

GLOBALISING SKILLS: IMPLICATIONS FOR SINGAPORE

Edited by Johnny Sung



Phillip Brown • Andy Dickerson • David Finegold
Hugh Lauder • Rob Wilson • Wu Wei Neng

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Foreword

Kwek Mean Luck

Dean and Chief Executive Officer
Civil Service College

In the past decade, global trade, production and supply chains and the markets for education, training and human resources have been re-shaped in sometimes surprising, often fundamental ways. We have experienced a fragile world economy, the growing urgency of emergent global challenges such as climate change and food security, a more sophisticated public with diverse interests and expectations, and the increasing need for public expenditure in important areas such as healthcare, transport and social safety nets.

Singapore cannot wait passively for these trends and challenges to overtake and overwhelm us. Our current and future workforce, both in the private and public sectors, must be equipped and ready to meet these challenges. From a public policy perspective, it is likewise important that we understand how these trends are evolving globally, and to consider how our own policies need to change.

It will not be easy to embrace these inevitable complexities, and tackle challenges in proactive and constructive ways.

Constant training and development will help us to do so. In the private sector, employers and employees value skills training and upgrading because it can enhance productivity, and improve both company profits and real wages. However, it is neither possible nor desirable for the Public Service to measure the benefits of training in terms of profits, since that is not the primary objective of government. Most of the products and services that the Government provides – infrastructure, laws, regulations, incentives and policies – are not traded on the market like conventional goods, and it does not make sense to speak of sales, revenue and value-added, because these are outputs rather than *outcomes*.

Governments must simultaneously achieve many outcomes – the provision of public goods and infrastructure, maintenance of enabling institutions such as the rule of law, economic stability and growth, internal and external peace and security, better standards of living, and ensuring effectiveness, public trust and legitimacy, to name just a few. Having provided for material security and stability, policymakers must sustain, strengthen and occasionally rethink key institutions, and engage in deeper collaboration and more empathetic dialogue with citizens and other stakeholders. Taken as a whole, these constitute **public value** for society. To deliver robust and legitimate solutions in a changing environment, the Public Service is building capabilities in strategic foresight and anticipation, policy entrepreneurship and innovation, leadership and organisational development, risk management and resilience, and engagement and empathy. This is an ambitious agenda but also a necessary one. These tools and skills will help us deliver better public value and ultimately, improve people’s lives in both concrete and intangible ways.

The Civil Service College (CSC) has a key role to play in this process as we strive to be the heart of learning excellence for the Public Service. In the 2011 fiscal year, CSC conducted about

1,800 programmes and courses for over 41,000 public officers. In addition, our lectures, conferences and seminars on current policy issues reach out to thousands more. In the past six years, the College has established new centres of expertise to document and advocate new research and thinking in public policy, public communications, governance and leadership, and to connect thought leaders with public officers. Building on past successes and strengths, we are currently examining how our business model, customer centricity, and content development and delivery can improve to serve public officers better.

This volume – “Globalising Skills: Implications for Singapore” – is a small but significant part of that effort. Government policies must be grounded on sound and practical knowledge of current developments and research, and CSC constantly collaborates with experts and partners such as the Institute for Adult Learning (IAL) to highlight and examine important policy issues of relevance to Singapore. Collectively, the chapters shed light on the fundamental and rapid changes that education, training and labour markets worldwide are undergoing, and show the critical importance of continuous upgrading and development of our resident workforce to achieving sustained productivity and economic growth, more meaningful work, and a better standard of living. I hope you will find it a useful read.

Foreword

Gog Soon Joo
Executive Director
Institute for Adult Learning

Tasked with the mission of ensuring that Continuing Education and Training (CET) remains an effective strategy to sustain the competitiveness of Singapore and the employability of its workforce, the Institute for Adult Learning engages with international experts to delve into the key challenges confronting the national CET agenda.

An effective skills strategy not only supports enterprise and industry, but also ensures the employability of our people. This was clearly brought out in the implementation of the Skills Programme for Upgrading and Resilience (SPUR) during the recent financial crisis.

Hence, since 2010, IAL has started pioneering research in the areas of skills supply and demand, skills utilisation, skills and productivity, skills and enterprise performance, and macro-meso level skills impact on workers to support and enhance the development of skills strategies for workers, enterprise and the state.

Our efforts culminated in an Expert Roundtable IAL hosted in May this year, featuring six skills experts from the United States,

United Kingdom, and Singapore. The aim was to discuss recent developments in skills research and workforce development policies and to share their views on Singapore's skills efforts to date. The roundtable generated an excellent and thought-provoking debate around the role of high skills policy in today's globalised environment and its implications for Singapore.

In questioning the link between higher education and income and the wisdom of expanding higher education, we are forced to confront the international trend that skills are as mobile as jobs because enterprises no longer have to choose between quality and cost in their production and business decisions.

In examining the link between skill, productivity and income, we realise that an enterprise may not always share the benefits of productivity increases with workers. This leads us to question the role of government, union, enterprise and workers in the economic system of production and how we can reconcile the interests of the various stakeholders.

This is IAL's first research publication with our distinguished partner – the Civil Service College. We hope to produce more of such joint publications in the future, to provoke greater interest and discussion and contribute to the national conversation on skills strategy development and workforce competitiveness.

We look forward to engaging you and welcome your feedback and suggestions on the issues and challenges IAL should look into that would support the efforts of workers, enterprise and government to remain competitive and relevant in a globalised economy.

Introduction

Johnny Sung

Singapore has been very successful over the decades in coordinating appropriate skills strategy in order to support national development efforts. However, in this globalised environment, with its rapid advancement in technology, the relationship between skills, performance and pay has become increasingly complex and differentiated. Some argue that gone are the days in which “high skills equalled high pay”. What we need now is a much better understanding of the interconnectedness of skills strategies at the different levels – those of the state, the enterprise and the individual, as well as “competing states”, competing enterprises and highly-skilled individuals in competing economies. In other words, to enhance our future efforts in coordinating workforce development policy, we need much better information about the demand for skills, and how this demand is influenced by global factors.

In May 2012, the Centre for Skills, Performance and Productivity Research (CSPPR) invited a panel of international experts to conduct a series of roundtable discussions and public lectures on the recent developments of skills research and workforce development policies. The experts were Phillip Brown, Andy Dickerson, David Finegold, Irena Grugulis, Hui Weng Tat and Hugh Lauder.

In order to illustrate some of these new arguments and their implications, we have selected three papers (by Brown and Lauder, Finegold, and Dickerson and Rob Wilson) for this CSC–IAL joint publication. In addition, Wu Wei Neng from the Civil Service College also provides a contextual paper which examines the strategic issues facing the Continuing Education and Training (CET) sectors, linking the three papers to the events and policy discussions in Singapore. Together, these papers will identify some of the most important challenges for contemporary workforce development in Singapore.

What Are the Benefits of Expanding Higher Education?

In the last four decades, workforce development policy has been mostly guided by the human capital theory. Gary Becker (1964) introduced the concept of human capital and the internal rate of return of human capital back in the 1960s. This theory demonstrated how internal rate of return of human capital could be employed to choose among alternative investments in human capital. Ten years later, Jacob Mincer (1974) followed Becker's human capital theoretical framework to construct his "human capital earnings function" (p. 44). The earnings function has become so influential that empirical studies can be conducted to investigate the effects of schooling and on-the-job training on the variance and inequality of earnings in almost every economy in which relevant cross-sectional data are available. Indeed, the most consistent results from studies in different countries suggest that it pays to have education, especially tertiary (or higher) education (Polachek, 2007). The faith in education is further strengthened by the general rising prosperity and opportunities for the educated as a result of the emergence of the high-tech, knowledge-based and globalised economy. Public policy reiterated the value of higher education and its expected utility, as shown in this UK government document (Department for Innovation, Universities and Skills, 2008, p. 3):

High level skills – the skills associated with higher education – are good for the individuals who acquire them and good for the economy. They help individuals unlock their talent and aspire to change their life for the better. They help businesses and public services innovate and prosper. They help towns and cities thrive by creating jobs, helping businesses become more competitive and driving economic regeneration. High level skills add value for all of us.

Likewise, Singapore’s Minister of State for Defence and Education Lawrence Wong¹ also emphasised,

... Going forward, the demand for university education in Singapore will continue to rise. Our economy is growing in scale and sophistication, and will need more highly-skilled manpower. ... at the tertiary levels, [other developing countries] countries will produce more graduates than there are Singaporeans. So the premium is on educating Singaporeans well, with skills, knowledge and the ability to learn, re-learn and switch careers in tandem with changing economic and industry requirements.

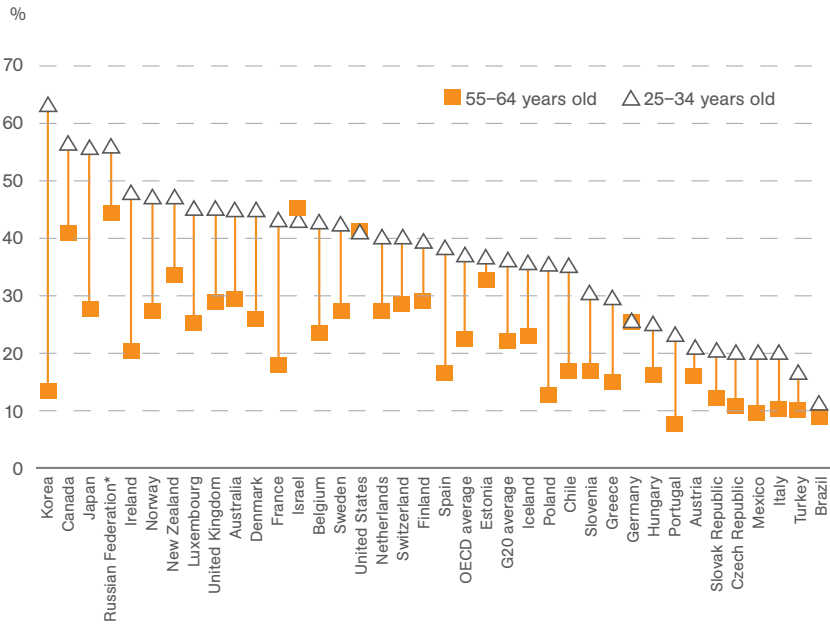
Indeed, looking at the Organisation for Economic Co-operation and Development (OECD) figures, it can be seen that higher education attainment is on the rise everywhere,² as shown in Figure 1. Here we see a general picture of how far higher education attainment has progressed between two generations. When we compare those in the 25–34 age group and those aged 55–64, we find that the higher education attainment of the younger group exceeds that of the older group in every case

1. Lawrence Wong, Minister of State for Defence and Education, at the First Session of SIM University (UniSIM) Convocation Ceremony, 6 October 2011.

2. OECD (2011), *Education at a Glance 2011*, Paris: OECD.

except Israel. (This is mainly due to the fact that the older cohort in Israel has one of the highest tertiary education attainment levels.) It seems that many countries share the higher education policy sentiment, which regards increasing numbers of graduates, as a major source of economic competitive advantage.

Figure 1. Percentage of population that has attained tertiary education by age group, 2009



*Year of reference 2002

Source: OECD, 2011

In terms of wage gains, the OECD reported that, on average, a person with a degree can expect to earn 50% more than a similar person with only an upper secondary or post-secondary non-tertiary education.³ The same OECD report further suggests that having a degree not only leads to an earning advantage, but this

3. *Ibid.*, p. 138.

advantage also increases with age. It is therefore not surprising that individual confidence in investing in higher education remains generally high.

Notice that the above-mentioned wage premium comes from cross-section data which consist of people who completed degrees decades ago, as well as more recent graduates. It does not necessarily tell the same picture for the fresh graduate who enters the labour market today. It is here that a different picture may be unfolding.

How Are Recent Graduates Doing?

Paul Harrington, an economist at the US Economic Policy Institute – a think tank in Washington – carried out an analysis on recent graduates using the 2011 Current Population Survey data.⁴ Harrington found that 53.6% of bachelor's degree holders under the age of 25 were unemployed or under-employed. In addition, when finding jobs, there were significant increases in the number of recent graduates who ended up with low skill jobs such as waiters/waitresses, bartenders, casual helpers, office receptionists and cashiers than technical and professional jobs.

In Asia (with the notable exception of South Korea), graduates are faring far better. Not only are economies in the East doing much better than Western economies, there is also increasingly greater focus on recruiting “local talents”. A study at the Hong Kong University of Science and Technology shows that the proportion of Chinese graduates returning to China has been rising significantly between 2003 and 2011, lured by the greater economic opportunities for Chinese graduates.⁵

4. Yen, H. (2012). In weak job market, one in two college graduates are jobless or underemployed. *The Huffington Post*. See http://www.huffingtonpost.com/2012/04/22/job-market-college-graduates_n_1443738.html

5. Asian talent market: Employment in Asian firms is booming – but for locals, not Western expats (2011, March 3). *The Economist*.

In contrast, years of rapid expansion in higher education in South Korea means that the country now has the highest proportion of graduates in the 25–34 years age group, compared with any other OECD country. There is now a shortage of graduate jobs. Increasing numbers of graduates, even with high grade point averages (GPAs), industrial experience through internships, and English-speaking ability, are now facing graduate joblessness and the ever-growing prospect of entering into low skill jobs.⁶ Much of the difficulty in South Korea appears to be the consequence of graduate jobs not being created at the same pace as the supply of graduates, or existing jobs are not up-skilled sufficiently fast enough to absorb the increased numbers of graduates. The Labour Ministry in South Korea identifies a shortfall of 500,000 graduate jobs while there is an over-supply of 320,000 jobs for high school leavers this year.⁷

So what is going on here? What are the reasons for the mixed picture of events? There is no doubt that higher education still accrues significant economic returns. However, the benefit of higher education for individuals is increasingly subject to new intervening factors, especially for recent graduates. For national policy, there is another important dimension of consideration that is constantly attenuating the expected economic benefits of higher education policy. To tackle these two points, our first paper (on the *Global Auction for High Skills*) by Phillip Brown and Hugh Lauder introduces the reader to an in-depth analysis of the impact of globalisation on the benefits of higher education, both at the individual level and at the national strategic policy level.

6. South Korean grads facing dire job shortage (2012, August 28). *The Straits Times*. See <http://www.straitstimes.com/premium/asia/story/south-korean-grads-facing-dire-job-shortage-20120828>

7. Ibid.

In this paper, Brown and Lauder ask important questions: In today's globalised and mobile environment, does learning always equate earning? Does the quality-cost revolution lead to "digital Taylorism" in which high skills are increasingly subject to a global auction where the value of high skills succumbs to "a race to the bottom"? Is there a (secret) "war for talent" where globalised firms can source their cheap, but equally talented, employees anywhere on earth?

Brown and Lauder's research shows that on balance of evidence, the globalised environment means that many of the "promises" no longer hold true. This creates huge tensions between enterprises and workers, and between state policy and individual expectations. Fundamentally, the first paper points to the necessary caution over what we know of the benefits of higher education and high skills. There are events that are subtle but are already shifting the ground that might ultimately undermine national skills policy.

New Approaches to Higher Education

Despite some of the potential problems identified by the first paper, Singapore's effort in expanding higher education has been progressing steadily with caution, and seems to be paying off in a number of directions. For example, in recent years, innovative joint ventures between leading international and local higher education institutions have been established to leverage expansion on "established excellence". The partnership between Singapore University of Technology and Design (SUTD) and the Massachusetts Institute of Technology (MIT) introduces new approaches to tackle design education. Another initiative between the National University of Singapore (NUS) and Yale sees the creation of the first comprehensive liberal arts college in Singapore. These efforts increase the number of places in higher education, and this expansion pushes the frontier for new disciplines and diversity, as witnessed by the addition of full-time

programmes at UniSIM and the expansion of enrolment at the Singapore Institute of Technology (SIT).⁸

In the second paper, David Finegold argues that three new trends are most important in facilitating the expansion of the higher education sector. These trends are already evident in the USA and some other parts of the world. He argues that these trends – namely affordability, quality/brand value, and convenience/flexibility – are the key “strategic differentiators” in contemporary and successful high education systems. They are key to meeting the aspirations of a much larger group of learners that includes sometimes the more mature, those who are not as well off, and many who may already be in mid-career. To some extent, this paper reminds us that future workforce development is not just about “more high skills”, as in the form of graduate numbers, but also diversity of skills and broadening participation, which can also be turned into a source of competitiveness. The implications, as such, beg the questions whether we have the appropriate “business model” driving future higher education, and whether we are sufficiently clear where our future learners are coming from, if indeed, higher education is a costly undertaking. In this paper, Finegold goes on to evaluate the extent to which Singapore is also addressing these important differentiators in the course of higher education expansion.

Are Graduate Jobs the Same as High-Skilled Jobs?

So far, we have been talking about high skills and low skills in the context of university education vis-à-vis others. But this is not the only way to understand high skills. In a classic paper on the concept of skills, Paul Attewell (1990) argues that the most useful approach to studying high skills is through understanding

8. Singapore to get its 5th and 6th universities (2012, August 26). *The Straits Times*. See <http://www.straitstimes.com/breaking-news/singapore/story/singapore-get-its-5th-and-6th-universities-20120826>

the concept of “job complexity” (p. 427). In the concept of job complexity, education qualifications play a part in defining and measuring skills, which also tend to serve as a proxy for general skills needed for a job. However, education qualifications are fundamentally a “supply” concept while job complexity reflects what a job demands. Therefore, in the effort to create a high skills society, we would need more information than the proportion of graduates that we have in Singapore. We would need “skills intelligence” with depth and details that can inform policy. In particular, skills intelligence relating to the demand environment is very rare. In this respect, research in Singapore is already making significant inroads into the creation of these new forms of skills data. For example, CSPPR conducts the Skills Utilisation Study, which identifies and measures skills (broad and generic) skills used in different jobs in Singapore.

