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ECONOMICS & SOCIETY

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Man & His Neighbour



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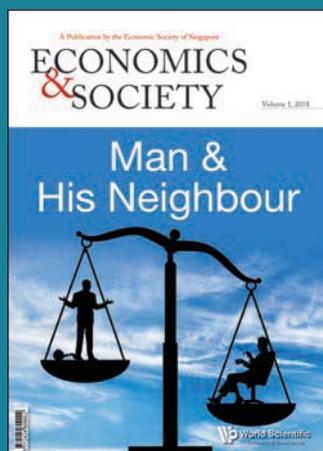
About the Economic Society of Singapore

The Economic Society of Singapore (ESS), formerly the Malayan Economic Society, was established on 28 July 1956, as a result of an initiative by graduates and staff from the Department of Economics from the then University of Malaya in Singapore.

On 28 March 1969, the Society changed its name from the Malayan Economic Society to the Economic Society of Singapore, in response to the new independent and sovereign status of the Republic.

Since 1976, the Society has been one of the founding members of the Federation of ASEAN Economic Association (FAEA). The Society published a journal, the Malayan Economic Review (MER), which was later renamed the Singapore Economic Review (SER) in 1969. The SER is now regarded as the leading journal in the Asia Pacific and it is in the Social Sciences Citation Index (SSCI) indexed journal.

Today, ESS has expanded to include members from the academic, government and business sectors. The Society organizes conferences and networking sessions to foster discussions of current economic issues relating to Singapore and the region.



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Our Mission

Since Adam Smith, the study of economics was largely motivated by the need to investigate the opportunities that people have for good living. Viewed in this light, economics is to promote a spirit of inquiry for the common good of humanity:

- A *willingness* to investigate issues in the local, school and wider community.
- A *readiness* to recognize social, economics, ecological and political dimensions of issues needed to solve them.
- The ability to analyze issues and to *participate* in action aimed at achieving a sustainable future.

(UNESCO, Teaching and Learning for a Sustainable Future)

Our mission is to help strengthen the foundation for economics to promote the above traits among citizens and fulfill what it has originally set out to do for mankind.

The foundation we mention above comprises outlook, attitude and values. We hope our economics will promote:

- a responsible and compassionate outlook to life. We believe that every one of us must bear responsibility for the development and change of the society in which we live. Our sense of responsibility must extend beyond the afflictions caused by our own actions to include miseries around us, especially those that are within our ability to help remedy. We hope that every citizen will be mindful of the consequences that follow their actions; this will be the first step towards building a compassionate society.
- intellectual inquisitiveness by encouraging people to question both the unknown and the known. We hope to see minds freed from conformism, conservatism and short-sighted interests so that morbidity will not settle in the minds of especially our young learners.
- a balance between positive and normative economics. We need to remind readers that economics is not a value-free mathematical subject; and that it is the product of a relentless effort to understand the world around us and to question the fundamental values required for sustainable living.

Together, these will lay the foundation to enable us to master the art of living, which is essentially the art of making choices that will be in line with promoting a good and harmonious living for all. This is economics for society.

Foreword



When I first came to know about Economics & Society, I appreciated the effort to make the subject of economics more accessible to readers, and bring the human aspect of economics back into the spotlight, for a better society.

This issue, themed “Man and his Neighbour”, delves into the topic of inequality. We all aspire towards building a fair, caring and inclusive society, one where Singaporeans of all backgrounds can improve their lives and no one is left behind. Tackling income inequality, ensuring social mobility and social integration are top priorities for the Government.

Singapore’s social strategies have always been closely tied to our economic strategies. Our efforts to build a vibrant, innovative economy, and to provide good jobs for Singaporeans, serve a very important social objective — to support broad-based improvement in income growth. Conversely, our social strategies provide the foundation for a vibrant economy — it is our people who keep Singapore going, and investments in education, housing and healthcare, skills upgrading and lifelong learning are critical to both the social well-being of Singaporeans and Singapore’s economic vitality. Both are mutually reinforcing, and serve to secure social upliftment and well-being.

However, today’s environment is vastly different from what it was 50 years ago. The confluence of globalisation, technological advancements and demographic trends such as a rapidly ageing population has given rise to growing and increasingly diverse social needs. Income inequality has also increased in Singapore, as in almost all developed economies. A volatile global environment, the emergence of new technologies and mismatch of job skills have widened the divide in societies between those who are able to tap the opportunities of the global markets, and those who cannot.

We have therefore invested heavily in social interventions over the years. These include multiple layers of assistance, with different tiers of support for different domains of well-being, ranging from broad-based subsidies and transfers, to targeted assistance for those with specific needs. For example, the Workfare Income Supplement (WIS) tops up CPF savings and supplements the wages of older low-wage workers in their working years. The SkillsFuture movement provides Singaporeans with opportunities to develop their fullest potential throughout life, regardless of their starting point, and acquire new skills to keep up with changing needs of the economy.

To make social assistance to Singaporeans more accessible and coordinated, the Ministry of Social and Family Development set up a network of Social Service Offices. This network strengthens the delivery, planning and coordination of social assistance and services for lower-income and vulnerable individuals, and households. We are now taking the next step to further strengthen coordination and integration of social services on the ground. We also introduced KidSTART to

support low income and vulnerable young children to enable them to have a good start in life. Through the SG Cares movement, we mobilise volunteers and reach out to partners with different resources to work with us in caring for those in need.

