a dialogue to assess what level and mix of investments in university research will yield the

desired level of risk and returns, given governments', universities', research funders' and the public's shared goals for and expectations of university research."

[9] HEFCE (1999), "The role of selectivity and the characteristics of excellence", HEFCE review of research policy and funding.

> "In the past ten years the degree of selectivity has increased: the proportion of HEFCE funding going to higher rated departments has increased relative to that going to lower highly rated departments. At the same time, because of the aggregation of highly rated departments in a relatively small number of higher education institutions (HEIs), research funding overall has also become increasingly concentrated. However, this has occurred as a consequential effect of the policy of selective funding, rather than as the result of a deliberate policy of concentration. International comparisons suggest that the UK research base is not less selective or less concentrated than in the USA. In fact the USA has become less selective in the last decade."

[10] HEFCE (1999), "The role of selectivity and the characteristics of excellence", HEFCE review of research policy and funding.

> "We recognise the danger that a major increase in selectivity could reduce the number of research-led institutions to a level that would be inconsistent with the general health of the UK research base, in terms of both its economic and its social contribution. In supporting excellence, we believe that a significant increase in selectivity would undermine the dynamism of the system as a whole, leading to complacency and ossification. It could also undermine research of national, regional and local relevance that is highly valued by users, and the removal from many institutions of the beneficial effects of research on teaching and other activities that have been identified by the sub-group investigating teaching, research and other activities. We conclude that for the benefits of HE research to have the greatest impact on the life of the nation, it is not only peak performance that should be supported, but also the 'average' quality of the system. This should be as high as is reasonably possible and well distributed geographically. Excessive attention, either to peaks or to average performance, could undermine effectiveness. This does not necessarily imply different funding and assessment mechanisms, but means that the roles and requirements of good research and the best research should be considered separately."

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