In the last paper, Andy Dickerson and Rob Wilson introduce an alternative approach to deriving demand related skills information. Their approach is to take advantage of the occupational skills data from a complex skills/occupational system called O*NET, which is widely used by labour market researchers, human resource professionals and policymakers in the USA. Dickerson and Wilson argue that for Singapore to embark upon high skill policy, it would need important and detailed skills information on all the jobs. They demonstrate a mapping methodology that they have already utilised in the UK to map the O*NET skills information to the UK Standard Occupation Classification (SOC). In this paper, they translate the same process to mapping the O*NET data to the Singapore Standard Occupation Classification (SSOC).

As the O*NET skills information is very detailed in the seven domains, measuring 239 descriptors of skills, the implications of a successful mapping of O*NET data to SSOC are very exciting. For example, we would be able to move away from the

“blunt” instrument of using graduates numbers as a means to achieving a national competitiveness. We can identify how various skills measures are linked to pay, performance, innovation and productivity. The ability to tweak these variables opens up a wide range of policy tools. This paper also forms the basis of another CSPPR skills research project that is expected to start in latter part of 2012.

Conclusion

We have brought together three very different papers to raise the awareness of the challenges facing a high skill economy. What we hope to do is to identify a series of relevant questions for policymakers as well as practitioners to explore. Indeed, after the May 2012 visit, not only are local skills researchers becoming more aware of the issues, new projects following these discussions are already under-way. For example, CSPPR is designing a further project to identify Singapore’s position in its relevant “global skills web”. This project examines the extent to which Singapore is subject to the risk of “global auction”. At the same time, CSPPR is launching an O*NET mapping exercise which will fulfil a number of objectives. As well as creating a new set of (occupation-based) skills data, we will be able to evaluate the cost-benefit of a similar exercise in Singapore, should that be contemplated. Meanwhile, the information will augment existing skills information that is already in the government domain. For practitioners, the O*NET type of information will facilitate job matching, training, performance criteria and other human resource activities. In time, we hope to be able to return and discuss the outcomes of those projects, and hopefully, make a contribution to the community that is interested in skills.

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Human Capital, Productivity and Inclusive Growth: Joining the Dots and Strengthening the Linkages

Wu Wei Neng

With the rapidly changing nature of labour markets, education and skills acquisition, there remains the fundamental question of why the Singapore Government places strong emphasis on the continuous upgrading and enhancement of skills training and education for our workforce. Why do policymakers care about skills and human capital? How does Singapore plan to achieve its policy objectives in this area, and what are the opportunities and challenges? These questions will provide a domestic policy context to the discussions by other contributors to this volume.

Skills, Education and Productivity¹

From the economic perspective, there is a strong linkage between investments in human capital and greater productivity – both

1. The focus of this chapter is on labour, wages and skills, and hence the term “productivity” will refer to labour productivity. Where a different measure of productivity (e.g., total factor productivity) is being referred to, this will be indicated. The Singapore Department of Statistics defines labour productivity as real output per worker. For the economy as a whole, real output is measured by GDP at 2005 market prices. Industry real output is measured by gross value added at 2005 basic prices.

in terms of the labour force as well as the economy as a whole. Productivity is a much cited, often desired and sometimes misunderstood goal. Economists Diewert and Nakamura (2006) have lamented that it seems to be like love in that everyone knows they want it, but few have a good definition of it.

A simple but accurate definition that will suffice for this article is that productivity measures the efficiency and effectiveness of converting economic inputs – or factors of production such as labour, land and capital – into outputs such as goods and services. Specific measures of productivity, such as labour productivity, aim to quantify the value-added in a firm or industry (often measured by its real output or real Gross Domestic Product [GDP]) divided by the total number of hours worked to generate that output.

Seen from this perspective, investments in effective skills training can enhance the human capital of workers, enable them to perform their duties (or higher value duties) better, and raise the amount of economic value they can generate per hour worked. This can often translate into higher wages. Many empirical studies support this hypothesis, with various studies indicating returns of 8% to 10% wage increases from every additional year of schooling (van Reenen, 2005; Dearden, Reed, & van Reenen, 2005; Ashenfelter & Krueger, 1994; Card, 1999). Further, using data on wages, training and productivity from the UK private sector, Dearden, Reed and van Reenen (2005) find evidence that a 10% increase in training increases wages by 3%, but increases productivity by twice as much (6%), suggesting that owners of businesses and capital benefit from some of the productivity gains.

Apart from the effect on wages, enhancing the human capital of the workforce can complement investments in physical capital such as more sophisticated equipment and software which require better trained operators. This synergy can have significant

positive impacts on related economic decisions. In France and Germany, higher levels of skills accumulation are correlated with higher levels of capital equipment installation, while other studies indicate that skills are correlated with better technology use and organisational processes, and therefore better total factor productivity (van Reenen, 2005).

In aggregate, sustained productivity growth is therefore important because it may translate into:

- Higher real wage increases for workers, which may increase their purchasing power;
- Lower prices for consumers due to lower unit costs of production, which may also improve purchasing power;
- Higher profits for businesses due to a more productive labour force, which may increase private sector investments; and
- Higher tax revenues for governments without increasing the percentage tax burden on society, which may support public spending and a better standard of living.

Given these multiple advantages, the Economic Strategies Committee (ESC), convened in May 2009 to study long-term growth strategies for Singapore, recommended:

We must make skills, innovation and productivity the basis for sustaining Singapore's economic growth. This will also provide for inclusive growth, with a broad-based increase in the incomes of our citizens. (ESC, 2010, p. 1)

The ESC proposed an ambitious target: to raise productivity growth from its current average rate of about 1.7% (2000–2011) to 2% to 3% per annum. This growth rate would be sustained from 2010 to 2020, bringing Singapore's productivity to a level one-third

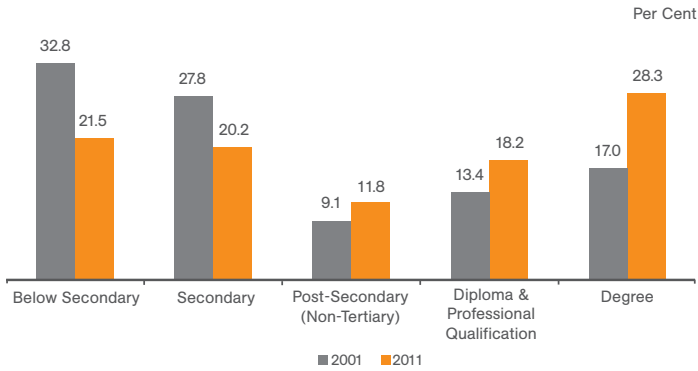
higher than before. If successful, productivity would account for about two-thirds of GDP growth during that time period, as compared to just over 20% from 2000–2010 (ESC, 2010, p. 77). Achieving this would put Singapore on par with other advanced economies such as Finland and Hong Kong.

Singapore's Workforce Skills and Education Profile

The skills and education profile of Singapore's workforce has been steadily improving. In 2011, about 47% of resident workers had diploma- or degree-level qualifications, a considerable increase over the equivalent figure of 30% in 2001 (see Figure 1). Younger segments of the workforce are more highly educated, with about half of all economically active 25- to 29-year-old Singaporean residents holding degree qualifications. This figure includes those with unsubsidised degrees obtained through local and foreign universities (Ministry of Manpower, 2011, p. 5).

This growth in higher education and degree-level qualifications is timely, given that Professional, Managerial, Executive and Technician (PMET) jobs are currently the fastest-growing segment of Singapore's workforce profile. In 2011, PMET jobs increased by 2.2% compared to a 1.5% increase in other jobs. Over the past decade, PMET jobs also increased faster, at 4.3% compared to 1% per annum. The net result of this has been an increase in the share of PMET jobs from 44% to 52% of the total resident workforce, from 2001 to 2011 (Ministry of Manpower, 2012, p. vi). By 2011, 44% of young employees (25- to 29-year-old Singapore residents) worked in jobs that paid at least \$3,000 a month, which could be taken as a proxy for graduate-level jobs (Ministry of Education, 2012, p. 10).

Figure 1. Distribution of resident labour force by education, 2001 and 2011 (as at June)



Note: Data for each year may not add up to 100% due to rounding.
 Source: Ministry of Manpower (2012)

Continuing Education and Training (CET) in Singapore

Continuing Education and Training (CET) refers broadly to education and skills training for adult learners outside the traditional academic system, although in practice some CET programmes are provided by the same institutions that also provide full-time academic degree programmes. The key objectives of CET in Singapore are to provide an avenue for continuous upgrading of employee skill sets in the face of a more volatile, complex economy, and to provide a pathway for the attainment of degree qualifications for those who entered the workforce immediately after obtaining their diploma or A-Level qualifications. In this sense, CET is the key platform to upgrade the human capital of our workforce. Looking ahead, the ESC projected that by 2015 at least 240,000 individuals will undertake CET annually, up from 100,000 in 2008.

CET programmes are offered by most institutions of higher learning in Singapore, including the National University of Singapore (NUS), Nanyang Technological University (NTU), Singapore Management

University (SMU), Singapore Institute of Management (SIM), Singapore Polytechnic (SP), Ngee Ann Polytechnic (NP), Temasek Polytechnic (TP), Nanyang Polytechnic (NYP) and Republic Polytechnic (RP). Vocational education is provided by the Institutes of Technical Education (ITE), Workforce Development Agency (WDA), Building and Construction Authority Academy (BCA Academy), as well as a number of specialised research and training institutes focusing on niche areas such as leadership, systems science and human resources.

Among all the institutions of higher learning, SIM University (UniSIM) is the only university in Singapore dedicated to working adults. It adopts a flexible and practice-focused learning approach, positioning it uniquely to cater to the needs of adult learners with full-time jobs. UniSIM offers more than 50 academic programmes in various disciplines and has an enrolment of over 12,000 students. UniSIM also partners with foreign universities and institutes to provide overseas degree programmes through SIM Global Education. This has an enrolment of over 20,000 students and offers over 60 full-time and part-time academic programmes at various levels. On top of this, SIM Professional Development trains over 11,300 professionals per year via 620 seminars, workshops and conferences. It will hence play a key role in our national CET strategy.

Smaller private education institutions (PEIs) in the private and non-profit sector play a useful part in providing a diversity of niche and specialised training in specific areas. However, the report of the Committee on University Education Pathways beyond 2015 (CUEP) noted that the sector comprised a large variety of firms with varying standards of quality, and that the “uncertain quality of education could compromise students’ learning outcomes, and lead to less-than-ideal outcomes and returns on investment for students.” (Ministry of Education, 2012, p. 10)

Singapore's Approach to Productivity

The emphasis on productivity as a source of sustained economic growth is not a new concept in Singapore. In 1980, the Ministry of Trade and Industry (MTI) formulated the Second Economic Plan to deal with labour shortages and improve the low productivity levels. Since then, there have been periodic initiatives focusing on skills upgrading, technology and innovation, and productivity. From this perspective, the current productivity targets should be seen not as a radical change, but rather the continuation of a long-standing belief in productivity and competitiveness by the Singapore Government. That said, there are significant differences in how the productivity challenge is being tackled today, compared to the past. This reflects a more sophisticated and nuanced, but also realistic and focused, understanding of the difficulties of increasing productivity growth and the areas where Government policy can make the biggest positive impact.

The multifactor productivity of an economy can be understood holistically through several levels. At the structural level, it is affected by the overall macroeconomic environment, quality of infrastructure and institutions, clarity of laws and regulations, as well as the structure and orientation of the economy. This last term refers to factors such as the composition of GDP (whether it is primarily services-, manufacturing- or agriculture-based), and whether the economy is domestically- or export-oriented. At the sector level, productivity is influenced by the effectiveness and impact of market structures, competition frameworks, sector-specific taxes and incentives, and the existence of complementarities or economies of agglomeration between similar or supporting firms in that sector. Productivity can also be enhanced through the sector moving up its value chain, as did Singapore's electronics industry from 1990–2011.² At the enterprise

2. See speech by Prime Minister Lee Hsien Loong at the NTUC May Day Rally on 1 May 2012, <http://www.pmo.gov.sg/content/pmosite/mediacentre/speechesinterviews.html>

level, the quality of management and strategic decision-making, structure of reporting, supply and logistics chains, technology use and office culture can affect the performance and hence the value-added. Finally, at the individual employee level, job productivity depends on skills, experience and motivation, and (some argue) the level of wages and prospects for promotion.

Given the diverse and interlinked drivers of economy-wide productivity, the ESC recommended a multi-faceted approach that recognised the rational limits to Government intervention. Speaking some months after the release of the ESC report, Deputy Prime Minister (DPM) and Minister for Home Affairs Teo Chee Hean outlined the different levels of strategy:

At the enterprise and sectoral levels, it is about innovation, enhancing competitiveness and process improvements.

At the worker level, we have to ensure that workers are properly trained and skilled to keep up with the needs of the market. This will raise the overall productivity of Singapore's economy to sustain future economic growth. (National Productivity and Continuing Education Council, 2010)

Earlier, the ESC (2010) had similarly mentioned that investments in human capital would play an important role:

We need to raise the quality of our human capital, both local and foreign. We must also strengthen the ability of our low-wage workers to upgrade their skills so that they can move into better and more productive jobs over time. These are the keys to raising Singapore's economic competitiveness, producing sustainable wage growth and improving the standard of living for all Singaporeans. (p. 77)

While acknowledging the continuing importance of foreign manpower in Singapore's economy, the report noted that firms

could not “continue to rely on low-cost, low-skilled foreign manpower as a substitute for investing in productivity improvements such as innovation, R&D and skills upgrading for their workforce.” (p. 77) In line with this assessment, the rejection rates of Employment Pass and S Pass applications from foreigners rose from 26% in 2011 to 30% in the first six months of 2012,³ to reduce infrastructure strain and create a broad incentive for firms to rely more on the productivity and human capital of their existing workforce.

The ESC further assessed that:

We should take an industry-specific response, given unique factors such as the competitive landscape and operating model within each industry. The national council should work with industry stakeholders, unions, and other Government agencies to drive productivity efforts within each industry. Productivity efforts could range from the adoption of productivity-enhancing innovations to re-engineering of processes to human capital development and training. (p. 78)

These recommendations were adopted by the Government. National productivity and CET strategies are directed by the Ministerial-level National Productivity and Continuing Education Council (NPCEC), which includes government, union and business representatives, and is currently chaired by DPM and Minister for Finance Tharman Shanmugaratnam. The NPCEC promotes national productivity initiatives, such as technological and process innovation and developing a comprehensive CET system, and coordinates initiatives by agencies such as the Ministry of Education (MOE), Ministry of Manpower (MOM), WDA, the Singapore National Employers Federation (SNEF) and NTUC (National Trades Union Congress). Additional cross-sector productivity enablers such as the SME Productivity Roadmap

3. Far fewer PRs admitted from 2010 (2012, September 11). *The Straits Times*, p. 1.

(SME-PRO), iSPRINT and Inclusive Growth Programme (IGP) will lie horizontally across these sectoral roadmaps to support productivity gains.

Another significant departure from earlier productivity initiatives is the use of sector-specific productivity “roadmaps” to address the productivity challenges faced by different sectors. The NPCEC has thus far identified 16 priority sectors such as retail, precision engineering, construction, hospitality, social services, and professional and business services, which collectively account for about 55% of Singapore’s GDP and 60% of total employment.

Significant financial resources have been committed to finance the design and implementation of productivity-enhancing activities and projects. The Productivity and Innovation Credit (PIC) was introduced as part of Budget 2010 to provide companies with significant tax deductions of up to 400% of the cost of innovation-related investments such as acquisition and registration of intellectual property, R&D, automation and staff training. The PIC’s tax benefits are cumulative with the various WDA subsidies for training. It will be available for five years, (from Years of Assessment 2011 to 2015), and will cost the Government \$480 million annually. A new National Productivity Fund (NPF) was also established in 2010 to complement the PIC by providing funding for innovative initiatives in specific industries, clusters, and enterprises. The Government allocated \$1 billion for the NPF in 2010, with plans for \$1 billion more.

This differentiated approach to improving productivity across and within the sectoral, enterprise and individual levels appears to be validated by subsequent empirical research on the nature of Singapore’s productivity challenges. A 2011 staff economist research paper by MTI (Tan & Guo, 2011) found that industry sectors had varying linkages between productivity growth

and higher wages from 2005–2010, and that these were due to different fundamental reasons such as the nature of their outputs or the predominant business model of the sector. Some sectors, like electronics, experienced slower real average wage growth compared to productivity growth, whereas others, like financial services, saw the reverse. Interestingly, sectors such as administrative and support services, real estate and transport engineering saw wages rise despite a fall in productivity.

The MTI researchers found that apart from changes in productivity, the wages of employees in export-oriented sectors were affected by the rate of inflation, with higher domestic inflation in Singapore resulting in a more rapid rise in prices here, compared to the prices (and hence value-added) of the goods they sold abroad. For such sectors, one solution might be to restructure and move up the sector's value chain to produce higher-priced goods. In contrast, the domestic services sector suffered from low productivity growth, suggesting that more training and capital investment that complements labour were needed to raise productivity growth and enable sustainable wage growth.

Market Failures in CET and the Scope for Policy Intervention

CET is an important part of skills upgrading and workforce training, and therefore an integral part of Singapore's approach to enhance productivity. The CUEP was established by the Ministry of Education in 2011 to examine the university landscape, and how it could be strengthened to create greater and more diverse educational and training opportunities for Singaporeans. The report highlighted the circumstances that prompted the review of the university sector – rising expectations and ambitions of the workforce, growing wage pressure due to the need to compete with a highly-mobile global talent pool, and the progress made by other countries in improving and reforming their own university sectors to produce graduates of higher quality.