Our policies to temper inequality and improve social mobility are motivated by our conviction to build a Singapore where all of us can lead lives with dignity and meaning, and participate and contribute in our own ways. Yet, building a fair and inclusive society has to go beyond government redistributive schemes and policies. It is at its heart about achieving a stronger social compact for the future, strengthening personal and familial responsibility, and supporting those in need through the collective actions of society.

The articles in this bulletin will delve deeper into the relationship between economics and issues surrounding inequality. I thank the writers for their insightful contributions. There is no easy solution to the issue of inequality. Therefore, we must continue to find better solutions and try out fresh ideas to keep the playing field level for Singaporeans of all walks of life. I hope that these articles will inspire not just thinking about the issues, but also spur action to bring about sustainable solutions. Let us work together as a society to strengthen our social compact and care for those in our midst who are less fortunate than ourselves.

Desmond Lee

Minister for Social and Family Development &
Second Minister for National Development



Note from the Editorial Team

In planning for this issue of *Economics & Society* a year back, the editorial team was convinced that inequality was one of the defining concerns of our time. Brexit and the election of US President Donald Trump showed that there was significant resentment over the distribution of the gains from globalisation and technological advancements. As such, this issue was titled *Man & His Neighbour* to focus on the topic of inequality.

We did not expect that our new President's first address would be about inequality too, of course, and are pleasantly surprised that this issue would be published in the midst of conversations regarding how Singapore can address the growing inequality and class differential in our society. In that light, we are pleased to have Minister for Social and Family Development, Mr Desmond Lee to write the *Foreword* for this issue.

In *In Conversation with*, we further explore the issue of inequality in the Singapore context through an interview with Dr Irene Ng, Associate Professor of Social Work and Director of the Social Service Research Centre in the National University of Singapore (NUS).

In *Essays*, Dr Kelvin Seah sheds more light on the well-known relationship between socio-economic status (SES) and academic performance by examining how SES may affect personality traits of students and hence academic performance of local students. Our other essay goes beyond the local context to examine the causes of global inequality in terms of inter- and intra-country inequality, and what the future may hold.

For this issue, we put a human face to inequality in our *Perspective* section by presenting a reflective blog post based on a learning journey to Jalan Kukoh, one of the poorest areas in Singapore.

Finally, the winning entry of the MAS-ESS Essay Competition 2017 on the impact of disruptive technologies bookends this issue.

We wish all readers a fruitful journey through the pages.



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The Impact of Disruptive Technologies



In Conversation with **Dr Irene Ng**

Dr Irene Ng is an Associate Professor of Social Work and Director of the Social Service Research Centre in the National University of Singapore. She holds a joint Ph.D. in Social Work and Economics from the University of Michigan. Her research areas include poverty and inequality, intergenerational mobility, youth crime, and social welfare policy. Her research projects include an evaluation of a national Work Support programme; National Youth Surveys 2010, 2013 and 2016; a study of low-income households with debt; and an evaluation of Social Service Offices. She is active in the community, serving or having

served in committees in the Ministry of Social and Family Development, National Council of Social Service, Ministry of Manpower, and various voluntary welfare organisations. Her teaching areas include poverty, policy, welfare economics, youth work, and program planning. *Economics & Society* caught up with her to find out her insights on inequality and intergenerational immobility in Singapore.



Let's start with your graduate studies. You have a joint Ph.D. in Social Work and Economics. These two seem to be very different disciplines. Why did you choose to do a joint Ph.D. in these two disciplines?

Initially, I did not think the two were that different. In my undergraduate studies in Economics, I learnt public finance, which involved analysing government revenue and expenditure and the allocation of a government's resources. The latter naturally overlapped with social policy and social interventions. I later discovered that the two can be quite

different, e.g., social case work is very different from macroeconomic theory. However, my decision was not driven by how similar or dissimilar the two disciplines were. Interest and passion were the greater considerations. Doing something that involved both Economics and Social Work appealed to me as I enjoyed the rigour of Economics and was also very interested in working with youths from low-income families. So, when I came across the joint Economics and Social Work programme offered by Michigan, it seemed like an ideal choice as it blended well my interest in poverty and Economics.

You're currently the Director of the Social Services Research Centre in NUS. How has your training in both Social Work and Economics been useful to your current work?

Social service research is multidisciplinary, and I adopt multidisciplinary thinking due to my training. For example, in the Michigan programme that I underwent, the training borrowed freely from many social science theories. These included theories from Sociology, Anthropology, Political Science, and of course, Economics. Also, my social work teaching and community service give me the natural professional linkages to social services, whereas my economic theories give me a rigorous framework to assess what's happening in the sector. In terms of research skills, my social work training grounds me in programme evaluation and my econometrics training grounds me in solid quantitative analysis. The two are complementary. The former involves understanding programme designs and

how programmes are supposed to work (also known as the programme logic) in order to find out what data ought to be collected and at which stage. The latter is used to analyse the collected data to determine whether the programmes' outcomes were achieved. It also helps that I understand the language of both disciplines.

Your research areas include inequality and intergenerational mobility. Could you share how the level of inequality and intergenerational mobility in our society has changed over time?

Let us start with intergenerational mobility, which refers to how easily younger generations can move beyond their parents' social class. Through analysing a limited data set and drawing links to larger trends, I was able to infer that intergenerational mobility has worsened over time. I think this inference should be quite accurate as I have presented the findings and found

Doing something that involved both Economics and Social Work appealed to me as I enjoyed the rigour of Economics and was also very interested in working with youths from low-income families.

that there was consensus with others who have worked on it. As for inequality, I think it is no secret that inequality is wide in Singapore. A widening inequality trend is similarly felt in other developed countries, with more and more redistribution required from policy to reverse the trend. The difference is that Singapore bears the brunt of inequality problems because of our rapid pace of development. Things got especially bad in the 2000s, which necessitated stronger policies such as the Workfare Income Supplement (WIS) and the Progressive Wage Model to alleviate the problem. This helped to partially reverse the trend. But, compared to other developed countries, Singapore's inequality is still high. Singapore is currently quite stratified. This explains the worsening intergenerational mobility because greater gaps between social classes mean that the barriers to entering a higher social class are higher. A graduate and a non-graduate are in very different social classes. So, in a nutshell, income inequality has worsened. This, together with other factors of widening gaps

in social classes, has contributed to Singapore's lower intergenerational mobility compared to the past. Today, it is harder to cross class boundaries even in our basic institutions of education and housing.

What are some factors that have caused these trends?

It is a mix of factors. Major ones include rapid economic growth, globalisation, skills-biased technological development, and pro-market government policies that overemphasise individual performance and underemphasise social protection. And these factors interact. For example, the rapid economic growth and globalisation make for a more volatile job environment as workers become more easily and readily replaced. This pushes more people into low-wage jobs. In such an environment, when policies do not sufficiently protect low-income earners, the negative effects on income inequality are magnified. And as explained earlier, higher inequality causes worsened intergenerational immobility. By policies

A widening inequality trend is similarly felt in other developed countries, with more and more redistribution required from policy to reverse the trend.

that do not protect low-income earners enough, I mean policies that simply “top up” incomes to a subsistence level. This is in contrast to policies that enable low-income earners to find ways to improve their situation (e.g., afford the time and space to learn new skills) and to help their next generation. Our current policies are generally designed to help families during short-term periods of financial distress and belong more to the former. That is a factor behind the rising inequality. The other part of the equation is that skills-biased technological development has increased the incomes of those at the top. In fact, a lot of the inequality is driven by higher incomes at the top besides falling incomes at the bottom.

Going forward, in response to the worsening inequality and intergenerational mobility, must the role of the government increase?

We have seen great benefits from an open, capitalist economic system compared to the system before which was closed. Incomes rose originally and welfare improved. However, as the system matures we have also seen how it worsens inequality in the absence of strong government institutions. With technological disruption and rapid market transformations, our current legislation and means-tested programmes have difficulty keeping pace. The role of government must



definitely increase. One role is to rethink our rules and test them for ill effects on the bottom in our society. Community self-help is sometimes thought of as an alternative solution but community self-help lacks the necessary infrastructure and resources to do so effectively.

Thank you for sharing your insights. The final question is on a lighter note — what advice would you give to students who have just started to learn Economics?

Keep empathy and feel your heart even as you learn this “dismal science”. The Father of Modern Economics Adam Smith was a moral philosopher. He advocated for market systems because the former mercantilist system oppressed the poor. Today, market systems are failing the poor. Remember the heart of Economics and use our Economics for social good, not individual financial gain.

Does Socioeconomic Background Matter?

The Case of Singapore



by Kelvin Seah Kah Cheng

Is there a relationship between the personality of children and their socioeconomic status (SES)? A wide body of research has found a robust link between students' socioeconomic background and academic achievement. Despite this, little is known about the relationship between

socioeconomic background and the personality and preferences of children. A good understanding of the latter is important because personality traits and preferences shape many facets of an individual's subsequent life, including his or her occupational choice, income, work performance, life

satisfaction, and even health behaviour.

To explore the relationship between family background and student personality and preferences, I examine data from the Programme for International Student Assessment (PISA) 2015. This is a large-scale international

survey, conducted in 2015, in which Singapore Schools were part of. It provides information on the Mathematics, Science, and English language competencies of each 15-year-old student who took part in the survey (as measured by the student's skills and abilities in solving real-world problems), as well as detailed family background characteristics of these students. Students were required to answer a comprehensive set of questions relating to how they felt about school and learning, allowing one to glean insights on their attitudes and aspirations towards education. The Singapore sample, consisting of 5,508 students, is representative of our 15-year-old population.

Since 15-year-old students in the sample came from a variety of grade levels, and because the overwhelming majority came from Secondary 4, I restrict my sample to students from Secondary 4.

There are a variety of ways to measure the socioeconomic background of children. In this article, I measure socioeconomic background using the educational attainment of a child's parents. In particular, I classify a child

Children from higher SES families tend to have higher expectations of themselves, are armed with more ambition and drive, and enjoy learning and taking the interests of others into consideration more.

as belonging to a higher SES if at least one of the child's parents has received some form of tertiary education and belonging to a lower SES if neither of the child's parents has received any form of tertiary education. That said, it should be noted that none of the conclusions about the influence of socioeconomic background change even when alternative measures for socioeconomic background are used (for instance, the conclusions are virtually identical even when I use the Index of Economic, Social, and Cultural Status created by PISA, which measures SES on the basis of several aspects such as the parents' occupational status, parents' highest level

of education, family wealth, educational resources possessed, and possessions related to "classical" culture in the student's home).