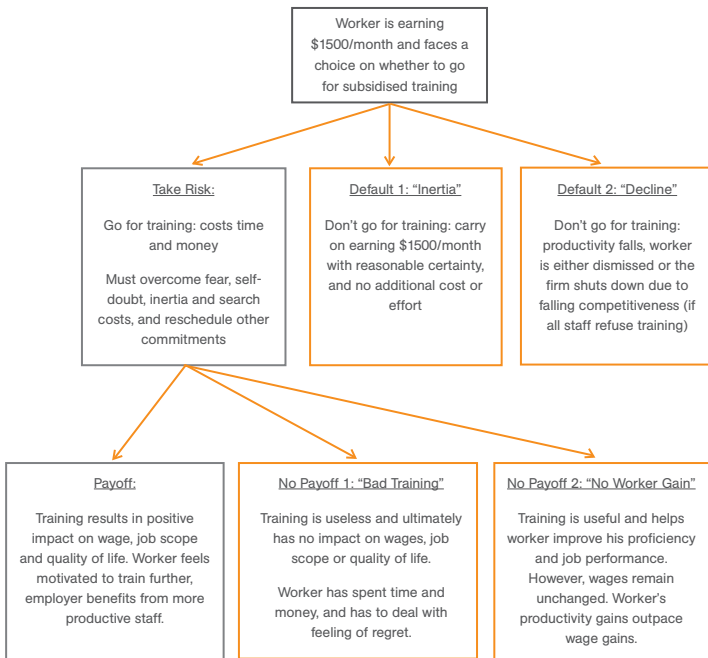
Apart from supply- and demand-related factors, the market for CET suffers from various imperfections, and may not yield a socially optimal outcome in the absence of government involvement. First, the individual consumption of education and training services has positive benefits to third parties. For instance, highly-skilled employees can perform tasks more quickly and to a better standard, raising team performance and making their colleagues' work easier. They may also make good workplace innovation suggestions for the benefit of their company. A critical mass of skilled workers with expertise in a particular sector may also enable that sector to attract strategic foreign investments and use more sophisticated technologies, resulting in complementary benefits for the value-added of the sector as a whole. Because these "spill-over" or external benefits do not accrue entirely to the trainees or their employer, but the direct training costs are borne entirely by them, it is likely that they may go for less training than is optimal from society's perspective. Second, there may be information or coordination failures, due to a lack of credible accreditation schemes, course evaluation and feedback mechanisms, ignorance of training options, or training schedules that do not suit employees' work schedules. Third, even if the worker fully realises the value of CET, he may not be able to afford the training fees and associated costs like materials and transport, given his budget and liquidity constraints.

From the worker's perspective, the accumulation of human capital is an investment decision, where the individual gives up some proportion of income during the period of education and training in return for increased future earnings. Individuals will therefore only undergo additional schooling or training if the costs (tuition and course materials fees, and foregone earnings while training) result in higher benefits (wages and job benefits) in future.⁴ There

4. Blundell et al. (1999, pp. 2–3). The authors note that most conventional economic models focus on employees' economic costs and benefits, and exclude intangible ones. However, behavioural economists argue that the latter are certainly relevant to employees' job and training decisions.

are additional non-monetary and psychological hurdles to enrolling for CET programmes of substantial duration and complexity. These stem from the uncertainty of outcomes following training. Courses may be of poor quality, or training may not result in a boost to wages and job satisfaction. These concerns are summarised in Figure 2 in the form of a stylised decision-making process that workers may face.

Figure 2. Stylised decision-making process faced by workers considering CET



Only one out of the four “endpoints” is positive for the employee, and he/she may not know the probability of these outcomes with reasonable certainty. In such situations, prospect theory (Kahneman & Tversky, 1979) suggests that the more uncertain the linkage between training and a positive payoff for workers, the less willing they will be to participate. If they are risk averse, they would prefer the more certain option of earning their existing wages

without incurring additional effort. There is hence a role for policy responses that help to strengthen and clarify the linkages, and improve the probability of a favourable outcome for employees and firms.

Overview of Singapore's National CET System

The state-subsidised CET system is organised broadly around two tracks, one focusing on vocational and professional education and the other on academic qualifications. The former is overseen primarily by the MOM and the WDA, while the latter is under the purview of the MOE. In practice, there is some overlap between these tracks, with polytechnics offering vocational and professional courses accredited by the WDA, and some WDA-accredited CET institutes like the Institute for Adult Learning offering relatively sophisticated and technical programmes in areas such as Training Analysis and Impact Measurement.

The recent and upcoming CET initiatives to enhance human capital and boost productivity can be seen in the context of David Finegold's framework (in this volume) of "affordability, quality and convenience".

Improving the Affordability of CET

Singapore's pro-education and training policies over the past decades have resulted in an impressive range of educational subsidies and CET financing schemes.

The Skills Development Fund (SDF) was established in 1979 and capitalised with the Skills Development Levy collected from employers. The SDF provides employers with course fee subsidies and training institutions to support workforce skills upgrading. The complementary Lifelong Learning Endowment Fund (LLEF) was set up in March 2001, with an initial capital of \$500 million. Following further contributions from the Government, the capital

sum of the LLEF stood at \$3.1 billion as at FY2010. WDA draws on LLEF funds for career centres designed to facilitate employment for unemployed Singaporeans, developing CET infrastructure and capabilities, and outreach and promotion activities.

The Government currently subsidises about 75% of the cost of a local degree, which is further supplemented by means-tested bursaries, as well as publicly-funded and commercial study loans available to all students. Singaporeans also have recourse to their Post-Secondary Education Account (PSEA) and their parents' Central Provident Fund (CPF) Account (under the CPF Education Scheme), to fund their degree studies at publicly-funded institutions. To enhance the affordability of CET, the Government has decided to extend the above financing options to students in Singapore Institute of Technology (SIT) and UniSIM full-time CET programmes. Government financial assistance schemes for part-time NUS and NTU students will also be extended to UniSIM part-time students. There is a further role for private sector scholarships.

The Workfare Training Support (WTS) scheme was introduced in 2010 to encourage older, lower-wage employees to upgrade their skills to improve productivity, employability and wages. It is part of Singapore's Workfare package, a key pillar of Singapore's social security net. For all eligible courses and participants, WTS subsidises 90% to 95% of course fees. WTS will operate for a period of three years from 2010. WTS further provides absentee payroll funding for employers, and a Training Commitment Award to encourage continuous upgrading. WTS is part of a broader range of CET financing schemes such as BEST, WISE, STEP and VTS, which cater to different groups of employees and sectors.

The provision of adequate financing options is equivalent to a subsidy that reduces the upfront costs of a worker's decision to attend CET. In this sense, it will, all other things being equal,

increase the demand for CET. From the behavioural perspective, reducing the upfront cost of CET also lowers the psychological barriers, uncertainty and downside risks.

Improving the Relevance and Quality of CET

Accreditation schemes such as the National CET Institute (NCI) status and the Workforce Skills Qualifications (WSQ) framework administered by WDA serve to **raise the quality** of the CET system. The WSQ framework was established in 2005 as a national skills qualification and certification system. To qualify to offer WSQ-certified programmes that are eligible for more funding, CET institutes must demonstrate quality, and register as Approved Training Organisations (ATOs). The WSQ framework also provides clear sector-specific training roadmaps that are based on industry skills requirements. To constantly drive improvements in professionalism and quality, all WSQ-approved ATOs are now required to maintain a significant percentage of staff with Advanced Certificate in Training and Assessment (ACTA), Diploma in Adult and Continuing Education (DACE) and Workplace Trainer Programme (WTP) qualifications by 2013–2014 (Workforce Development Agency, 2011).⁵ To ensure that more attention is given to priority areas, MOM also provides guidance to CET providers on skill gaps and future needs through its periodically updated “Skills in Demand” lists.

CET quality can be further enhanced through selective and useful **partnerships** with internationally-renowned foreign training institutes and programmes, in areas where local trainers’ expertise is lacking. This could be achieved through partnerships with institutions such as the CET Centres, IAL or the upcoming national CET Campuses. To maintain high quality in the CET system, WDA will focus on best-in-class foreign institutes.

5. To recognise the value of experienced trainers with vast tacit knowledge and skills, the Institute for Adult Learning (IAL) has the flexibility to grant case-by-case waivers of these requirements.

Several initiatives focus on improving the **choice and flexibility** that trainees have to tailor their learning experiences. MOM and WDA are developing two CET campuses in Paya Lebar and Jurong that will allow trainees to “mix and match” modular courses to meet their exact needs; and “cross train” for related jobs. Trainees will also have access to relevant programmes by tertiary institutions, such as polytechnics and the Institute of Technical Education (ITE), via referrals and collaborations, and will be able to train in real workplace settings through tie-ups between campuses and companies. Employers could work with CET professionals to jointly develop customised courses to train a pipeline of skilled workers for their business needs (Ministry of Manpower, 2009). In line with this objective, polytechnics have revised their part-time Diploma programmes to be more compact and modular. The duration of part-time Diploma programmes has been halved from five years (1,800 hours) to approximately two and a half years (900 hours) without compromising rigour or quality, by focusing on work-relevant knowledge and skills. Most part-time polytechnic Diploma programmes will now be offered as five distinct modular certificates (MCs).

There is also value in integrating and strengthening the linkages between training and **finding higher-value jobs**. The two CET campuses will serve as key focal points for skills upgrading, career coaching, training needs assessment, and career services for jobseekers. WDA introduced the Professional Conversion Programme (PCP) in April 2007 to help PMETs convert and upgrade their skills and make career switches to sectors, such as precision engineering, aerospace, healthcare, community and social services and training. By December 2011, 4,200 PMEs had either successfully completed training or were undergoing training under the PCP. In this, the National Trades Union Congress (NTUC) has likewise consolidated its CET efforts since 2009, including its work on the Job Re-creation Programme (JRP) alongside the

WDA, and career assistance and placement services under its Employment and Employability Institute (e2i). In 2011 alone, e2i assisted close to 46,000 workers. These schemes will assist trainees to focus on the appropriate CET programmes for their needs, and thereafter to help those seeking work find better jobs, where available.

Improving the relevance and quality of CET is a critical pillar in sustaining a national culture of continuous upgrading and training. It improves confidence and credibility in the system, and – if measures are successful – improves both the signalling and human capital value of CET to employers and employees. Accreditation and regulation of CET providers also reduces the chances of “lemons” and thus increases the chance that training will substantively benefit employee productivity.

Increasing Convenience and Training Capacity of the CET System

Improving access to CET can be achieved through broadening the eligibility and admissions criteria for courses, through providing more training places, and through enhancing the modes of delivery to better accommodate the working schedules of full-time employees. This must be balanced with the need to ensure that the quality of CET is not diluted as the volume of training increases.

One of the most significant changes to the CET system is the introduction of a new **applied “work-study” degree pathway** that will improve the integration between classroom-based taught knowledge and practical applied work experience, to cater to students with different learning preferences and interests and to improve graduate employability. As Singapore’s fifth autonomous university, SIT will spearhead this applied degree pathway through its partnerships with industry and a new Cooperative Education programme, which integrates meaningful work experience into the academic course requirements. In this sense, the applied degree

pathway has distinct benefits compared to concurrent part-time work and study, as the former explicitly integrates lessons from work experiences with academic knowledge.

Eligibility criteria for CET programmes have also been broadened to allow more groups of employees to access training and education programmes. For instance, selected WSQ and Workplace Literacy and Numeracy (WPLN) qualifications can be used for admission into part-time Diploma programmes. This would also have the beneficial complementary effect of increasing the attractiveness and value of these WSQ and WPLN qualifications. In addition, UniSIM's full-time programmes will admit fresh school leavers as well as working adults, and will take into account work experience and talents in its admission policy, beyond academic grades.

These improvements in convenience, accessibility and eligibility would result in an increased demand for CET. Therefore, complementary initiatives are required to ensure that **sufficient training places** are available to accommodate this larger group of learners. With the Government's emphasis on continuous skills upgrading, Singapore's annual CET capacity has already quadrupled from 22,000 workers in 2008 to 80,000 workers by 2010, and the challenge is to further expand this capacity. Two National CET Campuses will be located at Paya Lebar Central and Jurong Lake District. The campuses are expected to be completed by 2013, and to provide a combined total of about 150,000 training places annually. On its part, MOE aims to expand the publicly-funded university cohort participation rate (CPR) beyond its current level of 27%, to 30% in 2015, and 40% by 2020. This entails providing 16,000 university places per year, up from 13,000 today. As the part-time publicly-funded CPR could grow from 7% today to 10% by 2020 as training demand increases, the total publicly-funded CPR could reach 50% by 2020. This substantial increase will be achieved through the offering of full-time degrees

by SIT and UniSIM, and the earlier projected place increases in NUS, NTU, SMU, Singapore University of Technology and Design (SUTD), LASALLE College of the Arts and Nanyang Academy of Fine Arts (NAFA). MOE will also increase training capacity at polytechnics and ITE. For instance, the number of places in part-time polytechnic Diploma, Advanced Diploma (AD) and Specialist Diploma (SD) programmes at the polytechnics will increase by 60% – from 6,400 to 10,100 places – by 2015.

Productivity, Inclusive Growth and Wages

There is little doubt that a productivity-oriented growth strategy is the best choice for a small, densely-populated and land-scarce city state. In this context, the ESC's and NPCEC's broad recommendations are important and timely for achieving this goal. The ultimate objective of productivity growth is to sustain inclusive economic growth, with its consequent benefits for firms and employees. Hence, it is useful to consider the linkages between productivity, growth and real wages in more detail, and identify opportunities for strengthening these linkages.

The association between productivity and wages is a cornerstone of traditional microeconomic theory, in particular the idea that wages are closely related to the marginal revenue product of labour.⁶ In its simplest form, the theory states that in a freely competitive market for goods and labour, profit-maximising firms will demand labour up to the point where the revenue generated by hiring an extra worker is equal to the cost (wage) of hiring that worker. The implication of this model is that the only way to sustainably raise wages is by increasing the revenue generated by workers, and that real wages should increase in line with productivity growth over the long term.

6. Basic microeconomic theories linking wages to the MRP of labour can be found in Sloman (2006), pp. 232–236 and Mankiw (2007), pp. 393–399. Borjas (2010) Chapter 3 covers the issue in more detail.

There is some evidence that real wage growth moves broadly in line with productivity growth in Singapore. From 2000 to 2011, real total wages including employer CPF contributions grew at an annualised rate of 1.6% per annum, slightly lower than that of labour productivity at 1.7% per annum.⁷ However, given the volatile nature of Singapore’s productivity changes, we can observe some divergence between productivity and wage growth if different timeframes are chosen. For instance, the National Wages Council (NWC) reported in 2011 that from 2002 to 2010, Singapore labour productivity grew by an average 2.1% per annum, and outpaced growth in real total and basic wages of 1.6% per annum and 1.1% per annum respectively over the same period. Conversely, real total wage growth outpaced productivity growth from 2007 to 2009. A longer-term perspective from 1992 to 2010 shows the volatile relationship between the annual rate of change in productivity and real wages.

Figure 3. Labour productivity and real wage growth, 1992–2010



Data sources: Ministry of Manpower (MOM), Singapore Department of Statistics (DOS)

7. Ministry of Trade and Industry. (2012, May). *Economic survey of Singapore: First quarter 2012*. Retrieved from http://www.mti.gov.sg/ResearchRoom/SiteAssets/Pages/Economic-Survey-of-Singapore-First-Quarter-2012/FullReport_1Q12.pdf

Decoupling was much stronger in the US – labour productivity grew 76% more than median wages from 1972–2010, due partly to growing inequality, a lower wage share of GDP and a divergence in producer and consumer prices (Pessoa & van Reenen, 2012, p. 27). This tells us that labour productivity growth is only one of many determinants of real wage growth. As many empirical studies show, in nominal wage-setting processes, inflation and the stance of the labour market (e.g., level of reservation wages, and the preference for leisure time and informal employment) play a role, along with the level of taxes and benefits. Furthermore, in the real world, firms and/or workers are likely to have the power to influence wage rates through bargaining and *faits accomplis*.

Productivity thus provides the *potential or enabling conditions* for higher wage growth; it does not ensure higher wage growth. It is therefore important to strengthen the linkages and speed of transmission between productivity gains and higher wages. The ESC (2010) noted:

To ensure sustainability of our productivity efforts, there should also be a closer linkage between productivity and wage growth to motivate workers, through performance-based remuneration, to pursue skills upgrading and contribute to raising the capabilities of our workforce. (p. 82)

Productivity and Inclusive Growth

Singapore relies on consensus-based tripartite partnership between employers, employees and the Government to resolve labour-related disputes, implement productivity initiatives, and maintain a balance between ensuring wage competitiveness and fair remuneration for workers.

The NWC was formed in 1972, at a time when Singapore was undergoing a period of rapid industrialisation, which had

resulted in rising wage expectations. The NWC was thus set up to formulate wage guidelines to keep pace with long-term economic growth, so that Singapore's economic and social development would not be undermined. The NWC is a tripartite body comprising representatives from the employers, the trade unions and the Government. The NWC meets every year to reach a consensus on wage and wage-related matters, and issues annual wage guidelines based on this consensus. In making its recommendations on wage adjustments, the NWC considers factors such as productivity growth, unemployment rate, international competitiveness, and economic growth. A guiding principle established and observed by the NWC is that wage increase should follow productivity growth. This is to ensure that wage increases do not overshoot economic growth and are sustainable in the long run.