Table 1 shows results from eight different regressions, where a different personality trait / subject achievement is regressed on the binary variable measuring socioeconomic background. The values in the table are the estimated coefficients on the binary variable measuring SES from each of these simple regressions. This binary variable is equal to 1 if the child is from a high SES family and equal to 0 otherwise. As can be seen, children from better socioeconomic backgrounds differ along many dimensions from their lower

Table 1: Simple Regressions of Student Personality Traits / Academic Performance on a Binary Variable Indicating High SES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	Expect to Complete University	Want to Be Best Student in Class	Take What Interests Others into Account	Enjoy Acquiring Knowledge	Speak English at Home	Science Test Score	Math Test Score	English Test Score
High SES	0.260*** (0.013)	0.018* (0.010)	0.034*** (0.008)	0.057*** (0.010)	0.308*** (0.013)	0.550*** (0.026)	0.469*** (0.026)	0.553*** (0.026)
Observations	5,423	5,419	5,410	5,363	5,427	5,430	5,430	5,430
R-Squared	0.070	0.001	0.004	0.006	0.095	0.076	0.055	0.077

Notes: Each column summarises the results of a separate regression of a student trait / academic performance on a binary variable measuring a student's socioeconomic background (1 if student is from a high SES family and 0 if from a lower SES family). The dependent variable in column (1) is whether the student expects to complete university education. The dependent variable in column (2) is a binary variable indicating whether the student wants to be among the top students in the class. The dependent variable in column (3) is a binary variable indicating whether the student takes what interests others into account. The dependent variable in column (4) is a binary variable indicating whether the student enjoys acquiring knowledge in Science. The dependent variable in column (5) is a binary variable indicating whether the student speaks English as a home language. The dependent variable in column (6) is the student's test score in the Science Assessment. The dependent variable in column (7) is the student's test score in the Math Assessment. The dependent variable in column (8) is the student's test score in the English Language Assessment. Robust standard errors are shown in parentheses. *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

Table 2: Regressions of Student Personality Traits / Academic Performance on a Binary Variable Indicating High SES, Controlling for Age, Gender, and Migration Status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	Expect to Complete University	Want to Be Best Student in Class	Take What Interests Others into Account	Enjoy Acquiring Knowledge	Speak English at Home	Science Test Score	Math Test Score	English Test Score
High SES	0.251*** (0.013)	0.016 (0.011)	0.034*** (0.008)	0.053*** (0.010)	0.324*** (0.013)	0.538*** (0.026)	0.461*** (0.027)	0.539*** (0.026)
Observations	5,423	5,419	5,410	5,363	5,427	5,430	5,430	5,430
R-Squared	0.088	0.002	0.005	0.010	0.110	0.081	0.060	0.092

Notes: Each column summarises the results of a separate regression of a student trait / academic performance on a binary variable measuring student socioeconomic background (1 if student is from a high SES family and 0 if from a lower SES family). All regressions control for student gender, age, and migration status. The dependent variable in column (1) is whether the student expects to complete university education. The dependent variable in column (2) is a binary variable indicating whether the student wants to be among the top students in the class. The dependent variable in column (3) is a binary variable indicating whether the student takes what interests others into account. The dependent variable in column (4) is a binary variable indicating whether the student enjoys acquiring knowledge in Science. The dependent variable in column (5) is a binary variable indicating whether the student speaks English as a home language. The dependent variable in column (6) is the student's test score in the Science Assessment. The dependent variable in column (7) is the student's test score in the Math Assessment. The dependent variable in column (8) is the student's test score in the English Language Assessment. Robust standard errors are shown in parentheses. *** p-value<0.01, ** p-value<0.05, * p-value<0.1.

SES counterparts. Specifically, children from higher SES families are considerably more likely to expect that they will successfully complete university education, to aspire to be among the top performers in class, to take what interests others into account, and to enjoy acquiring new knowledge. These indicate that children from higher SES families tend to have higher expectations of themselves, are armed with more ambition and drive, and enjoy learning and taking the interests of others into consideration more.

The fact that students differ on these traits based on SES has

important implications because these traits — including the drive to succeed, ambition, willingness to learn, and ability to consider the viewpoints of others — are precisely those traits which are rewarded in the labour market. This suggests that the well-documented relationship between earnings and family background could be due not just to the tendency for parents from higher SES families to better invest in their children's human capital or for children from higher SES families to have greater access to social networks which help them achieve higher-paying

jobs, but to the tendency, as well, for individuals from better socioeconomic backgrounds to possess precisely those attributes which are valued by employers. The simple comparisons in the table show that differences in these traits between students from different socioeconomic backgrounds emerge even before they actually enter the labour market, while still in school.

Table 1 also shows two other things: children from higher SES families (1) are more likely to speak the test language (English) at home and (2) to fare considerably better in terms of

The well-documented relationship between earnings and family background could be due not just to the tendency for parents from higher SES families to better invest in their children's human capital or for children from higher SES families to have greater access to social networks which help them achieve higher-paying jobs, but to the tendency, as well, for individuals from better socioeconomic backgrounds to possess precisely those attributes which are valued by employers.

academic results. While 66% of kids from higher SES families speak English at home, only 35% of kids from lower SES families do the same. Because test scores in this analysis are standardised (subject test scores are standardised by subtracting the mean score from each student's score before dividing by the standard deviation of the test score distribution), the values in the table should be interpreted in the following way: Compared to students from lower SES families, students

from higher SES families scored approximately 0.55, 0.47, and 0.55 standard deviations higher respectively on the Science, Mathematics, and English language assessments. These test score differences are not only statistically significant (significant at the 1% level in each case) but are also very large in magnitude. Socioeconomic background accounts for a non-trivial fraction of the variation in individual test scores across students, approximately 5 to 8%.

The fact that children from lower SES families lag behind their higher SES counterparts has important implications for social mobility because academic performance in national exams determines in large part the type of education one will and can eventually receive (for instance, whether one is admitted to the normal technical or express stream in secondary school; or whether one is admitted to an Institute of Technical Education, polytechnic, or junior college,



post-secondary, depends not just on one's preferences, but on how well one performs in the Primary School Leaving Examination and the "O" or "N" levels respectively), the kind of peers one has, and ultimately, the type of jobs which are open to the person.

Because personality traits, academic performance, and socioeconomic background might be related to children's migration status, age, and gender, I run the regressions in Table 1, again, but this time, control for students' migration status (whether Singapore or foreign born), age, and gender. The estimated coefficients on the SES variable from these regressions are shown in Table 2. They show that none of the conclusions regarding the relationship between personality traits / academic performance and SES change even if these characteristics are held constant.

This analysis has shown that the academic performance and personality traits of students are strongly shaped by family background. While the strong association between academic achievement and family SES has been widely established in the literature and perhaps is not

The fact that children from lower SES families lag behind their higher SES counterparts has important implications for social mobility because academic performance in national exams determines in large part the type of education one will and can eventually receive.

too surprising, what is more eye-raising is the finding on how children from lower SES families feel about education, their school experience, and themselves.

Here, in Singapore, considerable effort has been made to ensure that students, regardless of background, are on a level playing field. Many financial provisions are available to students from lower SES families, such as the MOE Financial Assistance Scheme which provides an umbrella

of benefits including school fee waivers, free textbooks, subsidised transport, and meals. Still, the findings from this analysis suggest that more can potentially be done to help children from low SES families. Apart from providing them with the tangible resources to address disparities in academic achievement, there is scope for us to explore ways to empower them to think positively about schooling and their capabilities so that they may create a better future for themselves.

Kelvin Seah Kah Cheng is a Lecturer in the Department of Economics, National University of Singapore, and a Research Affiliate at the Institute of Labor Economics (IZA). His research focuses on the economics of education.

Is the World Getting More Unequal?

by **Christabelle Soh**

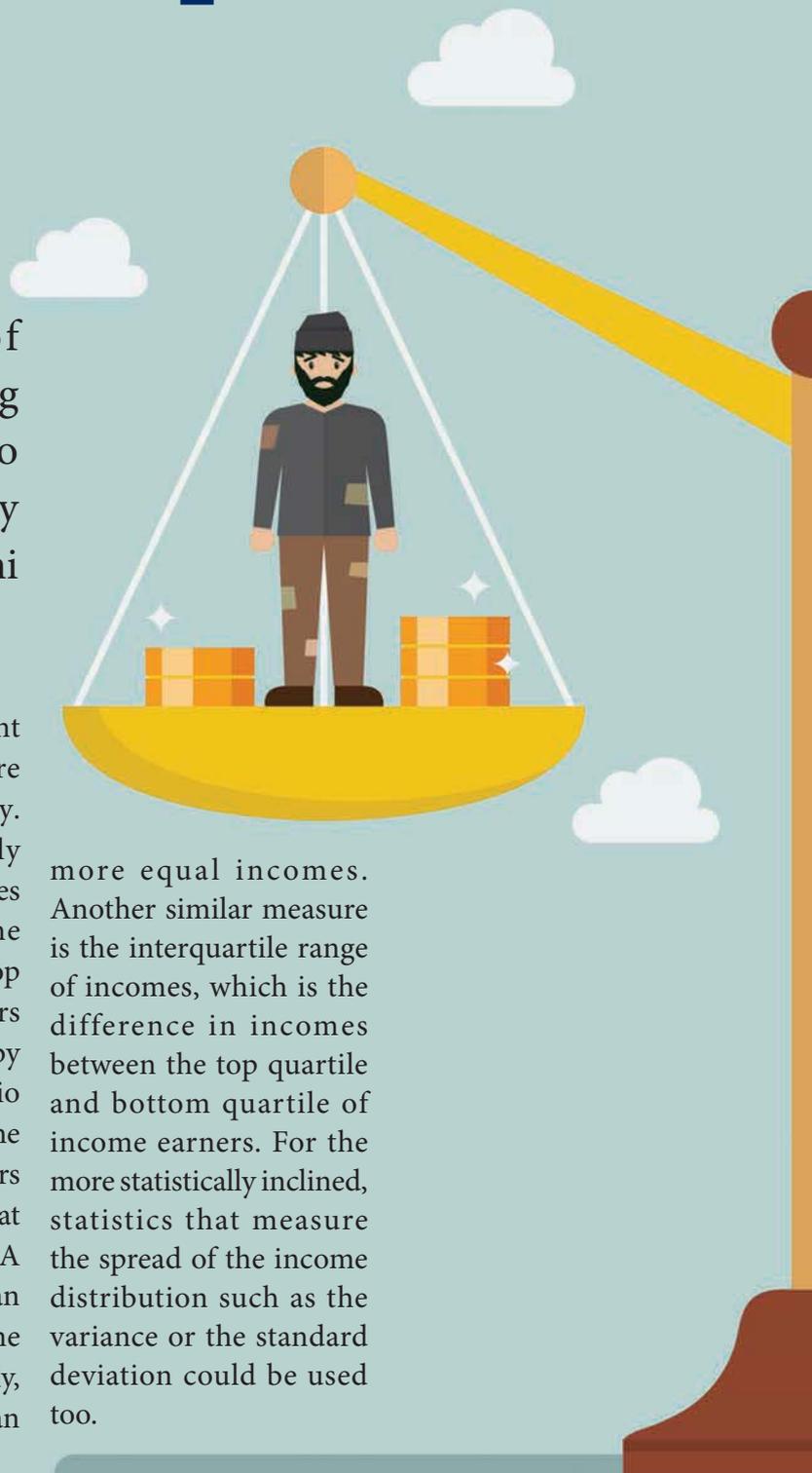
To answer the question of whether the world is getting more unequal, we need to understand one of the most commonly used measures of inequality — the Gini coefficient.