Former Chairman of the NWC Professor Lim Chong Yah (2011) noted that the tripartite model required “decisions on changes in national wage policy, wage systems, and wage rates to have the written public agreement of all the three social partners (unions, Government and businesses), all the 30 members, and alternate members of the NWC.” (p. 4) Wage or labour disputes can be unilaterally referred to a neutral third party for non-legally binding conciliation, and if this fails, to the Arbitration Court for binding settlement. This model has won international accolades: for instance, the World Economic Forum's World Competitiveness Yearbook 2012–2013 ranks Singapore second worldwide for cooperation in labour-employer relations, first for its quality of institutions, second in higher education and training, and second in labour market efficiency.

Despite these successes, the NWC has expressed concern that while some workers have seen their real incomes increase over the last 10 years, the income growth of low-wage workers has lagged

behind the rest of the workforce. Employees in this group have not kept up with the overall pace of economic upgrading, productivity gains and wage increases. In 2012, the NWC recommended that workers earning a basic monthly salary of up to \$1,000 be given a built-in wage increase of at least \$50, plus a single lump sum payout if the company could afford to. To ensure that wage increases translate effectively into higher standards of living, future wage increases due to labour productivity gains must not be undermined by extensions in working hours or reductions in worker benefits in other areas. This can be done by monitoring a measure of low-wage workers' **total hourly compensation package** rather than their total or basic monthly wages. To mitigate excessive wage pressures on the economy, the link between productivity and wages must operate smoothly in both directions. The increasing implementation of flexible wage contracts enables worker compensation to be adjusted downwards in response to economic downturns, helping the economy to recover more quickly while minimising layoffs and unemployment.

To strengthen evidence-based policymaking in this area, there is value in **conducting further empirical research in Singapore** on the specific linkages between wages, productivity and growth. Conventional human capital theory suggests that training increases productivity, increasing growth and then wages. Other economic theories suggest separate linkages between these complex variables. Proponents of tournament theory and efficiency wages argue that workers make sophisticated choices on work effort based on the remuneration from work, attractiveness of leisure (or non-work) time, nature of their compensation scheme, and their level of ambition to match the pay of better-performing colleagues.⁸ Hence, if workers are reasonably motivated and rational, then wages will affect

8. On efficiency wages, see Shapiro and Stiglitz (1984). On tournament theory and the impact of varying compensation structure on worker productivity, see Lazear and Rosen (1981) and Lazear (2000).

incentives to work and train, which affects productivity and growth. Endogenous growth models (Romer, 1990) further examine the connection between innovation, R&D and growth. Because innovation budgets and priorities are the product of strategic management decisions, they can be affected by the attractiveness of other options. A “low-wage low-skill” equilibrium may thus reduce the incentive to innovate, reducing productivity growth in the long run. Finally, the relationship between training and wages appears to differ from industry to industry. According to van Reenen (2005), US and UK-based studies indicate that vocational training tends to have a lower impact on wages. This could possibly be due to the larger and more liquid supply of lower-skilled manpower, and its effect on the relative bargaining power of firms and employees. Testing the salience of these hypotheses and theories using updated Singapore labour market data would provide a useful input for policy design.

Concluding Remarks: Strengthening the “Payoff” Outcome in CET

The NPCEC measures outlined earlier will have substantial positive impact on the attractiveness, quality and accessibility of CET. In particular, the expansion of financial assistance to employers and workers for CET, diversification of eligibility criteria, strengthening of quality standards and the introduction of an applied “work-study” CET pathway are particularly useful.

One remaining concern is the increasing **proliferation of funding and assistance schemes** managed by different agencies with various application procedures and approval criteria. The national productivity movement’s consolidated list of assistance schemes is 20 pages long,⁹ and there is also an ever-expanding range of modular options to promote customisation and tailoring of CET to individual needs.

9. See <http://www.waytogo.sg/uploads/files/schemes.pdf>, accessed 15 September 2012.

Conventional economics suggests that more choice is always better, and it is undeniable that some differentiation and variation of schemes to suit specific sectors and employee groups is beneficial. However, behavioural economics research in areas as diverse as pension investment options and jam purchase indicates that a surfeit of choices can cause information overload, paralysing consumers. Furthermore, even where people actually make choices, they may not be the best ones for them. As observed by Tapia and Yermo (2007, p. 25), “limitations to cognitive abilities and behavioural challenges thwart the intention of many to make effective choices.”¹⁰ These effects are exacerbated when the decision to be made is complex, the ramifications of poor decisions are significant and often frightening, and the decision occurs infrequently, so people lack experience and have little opportunity to refine their decision-making processes. It is likely that enrolment decisions in major CET programmes (e.g., part-time degree courses) fall under this category.

There is evidence that these extensive choice problems can be mitigated through the **use of intermediaries** (such as department store “Best Buy” labels) or the reliance on experts to shortlist beneficial options, or even to take over decision-making authority (Earl & Potts, 2004). In this regard, the training and career counselling and matching services offered by agencies such as e2i and WDA play a useful role, but information about CET funding and courses remains dispersed across various websites (e.g., WDA, MOM, IAL, MOE, the Ministry of Finance (MOF) and various tertiary institutes) and there is, to date, no one-stop portal or agency that guides workers through making intelligent choices between all subsidised CET funding and courses offered by different agencies. It may also be possible to further consolidate and rationalise funding schemes (e.g., the Media Development Authority simplified its funding schemes from 46 to five in September 2011), and frame

10. See also Benartzi and Thaler (2007) and Iyengar and Lepper (2000), and Scheibehenne et al. (2010) for a contrary viewpoint.

training choices in terms of final objectives and recommended packages of modules.

Another related challenge is how we can **augment traditional productivity measures** to present a better reflection of the added value that employees bring to their firms after CET. Ultimately, labour productivity is only a simple ratio of a country's GDP to its hours worked, and Singapore's volatile productivity growth figures are heavily influenced by the state of the world economy and our major trading partners. Singapore's total imports and exports amount to around 300% of our GDP, and therefore measures of our output per hour worked are relatively susceptible to the impact of external events such as foreign banking or debt crises, natural disasters or spikes in the prices of key factors of production such as crude oil, as well as policy-dependent variables such as the Man Year Entitlement (MYE) ratio¹¹ and the exchange rate.

Pegging wage increases to productivity may be a rational long-term strategy in a situation of competitive global product and factor markets, but it may nonetheless be demoralising to employees who work hard and train to the best of their abilities and produce higher quality goods and services, but do not receive commensurate wage increases due to exogenous events resulting in slower or negative GDP growth. From this perspective, the Government's efforts to encourage sector-specific measures of productivity improvement (such as process innovation for the precision engineering and logistics sectors,

11. The Man-Year Entitlement (MYE) system was implemented by MOM since 1998 to moderate the inflow of foreign workers in the Construction and Process sectors. Based on the value of projects/contracts awarded by developers/owners, main contractors are allocated a number of "man-years" required to complete a project (1 "man-year" = 1-year employment under a Work Permit), thereby controlling the number of foreign workers from Non-Traditional Sources (NTS) it is entitled to employ. From March 2008, exceptions were made to allow employers to bring in experienced NTS workers without needing MYE, through paying a higher monthly levy.

and sales per customer for the retail sector)¹² are very timely and complementary indicators of the tangible improvements obtained through CET.

Singapore has chosen a difficult but sound approach to medium-term inclusive growth. *The Economist* (2011) recently summed up the policy choice facing countries:

If you want to increase competitiveness, productivity growth is less disruptive than wage cuts, and wage cuts are better than unemployment [...] The best recipe for growth is to raise productivity through structural reforms – but nobody said that was easy.

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How Should Singapore Respond to the Global Auction for High Skills?

Phillip Brown and Hugh Lauder

Singapore is one of the most open and successful economies in the world. It is highly rated in all the major league tables on economic performance, global competitiveness and educational performance. An enduring commitment to developing the skills of the workforce has been at the heart of Singapore's spectacular rise from an entrepot economy in the late 1960s. Beginning with low-skilled jobs in manufacturing, Singapore has now established itself as a major location for research, financial services and high-end manufacturing. It is tempting to conclude that as long as Singapore continues to invest in education and employability skills, this process of workforce upgrading will continue to deliver rising prosperity and a competitive economy.

However, over a decade of research investigating the strategies of leading global companies and governments across Asia, Europe and North America has led us to challenge the widely held assumption that incomes will rise in line with individual and social investments in education. The reality is that there is no universal law determining the relationship between skills, jobs and incomes. Indeed, we argue in our book, *The Global Auction* (Brown, Lauder,

& Ashton, 2011),¹ that we may be witnessing a seismic shift in the world economy which not only accelerates economic development in Asia but raises profound questions about the viability of Singapore's approach to sustaining economic competitiveness: reducing its reliance on foreign talent; increasing the proportion of the workforce in professional, managerial, executive and technical (PMET) occupations; and improving the productivity of the workforce to deliver higher wages while narrowing income inequalities and building a shared prosperity.

Central to *The Global Auction* thesis is the view that the competition for jobs has shifted, from one largely restricted within clearly defined national boundaries to a global auction open to competition from across borders. While this has created new employment opportunities within global labour markets, it is characterised by a “dual” auction. We are all familiar with art auctions held by Sotheby's or on eBay. In these forward or progressive auctions, the highest bidder wins. The human capital view of “learning equals earning” is consistent with this view as the more workers invest in their skills, the more they are assumed to earn. In the global auction, it is still the case that those defined as “high potential” with degrees from prestigious universities and recruited by leading employers will continue to benefit from a Sotheby's type progressive auction, but many other college and university graduates will not. The global auction for jobs increasingly works in reverse to an auction where the highest bidder wins. In a reverse auction for jobs, Singaporeans with high skills as well as low skills, will find that learning may not meet their earning expectations given the increasing supply of graduates both in Singapore and beyond. There are four major trends converging to create a reverse auction for cut-price brainpower. These will be briefly outlined before assessing their implications for Singapore.

1. Based on a major international study, *The Global Auction* draws on cutting-edge research to show that competition for good, middle-class jobs is now worldwide.

Education Explosion

First, there has been an education explosion in the supply of university educated workers in both affluent and emerging economies. Even when limited to developed economies, this expansion poses a problem for middle-class families because widening access to a college education often reduces the value of credentials in the competition for jobs, unless it comes from a top-ranked university. But of even greater importance is the education explosion in emerging economies, leading to a doubling in the numbers of university-level enrolments since the mid-1990s. In 2009, over 179 million students had access to the same technological, business and scientific developments previously reserved for those studying in Western universities. This global supply of educated labour continues to expand. While some European countries are cutting university numbers, China has introduced a new talent initiative that will see an additional 95 million university graduates enter the global job market in this decade.

Quality-Cost Revolution

The global expansion of higher education would be less of a problem for Western societies and Singapore if emerging economies failed to match the quality standards of the developed economies. The bad news for the developed economies is that the second trend is a quality-cost revolution – resulting in a rapid increase in productivity levels and quality standards, and at lower costs than in the West, following the application of “best practice” in emerging economies.

On a visit to the engineering heartland of Baden-Württemberg in Germany, we asked a corporate executive at a leading car-maker about his company’s global operations. When asked if they could produce their luxury models elsewhere in the world, his response was an emphatic “No!” He explained that the quality of engineering required in the production of their luxury models meant that they

could only be produced in Germany. This was in the late 1990s. When we returned several years later, we met up with the same executive and posed the same question. This seemed to take him by surprise, not because we had asked it before but because the answer was obviously a “Yes!” Now, they were not only building their entire product-range outside Germany, but in an emerging economy.

We found the same story in many companies. The new competition is no longer based on quality *or* cost but quality *and* cost, offering companies more strategic choices as skills are less of a barrier to moving operations to low-cost locations. In financial services, jobs like client research and product development, as well as back office work such as data entry or invoicing, are now being undertaken in emerging economies. As a senior Indian manager working for an American investment bank told us, “We’re not doing those menial call centre type jobs. It’s global work and that’s where we think we’ve been able to add a lot more value than what was initially expected and that will continue.”

The quality-cost revolution has also opened the door for Chinese and Indian companies to compete higher up the value chain for goods and services, by using their cost advantage to undercut high-cost competitors. Consequently, many of the things we thought could only be done in a small number of mature economies can now be done anywhere in the world; it is not only cheaper but sometimes better. However, shifting high-skilled jobs to low-cost locations is not the end of the story.

Digital Taylorism

While much of the focus has been on the development of new products and services that highlight the demand for creative people exploiting clever ideas, it has ignored the shift towards global standardisation or alignment within companies, along with efforts to “capture” and digitalise knowledge that had previously

remained locked in the heads of professional workers. Indeed, the productivity of new technologies in offices and professional services was disappointing in much the same way that it took decades for the potential of factory production to be realised.

Our third trend shows how companies and cash-strapped public sector organisations in Western societies are attempting to reduce costs and increase control through a process of knowledge capture that we call *digital Taylorism*. The same processes that enabled cars, computers and televisions to be broken down into their component parts, manufactured by companies around the world and then configured according to customer specifications, are being applied to impersonal jobs in the service sector – jobs that do not depend on face time with a customer. In short, if the 20th century brought about *mechanical Taylorism* characterised by the Fordist production line – where the knowledge of craft workers was captured, codified and re-engineered in the shape of the moving assembly line by management – the 21st century is the age of digital Taylorism.

New technologies have increased the potential to translate *knowledge work* into *working knowledge*, leading to the standardisation of an increasing proportion of technical, managerial and professional jobs. Consequently, this raises fundamental questions about the future of knowledge work and social mobility. This is why Suresh Gupta from Capco Consulting foresees the arrival of the “financial services factory”,² because as soon as banks or insurance companies begin to break tasks down into a series of procedures or components that can be digitalised, it gives companies more sourcing options such as offshoring, so if these trends continue, “tomorrow’s banks would look and behave no differently to a factory”.

2. Suresh Gupta. The financial services factory. *Journal of Financial Transformation*. Capco Institute, <http://www.capco.com/journal.html>

This is exactly how it felt to a business relations manager working for a leading British bank. He shared how his discretion over the amount of money he could lend his clients had been removed. The bank previously respected his expertise and judgement in making decisions, but loans were now authorised by a “credit controller” — a software package that automatically assesses a loan application according to standard criteria. Only in appealing against the controller’s judgement does the manager have a role, but even in these cases, he was often overruled. From a position of authority and respect, he now described himself as a salesperson, armed with a series of software manuals on how to sell particular kinds of products, which also meant that, “a junior with a ready smile could now do my job”.

War for Talent

The final trend relates to what is described within the business literature as the global war for talent. Just as students and their families are being asked to pay more for a university education, the relationship between learning and earning is being pondered within the business community. Leading consultancy companies assert that the relationship between learning and earning needs to be revised because it is less applicable in today’s competitive world and fails to reflect differences in performance, especially the productive contribution of a talented minority of top performers. This is viewed as a critical issue for global companies in Beijing, Shanghai, Bangalore as well as London, New York, and Frankfurt.

Concerns about hiring the next generation of talented employees has led many companies to gravitate towards global elite universities because they are assumed to attract the best and brightest students. The head of human resources for a major global bank was in no doubt as to why her company set the bar extremely high, because they are not “selling anything but our brainpower”, so “we are very keen to get the best talent so we

go after the elite...in other words we want to get the top half percentile of university students... we're not interested in the rest.”

This focus on attracting, retaining and developing top talent, leads towards greater inequality of treatment, as companies seek to identify a cadre of high-flyers across the globe. It also contributes to widening income inequalities within middle-class occupations and differences in career prospects among people with the same credentials, experience, or levels of expertise. Hence, those defined as the best are being treated very differently from the rest.

These trends suggest that the squeeze on the middle classes may be more far-reaching than often thought, with the prospect of many university educated students becoming part of a high skill, low wage workforce. Previously, differences in income were assumed to reflect a meritocratic pyramid of individual achievement. This relationship has never been straightforward, but it is now in crisis as the relationship between jobs, incomes, and entitlements is being reconfigured.

The squeeze on the middle classes is also evident in all affluent nations as the global auction begins to take its toll, but how it plays out in countries such as Singapore, Britain, Germany or the United States will vary, depending on national context, including labour market conditions, domestic supply of graduates, and the country's social and industrial policies. In Britain, for example, the financial crisis has made the trading position of many middle-class families a lot tougher, and the political adherence to free market competition has left British workers seriously exposed to the full force of the global auction. Singapore, along with much of Asia, has avoided the worst of the debt crisis and its recessionary consequences that currently afflict much of Europe, but the global auction raises important policy questions that require further investigation.

Policy Questions for Singapore

Trend One: Globalisation of “High Skills”

Our research shows that “supply” side solutions involving further investment in human capital is unlikely to deliver competitive advantage for the simple reason that many emerging, as well as developed nations, are adopting the same policies. This is not to say that the quality of education no longer matters; it obviously does. It highlights questions about the quality of education and what is being studied, including the role of Science, Technology, Engineering and Mathematics (STEM) subjects. Whatever form the knowledge-driven economy takes in the future, high-quality teaching in STEM subjects is going to be important, but so is a culture of innovation which is hard to achieve in high stakes educational competitions, that encourage people to “play it safe”. This is a major challenge given that Singapore’s education system is intensely competitive within a narrow definition of meritocratic achievement, one that seeks to identify and sponsor an elite cadre of academic talent at a relatively early age. This is an issue to which we shall return.