What is the Gini coefficient?

The Gini coefficient measures the degree of income inequality. Its value ranges from 0 to 1 (although this is sometimes scaled from 0 to 100). A value of 0 means that incomes are perfectly equal (i.e., everyone has the same income) while a value of 1 means that incomes are perfectly unequal (i.e., one person has all the income while everyone else has zero income).

The Gini coefficient is not the only measure of income inequality. Other more intuitively understandable measures include the ratio of the income earned by the top decile of income earners to the income earned by the bottom decile. A ratio of 7:1 would mean that the top 10% of income earners make seven times of what the bottom 10% does. A higher ratio would mean a greater extent of income inequality and conversely, a lower ratio would mean

more equal incomes. Another similar measure is the interquartile range of incomes, which is the difference in incomes between the top quartile and bottom quartile of income earners. For the more statistically inclined, statistics that measure the spread of the income distribution such as the variance or the standard deviation could be used too.





Nonetheless, of the many measures available, the Gini coefficient is quite commonly used because it is rigorous in the sense that all data points have an effect on its value (in contrast, measures like the interquartile range are not affected by how skewed incomes are in between the top and bottom quartile) while still being easy enough to comprehend (in contrast to the statistical measures like the standard deviation).

The global Gini coefficient

Hellebrandt and Mauro (2015)¹ estimated that in the decade leading up to 2013, the global Gini coefficient had decreased from 0.687 to 0.649, meaning that global inequality had actually decreased.

The question then, is why the data does not seem to corroborate with ground sentiments. Ask any person on the street whether he/she feels that income inequality is rising or falling and chances are, he/she would say that it is rising. Yet, the data shows quite clearly that inequality is falling. To

¹ Hellebrandt, Tomas and Mauro, Paolo (2015) — The Future of Worldwide Income Distribution (April 1, 2015). Peterson Institute for International Economics Working Paper No. 15-7. Available at SSRN or <http://dx.doi.org/10.2139/ssrn.2593894>

The lifestyle differences between the rich and poor in the same country is more apparent than the lifestyle differences between people living in richer and poorer countries.

understand why this is so, we need to first delve into what affects global inequality.

Global inequality is affected by inequality within countries and inequality between countries. The sense of rising inequality is driven by rising inequality within countries as it is the inequality within countries that is more salient to most people. The lifestyle differences between the rich and poor in the same country is more apparent than the lifestyle differences between people living in richer and poorer countries. Data wise, inequality within countries has indeed been rising. For example, according to the Singapore Department of Statistics, across the same period (2003–2013), Singapore's Gini coefficient

before government transfers and taxes increased from 0.458 to 0.463.² The increase in Gini coefficient was also observed in the US (0.44 to 0.45).³

The reduction in the global Gini coefficient, however, was driven by the reduction in inequality between countries. This is because developing countries have been experiencing faster income growth compared to developed countries (a phenomenon known as convergence where all economies eventually converge in terms of having similar incomes per capita). Between 2003 and 2013, the gross domestic product (GDP) per capita growth in developing countries excluding China averaged about 2.8%.⁴ The figure for Organisation for Economic Cooperation and

Development (OECD), a proxy for developed countries, was only 1.0%.⁵

In short, global inequality had been falling because inequality between countries had been falling and outweighing the rise in inequality within countries. While the data presented only cover 2003 to 2013, the trend of rising inequality within countries and falling inequality between countries appears to have been sustained till 2017.

Will inequality continue to rise within countries and fall between countries?

Whether the scenario of rising inequality within countries and falling inequality between countries will persist will depend on trends in technological advancement and globalisation.

Technological advancement has a direct effect on income inequality within a country. Each wave of industrial revolution replaced labour with capital/technology. The

² Household incomes of all groups rise except for top 10%, The Straits Times, 19 February 2014.

³ <https://www.statista.com/statistics/374655/gini-index-for-income-distribution-equality-for-us-families/>

⁴ <http://www.worldbank.org/content/dam/Worldbank/document/Africa/Report/state-of-the-region-2014-spring-meetings.pdf>

⁵ https://stats.oecd.org/Index.aspx?DataSetCode=PDB_GR#

Fourth Industrial Revolution is no different in that regard. What is different is the type of labour that is being replaced. In the past, it was standardised and repetitive manual jobs that were replaced. In today's world, the jobs being replaced are increasingly cognitive in nature. White collar jobs that currently form the bulk of

middle-income employment (e.g., accounting) will increasingly be diminished. This hollowing out of the middle will worsen income inequality in two ways. First, a gap in the middle naturally creates a larger disparity in incomes. Second, since the displaced workers lack upward mobility, they will move into the

labour markets at the bottom end instead. The increase in supply of labour at the bottom end will then depress wages further. Thus, unless progress in artificial intelligence and machine learning is halted (an unlikely and undesirable scenario), inequality within countries will continue to increase.