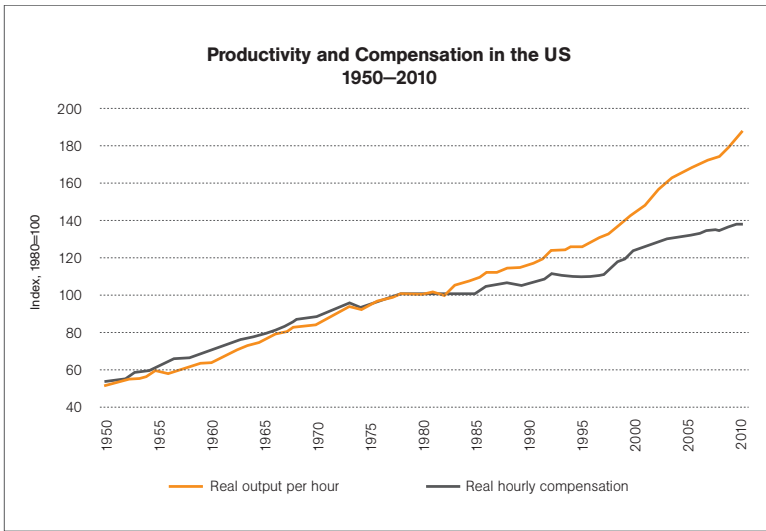
The question of meritocratic opportunity is closely related to issues of widening participation in higher education. While the Singapore Government has presented the economic challenge as one of a “permanent revolution” requiring re-skilling and up-skilling, its success at raising incomes has heightened expectations of what an education can deliver in terms of income and quality of working life. This has resulted in a public demand for a further expansion of higher education. But this comes at a time when the “learning = earning” equation is being called into question, and unless Singapore can address the strategic questions that are raised by the global auction, a university education may not deliver the “graduate premium” that many may expect.

Underlying the rise in the numbers of well-qualified graduates are fundamental questions about the relationship between education, productivity and incomes. In Singapore, it has been assumed that it is the greater productivity that education can yield that leads to higher incomes and this assumption currently dominates the policy agenda in Singapore. The Economic Strategies Committee report (2010) notes that:

What matters most is the growth of incomes of our people. We can only raise wages and incomes on a sustained basis if productivity rises. With the shift to productivity-based growth, we will be able to get higher growth in wages and incomes. (p.7)

Such ideas are based on the idea that *Upgrading Skills* → *Rising Productivity* → *Higher Incomes*, therefore if skills can be successfully upgraded, rising productivity and prosperity will follow. The problem with this view is that productivity data show the United States as being the most productive in the world, but this is a society that has witnessed widening inequalities, where most of the benefits in terms of productivity have gone to corporate leaders and shareholders rather than to employees (see Figure 1). Therefore, even if skills can be lifted and these skills can be utilised by companies to improve productivity, the assumption that the benefits of productivity will be transferred, through incomes, to employees is not supported by the country which is held out to be a leader in productive innovation.

Figure 1. Lagging wages, rising productivity, United States, 2011



Source: Economic Policy Institute, Washington, DC

This raises at least two questions about the relationship between productivity and incomes in Singapore. Does the relationship still hold? And if so, how can it be sustained in the light of the Global Auction which is likely to bid down the wages of graduates, with the exception of those considered the most talented?

Trend Two: The Quality-Cost Revolution

The declining cost of “quality”, resulting from technological innovation and the increasing capacity of China and India to thrive in the global economy based on low-cost competition, represents both an opportunity and a challenge to Singapore. It presents a major opportunity with the rising consumer power of China and India. Singapore is ideally located for both Western companies expanding operations in Asia, and Asian companies seeking to expand regional and international markets.

However, the challenge is how global value chains can be harnessed to facilitate the development of indigenous small and medium-sized enterprises (SMEs), raise productivity, and upgrade the skills of the workforce. These are important issues because they offer a sustainable way of transferring some of the knowledge, technologies and techniques adopted by transnational companies (TNCs) to SMEs. It also offers a strategy for gaining a degree of economic autonomy within a context of the market volatility created by TNCs, who are constantly looking to reduce costs through relocation. By developing indigenous SMEs with the potential to grow into TNCs, Singapore can create a degree of insulation from this volatility. It has sought to develop this strategy for some time but in the light of the Global Auction, there is greater urgency. However, the extension of global value chains and the restructuring of the division of labour create a new context for this strategy because global value chains cut across traditional relationships between employees, suppliers, companies, universities etc., in the global economy. This suggests that transnational companies are less dependent on “national” systems of skill formation to achieve economic competitiveness. As Singapore develops a strategy to address these new challenges, it is clear further research is required to understand how the Singapore model of skills, talent and innovation relates to the skill strategies of TNCs. Does it have a comparative advantage in this respect or does it need to change its model of skills and talent in these new circumstances?

Another major challenge is to avoid the growing income disparities and poverty as experienced in the United States and Britain. In short, we need to ask: quality at what price? Can Singapore find ways of ensuring that the fruits of economic development are spread beyond “oasis” operations, some of which exploit the vulnerability of employees that may have few realistic opportunities of finding alternative employment? This raises important questions about the benefits of economic growth, for if high-tech and no-tech

exist side-by-side, then most of the assumed connections between economic efficiency and social justice no longer hold – unless there is the political will for shared prosperity.

Trend Three: The Rise of Digital Taylorism

The rise of digital Taylorism poses important questions about the demand for skills and the role of education. It may limit the numbers of employees given permission to think to a relatively small proportion of elite employees responsible for driving the business forward, working alongside equally well-qualified workers in more Taylorised jobs. This process is at an early stage in many organisations but three types of knowledge worker can be distinguished: Developers, Demonstrators and Drones. Developers are the high potentials and top performers who typically represent no more than 10% to 20% of an organisation’s workforce; they are given “permission to think”, and include researchers, senior managers and professionals. Demonstrators are assigned to implement or execute existing knowledge, procedures, or management techniques, often through the aid of software. Much of the knowledge is standardised or pre-packaged, used for example by managers, teachers, nurses, and technicians. Indeed, while demonstrator roles may include well-qualified people, much of the focus is on effective communication with colleagues and customers. Drone roles involve routinised work where people have limited discretion. Many call centres or data entry jobs are obvious examples where much of what is communicated to customers is pre-scripted in software packages. Many of these jobs are also highly mobile as they can be standardised and digitalised. Increasingly, they are either filled by well-qualified workers attracted by relatively high salaries in emerging economies, or by over-qualified workers in developed economies, who struggle to find a job matching their training or expectations.

Digital Taylorism does not eliminate the importance of employee motivation or the need for good soft skills, (e.g., self-management or customer-facing skills), as standardisation required to achieve mass customisation still needs customers to feel that they are receiving a personalised service. This may contribute to a continuing demand for university graduates but their occupational roles are far removed from the archetypal graduate jobs of the past. This raises the intriguing question of the extent to which knowledge work can be standardised and its potential impact on the demand for creative knowledge workers and returns on investments in higher education. The question is: how would a much better educated workforce in Singapore respond to work that does not fulfil their expectations? This poses a major issue for Singapore as it continues to increase investments in human capital in the belief that there will be a demand for high-quality private sector jobs. The rise of digital Taylorism reinforces the need for strategic policy development in this area, as well as careful monitoring of occupational change and skill requirements.

Trend Four: The War for Talent

A key issue is whether Singapore's model of talent creation is "fit for purpose" in a rapidly changing context of regional and global economic competition. This is particularly important in the Singapore context, where there is increasing impetus towards reducing its dependence on foreign talent in private sector employment, which in turn leads to key questions concerning the definition, development and recruitment of talent.

The expansion of higher education and reduction in Singapore's reliance on foreign talent may be viewed as interconnected, but what is the relationship between a graduate education and the way companies define managerial talent? Is there a perceived difference in knowledge, skill sets, or mind sets between Singapore university graduates and foreign graduates with respect to talent

and its perceived relationship to productivity? How can Singapore increase its talent pool of indigenous workers, and to what extent are policymakers working with an appropriate definition of a talented workforce?

This also suggests the need for further research into what constitutes talent and how it is defined and managed within Singapore; and how this relates to the way talent is defined and managed within companies operating in the city-state. The key questions are:

1. To what extent is talent defined and managed differently in different industrial sectors and by companies within specific sectors?
2. Are there differences in the way talent is understood and managed in foreign transnational companies, as opposed to Singapore-based companies?
3. What is the relationship between skills, talent and productivity in different industrial sectors?

Conclusion

The Global Auction poses a fundamental challenge to developed nations that have based their competitiveness strategies on raising the skills of their workers. The rise of global labour markets for high-skilled workers, coupled with the introduction of standardised and routinised knowledge work through digital Taylorism raises fundamental questions about the viability of this strategy.

Singapore has been a world leader in the development of a demand-led strategy for raising skills. However, should it continue to modify this strategy incrementally? Or is a fundamental reappraisal needed – on how a highly-skilled work force can be delivered on the promise of rising prosperity for individuals and their families? Given its size, strategic position and lack of natural

resources, Singapore has few options but to focus on its human resources, and to continue to pursue the broad strategy of raising the demand and supply of skills.

The central question is how best this can be achieved in the light of the Global Auction. While seeking the answer, several issues need to be addressed:

- the conditions under which Singapore can be included in TNCs' value chains;
- the model of talent, skills and innovation that hitherto has been successful;
- the possibility of growing SMEs into TNCs; and
- how the rising aspirations of a growing middle class can be met.

These four issues are interrelated and it is important to draw the connections between them if a viable model of economic development is to be created.

Singapore's Continued Involvement in TNCs' Value Chains

To date, Singapore has adjusted its strategy – with respect to the changing decisions made by TNCs – to sustain the central idea of raising the demand and supply for skilled workers. The most recent, high profile, iteration of this strategy has been to attract and keep TNC regional head offices in the city-state. However, with a widening range of options that TNCs now have, and the attractiveness of locating their operations close to the rapidly expanding markets of China, Indonesia, and Vietnam, the strategy for continuing to attract high-skilled work is all the more pressing. Clearly, a key factor for TNCs has to be the availability of talented workers in Singapore. In the past, TNCs have recruited high value talent from around the world and then located them in Singapore. But that is a strategy that they can employ anywhere they choose to locate. Therefore, the key for Singapore is to provide indigenous

talented workers that will prove attractive to TNCs, and at the same time, create greater job opportunities for Singaporeans. In turn, the success of such a strategy will depend upon the way talent is constructed in Singapore. This then brings us to the second point.

The Model of Talent, Skills and Innovation

All countries have a particular model of talent and how it is to be selected and promoted through the education system. Arguably, how talent is understood, selected and promoted will determine the structure of education systems. Singapore has a high-stakes, intensely competitive education system (high stakes in the sense that there has, in the past, been little second chance education for talented individuals who, for whatever reason, have not been academically successful). At the same time, the education system has served the city-state well in identifying scholars who have served the country at the highest levels. There are three issues that arise in relation to this model of education and the talent it produces:

1. How can we best understand the nature of talent and are the qualities associated with the talented changing in the light of economic and social demands?
2. Is the talent that has served the city-state so well also the kind of talent that will flourish, entrepreneurially, in the private sector?
3. In what ways, if at all, does the education system need to change to meet the modern demands for talented individuals in the civil service and private sectors?

In raising these questions, we are aware of two issues. First, that there is a concern that the provision of greater second chance education, which may be considered as a fairer way to widen the pool of talent that can be selected, may at the same time have a negative impact on student motivation, precisely because they can have another bite of the cherry. Second, reforming the education

system in response to the demand for new kinds of talented workers has to be weighed against the success of the current system. There may be costs in changing a “winning” formula, just as there may be costs in keeping the *status quo*.

Growing Indigenous SMEs into TNCs

Singapore has already put in place a range of policies to grow its own SMEs and TNCs, and to develop the innovations necessary for global competitiveness. Our interest is in the skill sets that are necessary to convert the potential of these policies into successful practices. Again, some of these policies have utilised foreign talent to incubate innovations. The question here is what kinds of skills and talent are required from Singaporeans so that they can be employed to further SME development from “innovation to invoice”.

Meeting the Rising Aspirations of a Growing Middle Class

Clearly the issues we have identified above are all related to creating the demand for highly-skilled workers. At the same time, it may be that middle-class aspirations are also pressing for changes in providing greater opportunities for degree-level credentials. In itself, this may change the nature of the system for identifying, selecting and promoting talent – which will be to Singapore’s advantage if it is clear as to the nature and demand for talented and skilled workers within the context of the Global Auction.

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Disruption in the Global Higher Education Marketplace:

Key Trends, New Entrants and Implications for Singapore

David Finegold

Introduction: Disruption in Higher Education

For many decades, the higher education (HE)¹ sector has enjoyed sustained and relatively stable growth around the world to meet the steadily increasing demand for degrees. In the last few years, however, a set of changes in the global HE marketplace threaten to destabilise universities around the world. This paper will: 1) outline these trends; 2) provide a conceptual framework that identifies three key attributes of HE institutions that shape the individual's HE preferences – perceived educational quality, price/affordability, and convenience – and analyse emerging new business models in HE; and 3) explore the implications of these trends for Singapore and how the nation has been responding.

The Great Doubling: Supply of Graduates Exceeding Demand

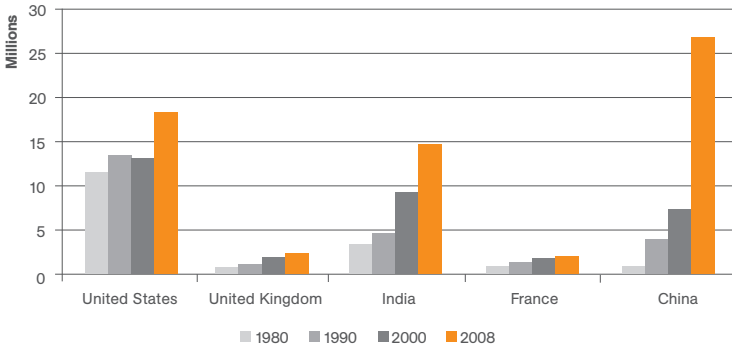
Two major disruptions to the global economy have called into question the trend of high-quality jobs and rising living

1. The terms higher education (HE) and post-secondary education (PSE) are used interchangeably in this paper as the discussion on the disruption in the HE sector is also applicable to that in the PSE sector (i.e., Diplomas and above).

standards for the majority of graduates that was sustained for several generations of graduates – will this persist in the coming decades of the 21st century? The first was “the great doubling” (Freeman, 2008, p. 1), the huge influx in availability of new talent supply for global corporations that occurred in the 1990s as a result of the collapse of the Soviet Empire, the opening and liberalisation of China and India and their entry into the World Trade Organization (WTO), and the spread of the Internet and decline in communications and transportation costs that made the workforce of these nations accessible to employers around the world. Much of this growth in talent supply has occurred on Singapore’s doorstep, with the greatest increase in the volume of graduates coming from China and India (see Figure 1). In China alone, the number of post-secondary education (PSE) graduates has grown over tenfold in two decades: from 600,000 in 1990 to over 6.5 million in 2009. And by 2020, China and India together are projected to have over 40% (China–29%, India–12%) of the world’s supply of 204 million graduates between the ages of 25 to 34.

The rapid increase in labour supply has greatly exceeded the increase in capital, depressing the share of productivity gains and profits going to workers. This was particularly true for workers in manufacturing, who were most subject to global competition. While overall skill demands are rising, the growth in highly-skilled jobs, across most Organisation for Economic Co-operation and Development (OECD) countries, has not kept pace with the growing number of graduates entering the labour market. This gap has only grown since the global financial crisis (GFC) and the collapse in new hiring it precipitated in many nations.

Figure 1. Enrolment in tertiary education for selected countries



Note: India: 2007 instead of 2008

Source: World Bank, EdStats

The second great shock was that the GFC led to the deepest recession since the Great Depression in the world's two largest economies – the United States (US) and European Union – and an accompanying reduced demand for labour. The second-order effects of this are just now being felt as governments – particularly in the US, the United Kingdom (UK), and Europe – try to close structural budget deficits by making major cuts in the public sector, one of the primary sources of graduate job growth in the first decade of the 21st century. New graduates have been particularly hard hit. Besides having to fund more of the costs of their education as public subsidies decline, they are forced to compete with a large supply of experienced and highly-skilled workers, resulting in large increases in graduate unemployment in many nations. Singapore has been fortunate to have been shielded from some of the worst effects of the GFC, with demand for graduates remaining more robust throughout this period.

The coincidence of these two trends – sharp increases in the supply of highly-educated individuals and a deep recession and slow recovery – has caused some policymakers to focus on skills demand, as concerns grow about whether there will be a sufficient

supply of jobs for these new graduates. The Scottish Government and the UK Commission for Employment and Skills (UKCES), for example, have recently joined countries like Singapore and Finland, which have had a longer-term policy focus, on trying to stimulate the creation of high skills jobs – both by encouraging existing employers to move up market and stimulating the growth of new, innovative enterprises. Policymakers in these countries recognise that with the advent of the Internet, sharp declines in transportation and communication costs, and integration of emerging economic powers like China and India into the WTO, companies can now draw on a large pool of high skill talent, picking locations for different forms of work where they can get the right skills at the right price (Brown, Lauder, & Ashton, 2011). This leads the UKCES to conclude that for Britain “to recover from recession and thrive in the new global economy, employers must become more productive and effective in their field. Businesses will need to build their future on innovation, quality, high value added and efficiency” (UKCES, 2009, p. 147).

Thanks to the combination of large government and individual investment in HE in Singapore, its universities have thus far not suffered from some of the other related trends that are forcing major changes in HE institutions in other countries: namely, declining public subsidies for HE and a reduction in access to HE for many students as lower- and middle-class incomes fail to keep pace with rising costs. The Singapore Government subsidises about 75% of every Singaporean’s tuition fees at local universities and about \$9.9 billion (3.7%) of Singapore’s GDP was spent on education in 2010. Of the \$9.9 billion, \$2.7 billion went to local universities.² A countervailing set of global forces could help to sustain the core model of Singapore’s existing universities for years to come. Despite rising costs, there is greater demand to get into the most selective colleges and universities than ever before, as

2. <http://www.straitstimes.com/breaking-news/singapore/story/ensure-growth-university-places-affordable-smu-president-20120830>

they now recruit students from around the world, and in an increasingly knowledge-based economy, the rate of return to obtaining a degree remains high (Baum, Ma, & Payea, 2010).

New Competition: The Changing HE Marketplace

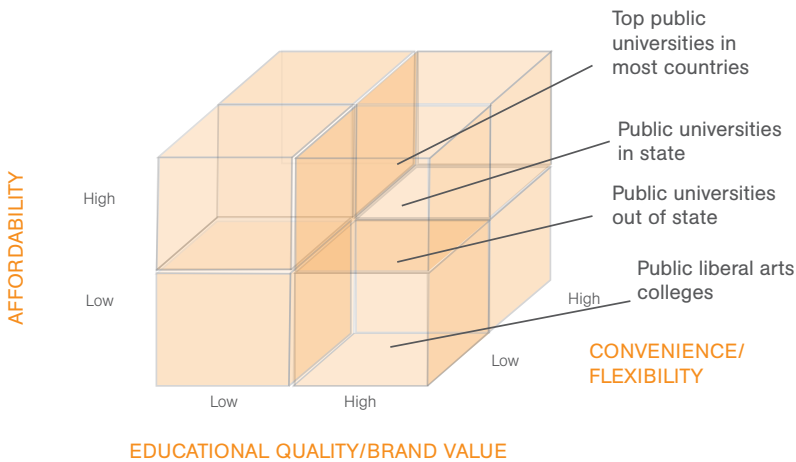
The three-dimensional framework shown in Figure 2 is designed to explain how the current forces disrupting global HE, are translating into an array of new business models serving distinct customer segments. This illustrates three distinct value propositions that HE institutions can offer potential students: 1) the quality of the educational experience and accompanying perceived value of the degree that is conferred; 2) affordability, that is, the cost of education to the individual; and 3) convenience – how easy it is for students to study where and when they would like, a particularly important factor for the growing segment of adult learners.

In reality, this framework should probably include at least four dimensions, subdividing quality into the full student experience – including the campus activities outside of the classroom, the interaction with peers, and the learning outcomes produced – and the perceived value of a university’s brand, which is shaped by factors such as the quality of its faculty and their research, the institution’s history, the degree of selectivity in the choice of who is admitted, and the career success of new graduates and alumni. With the move to more online education and global branch campuses, these two dimensions may become increasingly separated, and a key question will be: to what extent is the “quality” of the learning experience comparable through different modes of delivery?

Historically, in most countries, HE has been a very atypical market where the highest quality institutions, which students compete heavily to get into, have also been very inexpensive. This has been possible because these public universities are heavily subsidised by taxpayers, so that the students who qualify for admission pay

only a small fraction of the costs to educate them. The US is very unusual in having a group of elite private, non-profit institutions (e.g., the Ivy League, Stanford, and a number of excellent liberal arts colleges) that are even more selective than the top public universities. In China and India, by contrast, much of the recent growth in HE has come from private colleges that are lower status than the top public universities but charge more, able to survive because they help satisfy the large demand for HE.

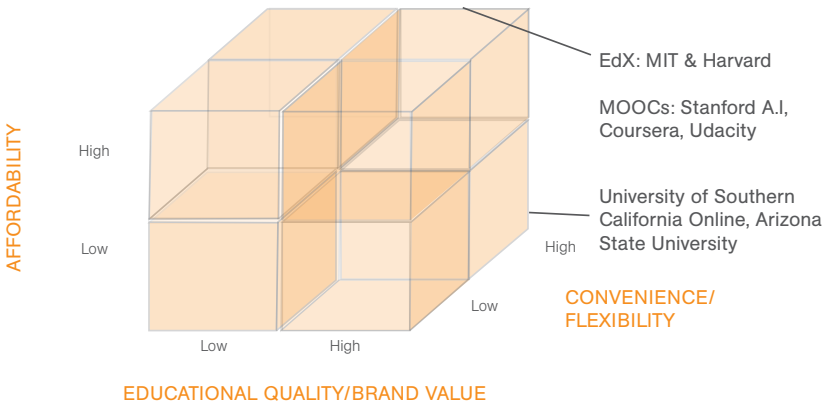
Figure 2. Strategic differentiators in higher education (HE)



The traditional university model, designed for young people to study full-time, is a poor fit for what has become the most rapidly growing segment of HE over the last several decades – adult part-time students (Christensen, 2011). Long before the Internet, the UK’s Open University (Open U) was a pioneer in serving this population, using a mix of correspondence course material, television broadcasts, and intensive residential sessions and local tutors to deliver a high-quality educational solution designed to make HE accessible to adult learners. This model was successfully replicated and scaled by the Indra Gandhi National Open University in India, which today serves 3 million students, meeting some of the unmet demand for low-cost and convenient education.

In the US, it was for-profit companies, such as the Apollo Group, which runs the University of Phoenix, and DeVry that have gained HE market share by developing convenient, standardised degrees geared to the needs of working adults. Their programmes began face-to-face and then were early movers in online education, since this gave them greater ability to both lower costs and increase accessibility. Consequently, their enrolments grew 236% between 1998 and 2008, compared to a 25% increase in the rest of US higher education (Kirschner, 2012). They charged a much higher tuition fee than the public community colleges, the main existing institutions serving adult students, but were able to make this very attractive based both on greater convenience and leveraging of Federal financial aid. While successful in promoting rapid growth and meeting the needs of a neglected student population, neither the Open U nor for-profits business models were viewed as very disruptive by existing institutions, since they generally served different students and the HE sector as a whole was still growing.

Figure 3. Strategic differentiators in higher education (HE)



The newest wave of innovators in the HE marketplace has begun to emerge in the US over the last few years – a hybrid model pairing a strong incumbent university (e.g., University of Southern California, Georgetown, University of North Carolina) with a private, for-profit

company. The university brings its brand and faculty, and retains ownership of the intellectual property in the courses and decisions about admissions and financial aid. The private partner pairs faculty with instructional designers and production teams to create state-of-the-art online courses, and all of the services needed to take fully online degrees to scale: a learning management system, 24/7 technical and student support, sophisticated national and international marketing, and detailed measures of learning progress and outcomes that can help improve student retention and allow for continuous improvement. The students, mostly adult learners, receive the same degree as those studying on the traditional campus and may not be aware that the partnership exists, since all of the marketing and learning portal feature the university's brand. They pay an equivalent or higher tuition fee, but save on overall costs of education since they do not need to live on campus or give up working.

A more radical new model, however, has emerged alongside these new entrants – one that poses serious potential challenges to the broad base of existing HE institutions around the world since it satisfies all three dimensions simultaneously: offering high-quality brands to anyone, and anywhere in the world that has access to the Internet at the most affordable price – free – and doing it with platforms that offer unprecedented potential for global scalability. The Massachusetts Institute of Technology (MIT) was a pioneer in this movement when it initiated the Open Courseware movement, placing the syllabi, course materials and videos of many lectures online. This was a bold philanthropic effort aimed at enhancing access and educational standards around the world, and hundreds of other universities followed suit. It offered a huge boon to the developing world, where many professors and students for the first time had free access to cutting-edge educational materials. But it was not disruptive, as the materials were supplemental enhancements to existing offerings, rather than offering a full alternative to a degree.

This situation began to change in 2009 when two Stanford professors, Andrew Ng and Daphne Koller, began developing a new online learning platform that enabled the Massive Open Online Course (MOOC) movement (Markoff, 2012). They used the platform to teach a course for over 100,000 students in computer science and shared it with other professors around the country to experiment with. The MOOC movement rose to global prominence in the fall of 2011, when then Stanford professor Sebastian Thrun and Google's director of research Peter Norvig, used the platform to offer a free Stanford Artificial Intelligence course that attracted more than 160,000 students from 190 countries (Markoff, 2012). It featured many innovations to make MOOCs effective – short video lectures, quizzes and exercises graded by fellow students before being checked by teaching assistants (TAs), a social learning platform that encouraged peer support, and student ranking of the best questions that would be answered by professors. Over 85% of the students dropped out fairly quickly, but over 20,000 were able to complete the course. Apparently, Stanford and Google were able to attract this huge global student body by just sending 50 e-mails to select opinion leaders in the IT sector who were asked to forward it to their friends and colleagues – illustrating the huge power of social media when combined with this new learning platform.

These Stanford courses gave rise to two new organisations: Coursera, formed by Ng and Koller, and Udacity, by Thrun. Coursera (<https://www.coursera.org>) offers a broad array of interactive, web-based courses in a broad range of subjects. By the third quarter of 2012, it had expanded from its four founding university partners – Stanford, the University of Michigan, the University of Pennsylvania, and Princeton – to 33 top universities from around the world. One of its financial backers, Kleiner investment partner John Doerr, arguably Silicon Valley's most successful venture capitalist, told *The New York Times* that he saw a clear business model, "Even with free courses. From a

community of millions of learners some should 'opt in' for valuable, premium services. Those revenues should fund investment in tools, technology and royalties to faculty and universities."³ The universities and the company also obtain valuable data on each of the students that could be used to market to them in the future. Udacity is pursuing the individual star faculty model as Thrun, who left Stanford and heads Google's X research lab, will recruit other leading academics from around the world to create their own MOOC that can be offered directly to learners.

MIT and Harvard, concerned that they might be losing their leadership in the open course movement as well as the intrusion of for-profit actors into this market, announced their own new US\$60 million cooperative non-profit venture in May 2012: EdX (Kolenbrander, 2012). EdX uses a platform developed by MIT's Director of the Computer Science and Artificial Intelligence Laboratory, Anant Agarwal, who will serve as President of EdX. Tested with an MIT MOOC course on Circuits, EdX will be used to create a wide range of new free course offerings starting in the third quarter of 2012. The primary driver of the initiatives is not generating revenue or marketing, but rather to "enable the study of which teaching methods and tools are most successful" by testing them on thousands of users simultaneously. "EdX represents a unique opportunity to improve education on our own campuses through online learning, while simultaneously creating a bold new educational path for millions of learners worldwide," MIT President Susan Hockfield said (Kolenbrander, 2012). Berkeley and the University of Texas, Austin have since joined EdX and other universities are likely to follow suit.

3. <http://www.nytimes.com/2012/04/18/technology/coursera-plans-to-announce-university-partners-for-online-classes.html>

Are Degrees Still Required?

Case Study of the Indian School of Business

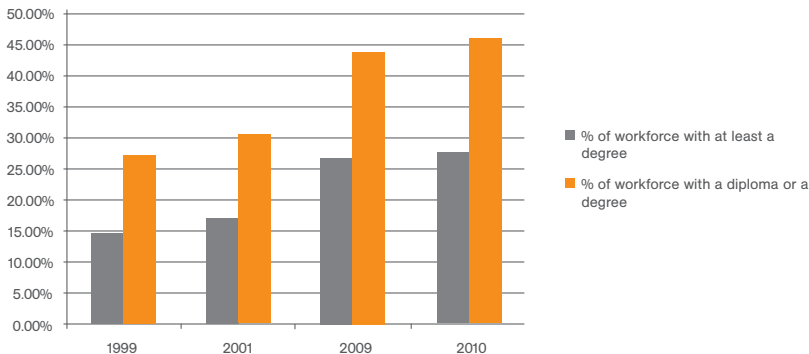
To counter sceptics who contend that traditional degree requirements will continue to be a major barrier to disruption within HE, one need look no further than the case of the Indian School of Business (ISB) in Hyderabad. ISB did not begin operations until 1999, yet it is the only Indian institution to feature in the top 20 in the *Financial Times* annual rankings of the world's top 100 business schools from 2010 to 2012. And it has achieved this meteoric rise without offering a degree – it offers an intensive one-year postgraduate certificate, roughly equivalent in contact hours and content to a European MBA, and a range of shorter executive education offerings geared to the Indian market. ISB chose not to seek accreditation by the Indian government for its certificate because of the requirements (for example, quotas for faculty and students) and bureaucracy this entailed. This led it to focus on terminal qualifications for the professional market, since its qualifications would not be recognised for admission to graduate school in India.

Two factors were vital in ISB's ability to convince top quality students to pay US\$50,000 (far more than the tuition at the prestigious Indian Institutes of Management) for an unaccredited certificate: 1) the assurance of educational quality provided by the key role that top international business schools (Kellogg and Wharton, later joined by the London Business School) played in designing the institution, its curriculum, and supplying many of their star faculty to teach ISB's short course modules; and 2) the promise of rapid career advancement suggested by the quality of ISB's two founding governing boards, one composed of the elite of Indian industry and the other of CEOs of leading global corporations. While this precise formula will be difficult for other institutions to generate, it does suggest that new institutions which can offer the key elements that students value – educational quality and good employment prospects – may not require formal accreditation to succeed.

Strategic Disruption: Singapore and China

Singapore is perhaps the leading global example of sustained government effort to move a national economy towards progressively higher skill, higher value-added business strategies and employment. It had a successful track record over the last 40 years, closely coordinating efforts to improve skills supply through the PSE system while creating incentives and economic development policies to attract employers who will make use of these skills. Starting with virtually no industrial base, but having the assets of a very high literacy rate, a central-Asia location, a stable government, good infrastructure, and an English-speaking population, the state initially used generous investment incentives and other policies to attract multinational corporations to locate manufacturing, distribution, and regional headquarters in Singapore. Recognising that much of the manufacturing may migrate to China and other lower-wage nations in the region, it has continued to move upmarket – focusing on high skill niches such as biotechnology and finance. A core part of this strategy has been generous, ongoing public investment in HE which has led to a consistent growth in the PSE participation (see Figure 4).

Figure 4. Proportion of the workforce with PSE qualifications in selected years



Note: The two bars are not exclusive: the orange bar includes all degree holders and those with a diploma.

Source: Report on Labour Force in Singapore, 2010, Ministry of Manpower

Combined with strong private demand for education and the robust and diversified economy which weathered the GFC well, Singapore has thus far been largely immune from some of the external forces that have disrupted the global HE marketplace. Instead, the Government has consciously chosen to spur innovation and greater individual choice in HE by introducing a range of new competitors offering different models for HE delivery. This began in 1990s with a partnership with Wharton that led to the creation of the Singapore Management University to complement the existing comprehensive universities: the National University of Singapore (NUS) and the Nanyang Technological University. In the current wave of reform, the Government is using global partnerships to add three new and very different universities: a collaboration with MIT to create the Singapore University of Technology and Design (SUTD), a Yale liberal arts college based on the NUS campus, and the Singapore Institute of Technology, which is serving as an aggregator for a wide range of foreign degrees.

SUTD and MIT

In another effort to spur innovation, the Singapore Government partnered with MIT to create the entirely new SUTD. SUTD itself represents a major attempt at innovation within HE, with a curriculum that is both highly interdisciplinary and tightly integrated, and designed from scratch to try to give students a holistic and global viewpoint on design. There are no departments but four interdisciplinary pillars instead – where faculty work together to design and deliver courses organised around complex problems. It also places a heavy emphasis on action learning – where cohorts of 50 students, paired with three faculty members – are given a large open classroom space to customise to the group's own learning needs. There is also a conscious effort to design the overall learning environment, as students are limited to four courses per term, but are required to participate in a fifth pillar – extra-curricular activities that promote creativity and leadership.

MIT is providing the design of the majority of the curriculum, with SUTD's first President, Thomas Magnanti (former Dean of MIT's Engineering School) and a number of faculty teaching the initial courses. It is also a part of the hiring process to enable SUTD to attract a world-class faculty, and is collaborating with SUTD's International Design Centre (IDC). For MIT, this represents an opportunity for a radical educational experiment financed entirely by the Singapore Government. Interestingly, many elements within this experiment had been attempted but were unsuccessful – blocked by the large and deeply entrenched existing departments – at MIT in Cambridge.

SUTD accepted its first students in the spring of 2012 and hopes to eventually grow to 4,000 students and 400 faculty. Its resource-intensive educational model is only sustainable with the major support of the Singapore Government. This includes: hiring faculty at salaries benchmarked to the top 20 engineering schools in the world, keeping teaching loads low so faculty can combine intense interaction with students with world-class research, a \$100 million commitment over 10 years to support the IDC, and providing scholarships so that 25 members of each of SUTD's first six graduating classes can obtain free joint Master's degrees from MIT and SUTD.

Yale and NUS

Yale announced in 2009 that it would be creating its first comprehensive liberal arts college outside of the US, in partnership with NUS. The Yale-NUS College, which will start classes in August 2013, will offer undergraduate degrees in 14 subjects, ranging from life sciences to urban studies and anthropology. While Yale is taking the lead in the design of the institution and curriculum, students will receive an NUS degree that mentions students were enrolled in the Yale College. The goal is to stay small, eventually ramping up to 1,000 students.

Despite some protests from Yale's US faculty (Fischer, 2012), the College has begun the process of recruiting from around the world for the Singapore campus, which is projected to eventually have a faculty of 100. Initial hires have indicated that they are attracted by the Yale name and the opportunity to build a new institution by combining the best of East and West, with a focus on interdisciplinary studies. Replicating the experience in New Haven, Yale Singapore will have three residential colleges that will serve as the focus of academic and social life (Chronicle of Higher Education, 2012).

A New Vocational University Model?