Technological advancement also affects income inequality between countries. First, it allows developing countries to leapfrog developed economies by lowering certain barriers. For example, the spread of mobile phones in Kenya made it easier for more people to be plugged into the financial infrastructure through M Pesa, a mobile phone-based money transfer, financing and microfinancing service. WeChat in China serves a similar function (and more). Second, technological advancement facilitated globalisation through lowering barriers to trade, capital flows, and labour flows. Such flows have generally benefitted developing countries to a greater extent through creating multiple channels for growth such as exports and inward foreign direct investment (FDI).

However, continued

globalisation is not necessarily a given. While technological developments have lowered the barriers to trade, capital, and labour flows, artificial barriers have sprung up instead. In the US, President Donald Trump pulled out of the Trans-Pacific Partnership (TPP) and followed up with slapping tariffs on a range of products. In the UK, voters voted for Brexit. While France's election of Emmanuel Macron is an endorsement of the belief in open markets, its significance lies more in the fact that it bucks the prevailing trend towards nationalism and closed doors. Such a climate is unlikely to change while global growth remains anaemic and the disenfranchised do not see their lives improve. Since the fortunes of developing economies are tied to more open markets, de-globalisation would slow the convergence between developing and

developed economies. Thus, inequality between countries is likely to fall but more slowly (it is unlikely to increase since the growth rate of developing countries' GDP per capita will naturally be higher given the lower base that it starts from).

Governments naturally care about inequality within countries and much less so about inequality between countries. Nonetheless, governments should take actions that reduce both.

Redistribution is not a bad word

In thinking about inequality within countries, since technological advancement is one of the driving forces of such inequality, should we stop the progress of technology or make it extremely expensive to adopt new technology? The answer is a clear and resounding no. If

Since the fortunes of developing economies are tied to more open markets, de-globalisation would slow the convergence between developing and developed economies.

the Luddites, a band of 19th-century workmen who went around destroying machinery in cotton mills to protect their jobs, were successful, our world would be a much poorer place today. Instead, what is needed is to accept the benefits that technological advancement presents, and take a good hard look at redistribution after.

Redistribution is anathema to some economists who argue that it reduces the incentive to work hard and distorts markets. However, there is a distinction between redistribution to achieve equal outcomes and redistribution to achieve equal opportunity. The former is indeed a terrible idea. The latter, however, would pay for itself by allowing every unit of labour reaches its potential. Unfortunately, while the concept is simple, implementation would be challenging. For starters, equal opportunity would need to be clearly and accurately defined — a difficult task.

Regarding inequality between countries, governments should embrace globalisation not because it decreases inequality between countries but because globalisation creates mutual benefits. Trade

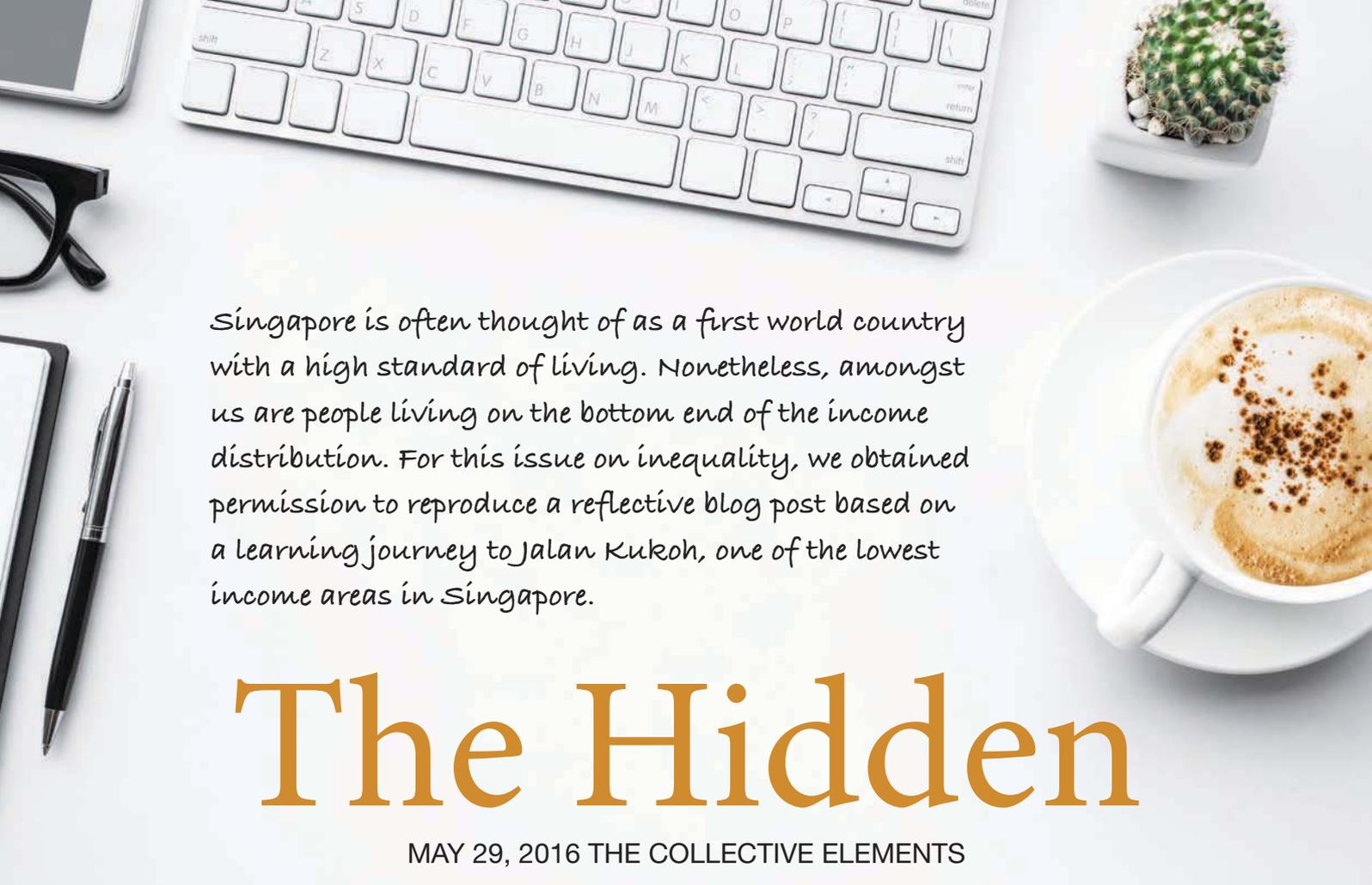
Regarding inequality between countries, governments should embrace globalisation not because it decreases inequality between countries but because globalisation creates mutual benefits.