In keeping with its thoughtful approach to long-term strategic planning, the Singapore Government has created the Committee on the expansion of the University Sector (CEUS).⁴ In 2007, CEUS established the Task Force on Expanding Upgrading Opportunities for Polytechnic Graduates to explore which models might be the most beneficial for establishing a new university. The Task Force, composed of polytechnic principals and representatives from the Ministry of Education, Ministry of Manpower and Economic Development Board, conducted study tours to the US, Hong Kong and several European countries, and appears to be leaning towards a more applied HE model, like those that have built close ties with industry in Germany. One candidate for the new university is the Singapore Institute of Technology (SIT), created three years ago to offer polytechnic graduates the opportunity to continue their studies to obtain a degree. Currently, SIT has over 1,500 students spread across 24 applied degrees from a range of foreign universities, but does not have the capacity to offer its own degrees. UniSIM, which already has a strong industry orientation, will also add diversity to the higher education landscape.⁵

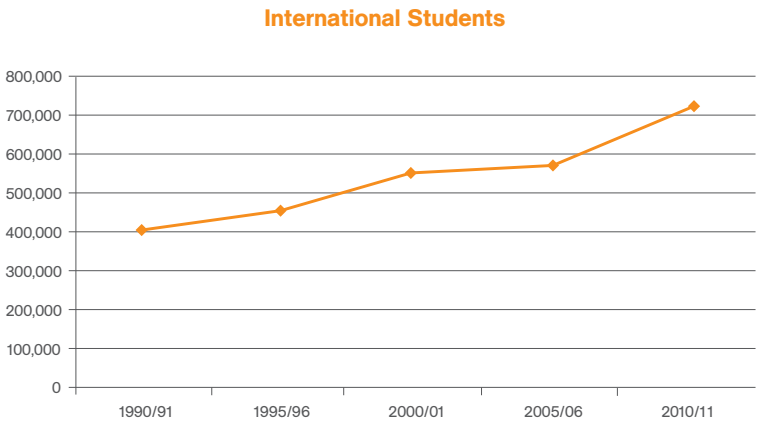
4. http://www.edb.gov.sg/etc/medialib/downloads/media_release_2009/ministry_of_education.Par.0468.File.tmp/Press%20Release.pdf

5. <http://www.straitstimes.com/breaking-news/singapore/story/ensure-growth-university-places-affordable-smu-president-20120830>

Together with SIT, they will be the fifth and sixth universities in Singapore, creating an additional 3,000 full-time university places a year by 2020.⁶

The combined effect of these changes is that Singapore has begun to emerge as a regional HE hub, not only offering more options to its citizens, but also attracting students from across Asia and beyond. It is thus seeking to compete with established leaders such as the US, UK, Australia, for the huge surge in young people travelling abroad for their degrees, with the biggest increase coming from China (see Figure 5). Thanks to these innovations and the continued strengthening of its existing institutions, Singapore was recently ranked first in Asia (11th overall) in a global ranking of countries with top HE systems.⁷

Figure 5. Growth in international students in US higher education (HE)



Source: Institute of International Education, Open Doors Database, 2012

6. <http://www.moe.gov.sg/media/press/2012/08/greater-diversity-more-opportunities-in-singapores-university-sector.php>

7. <http://www.universitas21.com/news/details/61/u21-rankings-of-national-higher-education-systems-2012>

As it seeks to expand HE as an export sector, Singapore is competing with a growing number of top universities (e.g., New York University, Yale, Berkeley, Stanford and Wisconsin) that have created campuses in the United Arab Emirates (UAE) and Asia (e.g., China and South Korea), attracted by generous financial incentives that include free land, construction of a new campus and an operating subsidy. While some of the campuses in the UAE have struggled to attract a large supply of students, since the domestic supply is limited, other campuses in China show great promise. For example, Xi'an Jiaotong Liverpool University, located on the outskirts of Shanghai, has already grown to 4,000 students, since opening its doors in 2006. Almost all (95.5%) of its first graduating class went to graduate school abroad (including 750 to Liverpool and many others to top universities around the world), and the university continues to expand its research programmes rapidly. For established universities, these foreign campuses represent multiple potential benefits that can help them offset the loss of public funding at home: a chance for a new, state-of-the-art campus, attracting a steady pipeline of well-prepared, fee-paying international students to their main campus, and a way to tap into generous research support from the host government.

Conclusion

Singapore appears well placed to benefit from the disruptions in the global HE marketplace. Through sustained, generous support from the Government, it has been able to build a set of universities that offer high-quality education at an affordable cost. This, combined with a set of strong, more applied polytechnics and further education institutions, and one of the world's best K-12 education systems, has enabled Singapore to rapidly grow its levels of PSE participation, while maintaining low attrition rates.

It is on the third dimension of HE competition – flexibility and convenience – that Singapore appears to have room for

improvement. While it has some options available for adult learners, most HE institutions remain heavily oriented towards younger, full-time students. The need to expand educational opportunities for working adults is only likely to intensify due to a combination of forces: increased life expectancy, an ageing workforce, and continuing rapid technological and market changes that necessitate individuals keeping their skills current and/or create the need for individuals to make more significant career changes multiple times during their lives. Expanding such opportunities may not only entail creating new PSE institutions or programmes focused on adult learners, but also requires shifts in the working environment that will make it easier for individuals to participate in lifelong learning. The Government could encourage firms and working adults to invest more in continuing education by extending some form of the Professional Conversion Programme, which was used during the GFC to minimise unemployment, by encouraging individuals who were displaced to return to college to retrain for a new career. Currently, the Government provides generous support for certain high need occupations (mostly at diploma level), for example, diagnostic radiographers, eldercare professionals, fashion and textile professionals, occupational therapists, physiotherapists, registered nurses and social workers. This could be extended to a more general set of incentives for incumbent employees to pursue part-time degrees, where the costs of further degrees would be shared more equally by individuals, firms, and the Government. A recent announcement to enhance government subsidies for Singaporeans embarking on polytechnic part-time diploma programmes for their first time is an attempt by the Government to encourage working Singaporeans to upgrade and re-skill through part-time learning at the polytechnics.⁸ This is part of the Government's broader plans to enhance CET opportunities.

8. <http://www.moe.gov.sg/media/press/2012/09/enhanced-subsidies-for-polytechnic-part-time-diploma-programmes.php>

HE provision is not only a high skill sector in itself, but is also a key generator of the innovations and talent needed to fuel the growth of other high skill sectors such as biotechnology, IT and finance; this is in line with the Government's broader strategy of moving the Singapore economy into higher value-added, higher wage sectors. Although Singapore is likely to face intensified HE competition from foreign campuses being established in China and other parts of the region, it is well placed to succeed.

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Developing Occupational Skills Profiles for Singapore:

A Methodological Proposal

Andy Dickerson and Rob Wilson

Introduction

Skills are a major policy priority, both nationally and internationally. Yet we only have very imperfect measures of the skills available and in use in employment today. This paper describes a proposal for the development of a new and comprehensive set of detailed, multi-dimensional skills profiles for Singapore, encompassing the different skills required by employers and the utilisation of skills by individuals in the modern workplace. These skills profiles would have a wide range of potential uses and users – providing a much richer and deeper understanding of the changing patterns of the demand for skills, as well as helping to shape policy on the provision of skills training. They could also be used to inform individuals and those who advise them on the skills that are useful in employment today.

Skills are measured in a variety of different ways. The two most commonly employed measures are *qualifications* and *occupation*. While these are relatively simple to measure, they are but very

poor proxies for the actual skills required by employers and those used by individuals in their jobs. Indeed, when asked about skills and skills needs, employers tend to focus on other aspects of individuals than their qualifications or occupations. Generic skills such as communication skills, problem-solving abilities, technical skills, as well as basic skills such as numeracy and literacy are the typical concerns of employers when recruiting new employees, for example. And when describing skills deficiencies, employers tend to list these generic skills rather than a lack of any particular qualifications amongst their employees. Moreover, for policy design, interest may be on broader skill sets, such as STEM (Science, Technology, Engineering and Mathematics) skills. However, no comprehensive measures of such skills are available in most countries.

In contrast to the comparative lack of information on skills for almost all developed countries, the US-based Occupational Information Network (O*NET) system provides nearly 250 different measures of skills, abilities, work activities, training, work context and job characteristics for each of around 1,100 different US occupations, with information gathered from both job incumbents as well as assessments by professional job analysts (Tippins & Hilton, 2010).¹ This information is also linked to information on current employment levels, rates of pay and future employment prospects.

Ideally, we would like to have an O*NET-type system for Singapore which could provide a broad set of descriptors of the skills that people utilise in their jobs. We could then use the trends in skills to inform policymakers about the skills that are utilised and rewarded in employment today. However, the costs of developing such a system would be considerable, both financially and in terms of time – the current budget for O*NET

1. A comprehensive description and review of O*NET is provided by N. Tippins and M. L. Hilton.

is over US\$6 million per year, taking more than 30 years since its inception to the release of the first complete O*NET database. As an alternative, we therefore propose the development of a *mapping or correspondence* between jobs in the United States (US) and comparable jobs in Singapore in order to exploit the information that is already collected for the US O*NET system. Using this mapping, we can then use the measures of skills and other content of O*NET to provide measures of the levels and trends in skills utilisation in Singapore. While the mapping necessarily means this will be an approximation, our experience from evaluating a similar mapping for the United Kingdom (UK) suggests that the approximation is very “close”. Thus, this method is a very cost-effective way of providing for Singapore, with much of the richness and complexity of the information contained in the O*NET system.

The remainder of this paper describes our proposal for constructing this systematic mapping between O*NET and the Singapore Standard Occupational Classification (SSOC). We first discuss the measurement of skills and briefly describe the O*NET. We then explain how the detailed content of O*NET can be utilised to develop profiles of the skills used in all SSOC 4-digit occupations. Finally, we describe some of the uses that such skills profiles could have in informing policy on skills and workforce development in Singapore.

Measuring Skills and O*NET

The importance of skills in modern economies and in economic policy debate is widely acknowledged. Understanding skills is important, both at the micro (individual) level for employment and earnings, and at the macro (economy) level for explanations of productivity and growth. Despite the fundamental importance of skills to the discourse surrounding the knowledge economy, procedures for measuring skills are still comparatively under-developed in almost all countries.

We can identify at least six distinct ways of defining and measuring skills: qualifications and/or educational attainment; education length; occupation; tests; self-assessment; and job requirements or activities. There are a number of advantages and disadvantages associated with each of these different conceptualisations and measures of skills. Skills are multi-dimensional, socially constructed, intangible and often unobservable, and each of the different measures of skills can be argued to have some relative merits and demerits associated with them.

Ideally, we would like to have objective, internationally-comparable measures of skills. Of the different measures of skills, the most commonly utilised are the qualifications that individuals have acquired and the occupations of the jobs that they do. These both afford some international comparability, particularly when international classification systems such as the International Standard Classification of Education (ISCED) are employed, which is maintained by UNESCO,² and the International Standard Classification of Occupations (ISCO), which is compiled by the ILO.³ However, qualifications in particular can be regarded as a poor measure of skills used in employment: they are typically gained before individuals enter the labour market, and any skills that are acquired in the process of gaining any particular qualification can soon depreciate, especially if not used. Rather, qualifications arguably provide a means of entering particular employments or employment levels.

The skills subsequently gained while in employment – through learning-by-doing, formal and informal on-the-job training, or in any subsequent off-the-job training, and then utilised in employment – are those that are of primary interest for individuals and

2. <http://www.uis.unesco.org/Education/Pages/international-standard-classification-of-education.aspx>

3. <http://www.ilo.org/public/english/bureau/stat/isco/index.htm>

employers, and for public policy. Individuals seeking to move jobs, firms seeking new employees, agencies responsible for assisting people back into work, training providers, HR managers and policymakers responsible for identifying skills shortages, trends and future requirements, all require skills that are used, valued and rewarded in employment. Qualifications are, at best, only a poor proxy for the skills that individuals will acquire or utilise in their jobs. They are also a weak measure of the attributes possessed – but rewarded in the labour market – by individuals.

Occupations arguably provide a more meaningful summary of the skills that individuals are using in employment, particularly where the occupational classification is hierarchical so that higher occupational levels can be associated with higher levels of skills. However, any occupational classification still fails to record the actual skills that are being utilised, nor does it effectively recognise that jobs are typically bundles of skills. Thus, the skills being utilised in any job cannot be captured by a uni-dimensional indicator such as the SSOC code. Of course, skills can differ even within occupations, for example, according to sector or organisation size.

More recently, the advantages of the so-called “job requirements” approach to measuring skills have found increasing favour. These measure skills that are being used by individuals in their jobs – by their (self-reported) answers to questions regarding the degree (and sometimes intensity) to which their jobs require them to perform particular tasks. Examples include the UK Skills Surveys (Felstead, Gallie, Green, & Zhou, 2007) and the Singapore Skills Utilisation project (Sung, Loke, Ramos, & Ng, 2011). However, given the relatively small scale of skills surveys of this kind – primarily due to their cost – it is only possible to use the information to assess the skills at an aggregate level (1-digit SSOC). Thus, the

skills surveys are unable to capture much of the heterogeneity within and between jobs. Moreover, the range of job skills recorded is limited to the dimensions captured by questions listed for a particular job task.

In contrast to the relative lack of information on skills in most countries, the US has long devoted considerable resources to measuring and recording the skills used in employment. The Dictionary of Occupational Titles (DOT), first published in 1939, has evolved considerably over time. O*NET, for example, was almost 20 years in development as a replacement to the DOT, and the first full version of this new system was first published in June 2008. O*NET is now the main source of occupational competency information in the US. It utilises a modified version of the US SOC to record information for around 1,100 different occupations across six different “domains”: worker characteristics; worker requirements; experience requirements; occupational requirements; occupation-specific information; and workforce characteristics. Much of the information in the O*NET “content model” is gathered from self-reported assessments by job incumbents based on standardised questionnaire surveys, supplemented by professional assessments by job evaluation analysts. Table 1 provides a summary of the information that is collected:

Table 1. Range of information collated in the O*NET surveys

Survey instrument	Main content	No. of items (“Descriptors”)
Education and Training	required education, related work experience, training	5
Knowledge	various specific functional and academic areas (e.g., physics, marketing, design, clerical, food production, construction)	33
Skills	reading, writing, math, science, critical thinking, learning, resource management, communication, social relations, technology	35
Abilities	writing, math, general cognitive abilities, perceptual, sensory-motor, dexterity, physical coordination, speed, strength	52
Work Activities	various activities (e.g., information processing, making decisions, thinking creatively, inspecting equipment, scheduling work)	41
Work Context	working conditions (e.g., public speaking, teamwork, conflict resolution, working outdoors, physical strains, exposure to heat, noise, and chemicals, job autonomy)	57
Work Styles	personal characteristic (e.g., leadership, persistence, cooperation, adaptability)	16
TOTAL		239

Source: Handel (2010); Tippins and Hilton (2010)

In total, information is collected on 239 different dimensions or “descriptors” of skills and job characteristics including: qualifications required; practical and technical skills; a wide range of soft skills such as communication skills, stamina etc.; as well as details of the tasks involved in the job. For the four areas of Knowledge, Skills, Abilities and Work Activities, both the “Importance” and “Level” of each skill or characteristic being measured is recorded. For example, Figure 1 shows the importance and level scales used for the Reading Comprehension skill item:

Figure 1. Example of O*NET question with importance and levels scales

1. Reading Comprehension

Understanding written sentences and paragraphs in work-related documents

A. How important is READING COMPREHENSION to the performance of the occupation?

Not Important*	Somewhat Important	Important	Very Important	Extremely Important
1	2	3	4	5

* If you marked Not Important, skip LEVEL below and go on to the next skill.

B. What level of READING COMPREHENSION is needed to perform the occupation?

	Read step-by-step instructions for completing a form		Read a memo from management describing new personnel policies		Read a scientific journal article describing surgical procedures	
	↓		↓		↓	
1	2	3	4	5	6	7

Adapted from source: National Center for O*NET Development: Skills Questionnaire, <http://www.onetcenter.org/questionnaires.html>

*Utilising the O*NET for Measuring Job Skills in Singapore*

We propose to construct a detailed set of occupationally-based skills “profiles” — describing the many different skills that are used in employment in Singapore — by utilising the information gathered and summarised in O*NET. These occupational skills profiles are intended to be multi-dimensional and therefore would provide a much richer description and measurement of skills demand and skills utilisation than is possible if existing methods of measuring skills were used.

The three main stages to the development of these skills profiles are:

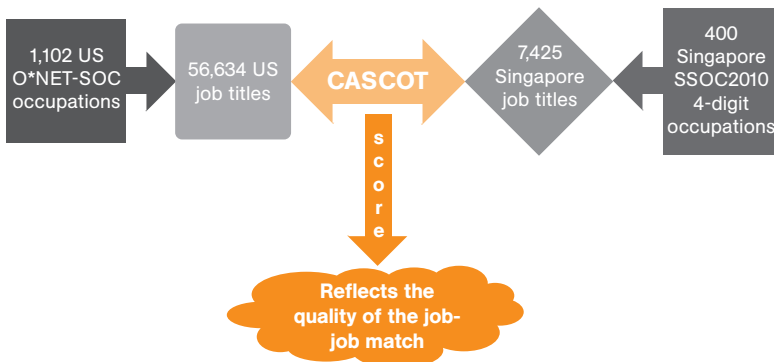
- **Stage 1:** Matching between the O*NET occupational classification and the SSOC.
- **Stage 2:** Assigning job skills and abilities provided within O*NET to SSOC occupations, based on weighting and aggregating according to the quality of the match and occupational distribution of employment.

- **Stage 3:** Summarising job skills and abilities to produce useful taxonomies for 4-digit SSOC occupations.

Stage 1

The first stage will be to match the occupational taxonomy in O*NET to that of the SSOC. Using CASCOT (Computer Assisted Structured Coding Tool), almost 57,000 US job titles (used in the O*NET) will be matched to around 7,500 Singapore job titles identified in the SSOC. CASCOT operates by matching input text (in this case, US job titles) to be coded against an index of words (“dictionary”), to which the relevant codes have been allocated (the SSOC). CASCOT produces a score (between 0 and 100) which reflects the “quality” of the match. Each job belongs to a specific occupation, and hence, the US job to Singapore job matching can be aggregated to produce a corresponding O*NET SOC to SSOC matrix of matching scores. Schematically, the process is shown in Figure 2.

Figure 2. Schematic representation of the O*NET to SSOC matching process



For each of the 56,634 US job titles, we will find the best “match” to each of the 7,425 Singapore job titles. Some matches will score highly (a score at or close to 100) when the job description is

unique in both classifications (e.g., “plumber” or “astrophysicist”). Others will score poorly (a score at or close to 0) when the job is not listed in the Singapore classification, either because of the greater detail in the US classification (where seven times more job titles are listed), or because the job simply does not exist in Singapore (e.g., “snow maker”). There will also be intermediate scores which may require intervention in order to identify the “best” match between the job categories.

Stage 2

Each job title in the O*NET classification can match with one or more job titles in the SSOC. In the second stage of the project, given the matches at the job title level, these can then be used together with the relative employment in the O*NET occupation to produce a matrix of weights, which enables us to match between the 1,102 O*NET occupations and 400 4-digit SSOC occupations. By construction, each SSOC occupation will match with one or more O*NET occupations.

Stage 3

In the third stage, we will select a range of dimensions or descriptors of job skills and abilities from the O*NET system, and use the weights to assign these measures to each 4-digit SSOC occupation. For example, we could use the 35 skills descriptors in O*NET to produce three summary indicators of (i) cognitive skills, (ii) interpersonal skills, and (iii) physical skills to reflect the quite different sets of skills that individuals use in their jobs. Or we could create a measure of STEM skills by averaging relevant descriptors such as: deductive reasoning, information ordering, mathematical reasoning, and number facility (from the abilities domain) and mathematics, science, technology design, and programming (from the skills domain).

Our preliminary findings employing this type of matching methodology for the UK suggests that it is indeed possible to create a meaningful and informative mapping between O*NET and the UK SOC, and thus be able to assign the skills and other content of the US O*NET system to the matched UK occupations (Dickerson, Wilson, Kik, & Dhillon, 2012). The mapping appears to be quite robust to the methodological approach employed. When used to generate occupational skills profiles at the 4-digit level of the UK SOC, the resulting occupational profiles appear to be sensible and reasonable, and conform to our prior expectations. Moreover, when we use the mapping to derive measures of required qualifications and training time, and compare these with similar measures taken from the 2006 Skill Survey (Felstead et al., 2007), the correspondence between the two different sources are very high, giving us further confidence in the validity and robustness of the methodology we have developed. We fully anticipate that similar results can be generated for Singapore given the similarity between the SSOC and the UK SOC.

Outcomes and Uses of the Skills Profiles

Exploiting the mapping that we plan to develop between the O*NET and SSOC will enable the multi-dimensional O*NET system to be used to generate a comprehensive database of occupational skills profiles for Singapore, providing a more detailed depiction of skills utilisation, and changes in utilisation, than is currently available. This is crucial if we are to really develop an understanding of skills utilisation and changing skill needs. The profiles are likely to be of considerable interest to policymakers and agencies which have an interest in skills, their importance as well as their impact for individual labour market outcomes, and also for macro-economic performance. Additional potential uses of the skills profiles include:

- An assessment of trends in skills demand (as recorded by their changing utilisation in employment), and providing estimates of future skills demand. This can be accomplished by undertaking the proposed matching exercise at two points in time to obtain skills measures over, say, a 10-year period. We are currently in the planning stages of a joint project with the Institute for Adult Learning (IAL) to undertake this exercise.
- Supplying useful information to careers advisers and individuals on the types of skills that are necessary for and useful in employment today, and likely to be of importance and value in the future in terms of labour market outcomes.
- Estimating the value and returns to skills in employment for individuals.

Conclusion

Developing skills policy requires, first and foremost, an understanding of skills demand and utilisation. Traditional measures of skills such as qualifications or occupations do not capture the breadth of skills that employers demand from their employees. Nor do they reflect the skills that are actually in use in employment. Survey-based approaches to measuring skills utilisation as in the IAL Skills Utilisation project can provide a richer understanding, but such individual surveys are expensive and thus necessarily small scale. This short paper describes a complementary approach to measuring skills and proposes a methodology for providing a more comprehensive and detailed assessment of the skills in use in employment. The resulting national skills profiles can be used to inform policy design, as well as provide information to individuals and employers on available and in-demand skills in Singapore today.

The primary task is to construct a systematic “mapping” between the US O*NET and the SSOC – by using the correspondence between the jobs that describe occupational classifications in the

US and in Singapore. Given the mapping, we can then assign the skills measures and other content of the US O*NET system to the matched Singapore occupations with a weighting scheme that reflects the quality of the mapping and the relative distribution of employment in each country.

Finally, the design and development of a coherent skills policy requires a good understanding of the trends in skills demand and utilisation, as well as an assessment of the needs of employers and individuals in further developing their skills. Using the O*NET provides a quick method of generating this skills information base for Singapore, which can then be used to complement other available measures of skills as well as inform policy design.

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Conclusion

Johnny Sung and Wu Wei Neng

This book has attempted to shed light and improve clarity on globalisation and its consequences for labour markets, human capital, skills, education and training, productivity, wages and standards of living in any society, and in particular for Singapore.

As a small, open and globally-dependent economy, Singapore is uniquely vulnerable to the immense changes identified by the contributors. Singapore's policymakers have thus far demonstrated their intent to make a virtue out of necessity by launching a comprehensive nationwide productivity effort, to position Singapore's workforce and economy to gain long-term benefits from this transformation. There remains further work to be done to improve our understanding of both the driving forces of change, and the range of policy options available to governments to address these challenges.

In the context of Singapore's policy environment and circumstances, it means paying attention to the following three interrelated efforts in order to address issues identified in this edited volume:

1) Improve the **collection and aggregation** of data on the labour market, educational and skills endowments, higher education and training, productivity and wages, and employ new and more sophisticated analytical tools to **make sense of this raw information** to benefit research and support policy.

2) Design **effective policies** that take into account the rapidly-changing nature of supply chains, labour markets, technological innovation, and new models of development and delivery. Policy must also be based on a sound and nuanced understanding of the needs of both employees and firms, especially in the globalised context, and the economic, social and behavioural obstacles that each faces in the path towards skills and productivity improvement. Ultimately, effective policies need to mitigate and correct the market and incentive failures that can retard productivity growth, and to consider competing and emerging trends that might otherwise negate national effort. This will help ensure that the linkages between retraining, skills, productivity, wages and standards of living are robust and well-functioning in practice.

3) Support **sound tripartite and CET practices** that encourage continuous skills improvement and upgrading on the one hand, and sustainable, fair sharing of the returns to businesses on the other hand, so that both employers and employees quickly and constantly experience the benefits of higher productivity. To be effective, tripartite collaboration needs to define and champion the optimal relationships between skills upgrading, productivity improvement and wages.

The agenda is clearly a complex one which requires careful policy design as well as coordination amongst key stakeholders. Policymakers as well as researchers face complex challenges. They may need to explain and mitigate the uncertainty caused by the weakening relationship between high skills and high pay amongst new graduates. In addition, substantially increasing the supply of highly-skilled workers will require a solid understanding of future market trends in higher education. In particular, the simultaneous demand for affordable, flexible and good quality higher education may require the development of new modes of delivery. To stay relevant and avoid the pitfalls of the “global auction” of high skills, Singapore must identify its place in transnational supply chains, its skills endowments, and its position in the global market for skills. Such efforts are crucial to ensure that high skills are linked to high value-added and high-paying work. Currently, the state of research work, as outlined in this book, is still relatively new. More substantial and specific research will enable Singapore to better assess and develop its strategic options.

About the Contributors

Phillip BROWN is Distinguished Research Professor in the School of Social Sciences, Cardiff University, UK. He worked in the auto industry in Oxford before training as a teacher. His academic career took him to Cambridge University and the University of Kent at Canterbury before joining Cardiff University in 1997. He has written, co-authored and co-edited 16 books including *The Global Auction: The Broken Promises of Education, Jobs and Incomes* (Oxford University Press, 2011) with Hugh Lauder and David Ashton. Research for this book was ranked as “outstanding” by the UK’s Economic and Social Research Council, and it has also been debated at the World Bank in Washington, International Labour Office in Geneva, and at the European Commission.

Phillip has been Visiting Professor at the University of British Columbia and Sciences Po in Paris, and until recently an expert panel member for the United Kingdom Commission for Employment and Skills.

Andy DICKERSON studied at the University of Durham (BA Maths and Economics) and then Warwick University (MA Economics, PhD Economics) and worked at the Bank of England and the University of York before taking up a post as Lecturer in Economics at the

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Andy is a member of the UK Commission for Employment and Skills (UKCES) Expert Panel which advises the UKCES on skills and productivity issues, and is a Visiting Research Fellow at UKCES. He previously coordinated the activities of the Department for Work and Pensions-sponsored Work, Pensions and Labour Economics Study Group (WPEG) from 2006–2010.

Andy's research interests are mainly applied, and are focused on the operation and functioning of labour markets, the interaction between financial and product markets and the labour market, and the analysis of micro and longitudinal data, including matched datasets. Andy's forthcoming publication, written with Francis Green, is entitled *Fears and Realisations of Employment Insecurity*.

David FINEGOLD is Senior Vice President for Lifelong Learning and Strategic Growth Initiatives at Rutgers, The State University of New Jersey. Prior to this, he served a five-year term as Dean of Rutgers School of Management and Labor Relations. He is a leading expert on skill development systems and their relationship to economic performance. His current work is focused on the evolving skill development systems in India and China.

He is the author of more than 80 journal articles and book chapters, and has written or edited seven books, including *Are Skills the Answer?* (with Colin Crouch and Mari Sako), *Corporate Boards: Adding Value at the Top* (with Jay Conger and Ed Lawler), and *BioIndustry Ethics* (Elsevier Academic Press, 2005).

David graduated summa cum laude with a BA in Social Studies, from Harvard University in 1985, and was a Rhodes Scholar at Oxford University, where he completed his DPhil in Politics in 1992.

GOG Soon Joo heads the Institute for Adult Learning that is pioneering the development of CET Professionals and workforce development research in Singapore. Besides encouraging innovative ways of designing and delivering training, she invested efforts and resources into research and development for workforce enhancements.

Formerly Director of the Quality Assurance Division at the Singapore Workforce Development Agency (WDA), Soon Joo is one of the founding members of the Singapore Workforce Skills Qualification (WSQ) system and was involved extensively with the development of the WSQ system. Prior to joining WDA, Soon Joo spent a large part of her career in the hospitality industry and as an academic staff member with Temasek Polytechnic.

She holds a Master in Tourism Administration from George Washington University and a Bachelor's degree in Economics from the University of London.

KWEK Mean Luck is Dean and Chief Executive Officer of Singapore's Civil Service College (CSC). The mission of CSC is to develop people for a first class public service. He is also concurrently Deputy Secretary (Development) in the Public Service Division of the Prime Minister's Office.

Prior to his current appointment, Mean Luck was the Deputy Secretary (Industry) in the Ministry of Trade and Industry. Before joining the Singapore Administrative Service, he served in the Singapore judiciary, where he had been a District Judge of the Subordinate Courts and Senior Assistant Registrar of the Supreme Court, as well as a Justice's Law Clerk of the Supreme Court.

Mean Luck was awarded the PSC (OMS) scholarship to read Law at the University of Cambridge, where he graduated with a Triple First.

He was also awarded the Lee Kuan Yew Scholarship and graduated with a Master of Laws from Harvard Law School. He holds a Diploma in Singapore Law from the National University of Singapore and is called to the Singapore Bar as an Advocate and Solicitor. He is currently a board member of the Singapore Economic Development Board, the Singapore Civil Service College and Caritas Singapore Community Council.

Hugh LAUDER is Professor of Education and Political Economy at the University of Bath. He studied at the University of London, the Institute of Education, and gained his Doctorate at the University of Canterbury, New Zealand. He was formerly Dean of Education at Victoria University of Wellington. He specialises in the relationship of education to the economy and has, for over 10 years, worked on national skill strategies and more recently, on the global skill strategies of multinational companies.

Besides *The Global Auction: The Broken Promises of Education, Jobs and Incomes*, Hugh has also co-authored *Education, Globalization and Social Change* (Oxford University Press, 2006). He has published many academic papers including on international education and globalisation, and is editor of the *Journal of Education and Work*. He has been Visiting Professor at the Institute of Education, the University of Turku (Finland) and is currently at the University of Witwatersrand (South Africa).

Johnny SUNG is Principal Research Fellow at the Institute for Adult Learning (IAL) and the Head of the Centre for Skills, Performance and Productivity Research (CSPPR). In January 2011, Johnny took up his appointment in CSPPR to develop skills research in Singapore for policy purposes. As well as coordinating eight research projects in CSPPR, covering various skills and

productivity related topics, Johnny is also working on two books: *Vocational Education and Training for Skills and Performance: the Fundamental Principles of a Contemporary Workforce Development System* (Edward Elgar Publishing), and *Competing Through Skills* (Sage Publications).

Johnny is also Professor of Skills and Performance at the Centre for Labour Market Studies, University of Leicester in the UK. His research areas include the sectoral approach to national workforce development and high performance working. Both of these areas have provided input into recent skills policy of the British Government.

Rob WILSON is Professorial Fellow and Acting Director of the Institute for Employment Research at the University of Warwick, UK. He leads the Institute's labour assessment and market forecasting work and has also researched and published on many other aspects of labour market behaviour, including the changing patterns of demand for and the supply of skills at national and international levels.

Rob has played a leading role in developing quantitative approaches to anticipating changing skills needs at a national and international level. In addition to producing Working Futures for the UK Commission for Employment and Skills (UKCES), he has led the Cedefop Skillsnet project on developing medium-term forecasts of occupational skill needs in Europe and the analogous project on skills supply. He has authored or co-authored a number of major reports published by Cedefop and the UKCES on these topics, including *Future Skill Needs in Europe*. He is a member of the UK Migration Advisory Committee and the UKCES Expert Panel.

WU Wei Neng was until July 2012 the Deputy Head of the Centre for Public Economics, Civil Service College, where he focused on environmental and resource economics. He is currently on leave from the College, and is conducting research on policies related to urban management and planning, in particular on land use and sustainability, in collaboration with the Centre for Liveable Cities.

Wei Neng was a member of the Singapore Government delegation to the United Nations Framework Convention on Climate Change (UNFCCC) from 2007 to 2009, specialising in climate finance and investment issues. He was previously at the Energy Division of the Ministry of Trade and Industry, where he worked on climate change and international energy cooperation issues. Prior to the above appointments, he dealt with defence diplomacy and security policy issues at the Ministry of Defence.

He graduated with a BA (Hons) in Philosophy, Politics and Economics from Oxford University (2001) and an MSc in Comparative Politics from the London School of Economics and Political Science (2002).

About the Civil Service College

Civil Service College (CSC), Singapore

The mission of the College is to develop people for a first class Public Service. As the public sector's core institution for training, learning, research and staff development, CSC builds strategic capacity in governance, leadership, public administration and management for a networked government in Singapore.

Centre for Governance and Leadership (CGL)

As a centre of expertise in the College, CGL seeks to enhance the public sector's thinking on governance and leadership through its fellowship programmes, lectures and symposia, as well as in-house research and publications.

About the Institute for Adult Learning

Institute for Adult Learning (IAL), Singapore

The Institute for Adult Learning (IAL) facilitates the development of an effective, innovative and responsive Continuing Education and Training (CET) ecosystem by raising capabilities, catalysing innovation and leading research in workforce development.

We serve adult educators, business leaders, human resource managers and policy makers. Together we enhance CET to meet the needs of industries and the Singapore workforce.

Centre for Skills, Performance and Productivity Research (CSPPR), IAL

The Centre for Skills, Performance and Productivity Research focuses on the impact of skills at work, and the implications of this for policy and practice in CET. In particular, research is directed to examining the role of skills in enterprises and the relationships amongst skills, productivity, work systems, innovation, learning, training and qualifications.

In May 2012, the Centre for Skills, Performance and Productivity Research at the Institute for Adult Learning (IAL) invited a panel of international experts for a series of roundtable discussions and public lectures on the recent developments in skills research and workforce development policies.

The roundtable generated debate around the role of high skills policy in today's globalised environment and its implications. Three papers were selected from the discussions for this Civil Service College-IAL joint publication, and rewritten in a style accessible to policymakers, and human resource and CET practitioners as well as the layperson interested in issues related to skills, higher education and manpower.

Together, the articles identify some of the most important challenges for contemporary workforce development in Singapore.

In the first article, Phillip Brown and Hugh Lauder introduce the reader to an in-depth analysis of the impact of globalisation on the benefits of higher education, both at the individual and national strategic policy levels. Next, David Finegold shares the three new trends that are most important in facilitating the expansion of the higher education sector and evaluates the extent to which Singapore is addressing these important differentiators in the course of higher education expansion.

In the last article, Andy Dickerson and Rob Wilson introduce a complex skills/occupational system called O*NET, which is widely used by labour market researchers, human resource professionals and policymakers overseas.