benefits the developing world by creating jobs and the rich world by lowering prices and increasing purchasing power. Capital flows generate income for the source country and form a source of finance, as well as facilitate technological transfers for the recipient country. Remittances from labour outflows add to source countries' incomes and help fill up labour shortages in host countries (especially rich and ageing ones). However, while the benefits of globalisation outweigh its costs, the benefits and costs are not equally spread out. In developed economies, many blue-collared workers have borne the brunt of the

costs but not enjoyed as much of the benefits. Here too, redistribution for equal opportunity is key.

In conclusion, if no action is taken, inequality within countries will increase and that between countries will decrease much more slowly. The solution is to continue to embrace both technological changes and globalisation while also strengthening policies to mitigate their redistributive effects. Such policies should achieve equal opportunity but not necessarily equal outcomes. Experiments involving universal basic incomes should yield useful findings on the feasibility of such policies.

Christabelle Soh's passion lies in Economics and Education. She is an editorial team member of *Economics & Society* and believes in making the world a better place through raising rational and compassionate students of Economics.



Singapore is often thought of as a first world country with a high standard of living. Nonetheless, amongst us are people living on the bottom end of the income distribution. For this issue on inequality, we obtained permission to reproduce a reflective blog post based on a learning journey to Jalan Kukoh, one of the lowest income areas in Singapore.

The Hidden

MAY 29, 2016 THE COLLECTIVE ELEMENTS

I had the opportunity to go on a community trail hosted by National Youth Corp and The Thought Collective in Jalan Kukoh, one of the less fortunate areas in Singapore, and had my eyes opened.

But first, some background about Jalan Kukoh.

Jalan Kukoh is situated on a hill near the Central Business District (CBD), but is still one of the poorest parts in Singapore. The unemployment rate there is at a staggering 60% (a stark contrast compared to the country's 1.9%), but the majority of people there are actually in the working ages of 30–40 years old. Due to a variety of demographic factors, the residents there still live their lives in relative poverty compared to regular Singaporeans.

Here's what I found out:



Jalan Kukoh hidden right next to the Clarke Quay district, along the Central Expressway (CTE). This spot is a regular hangout place for the local residents. The stench of urine is particularly strong here.



A resident dries plastic bags on the clothes rack. Are even plastic bags hard to come by? Perhaps she's just being environmentally friendly.



Another popular hangout place, a grass patch littered with cigarette buds and peanut shells.

A Numoni stand, trying to bring financial inclusion to the poor here.



The three brightly colored flats stand out among the other depressingly purple coloured ones. The three are the only flats that are not rental flats in the area. They also have facilities like basketball and tennis courts plus a playground, strikingly different from the other rental flats.

● Perspective

A resident spends his time growing plants outside his house. What do you think his lifestyle is like?

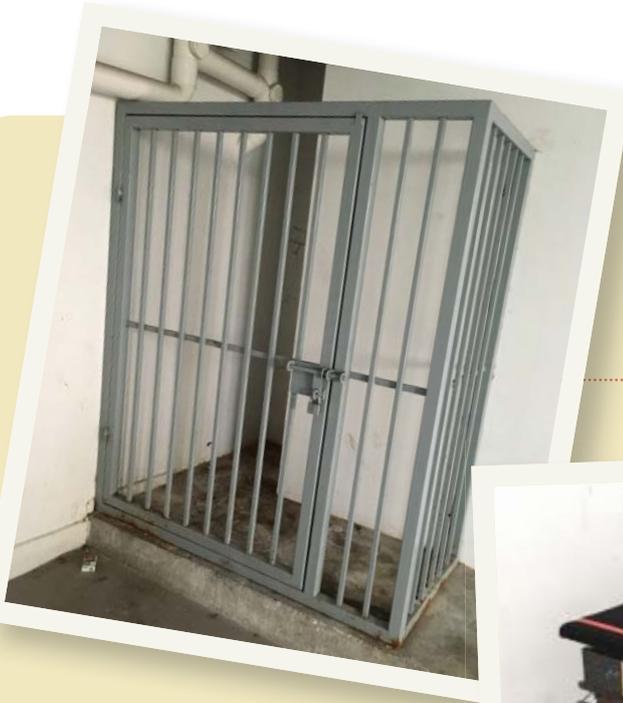


Plugs left behind from an old Laundromat area, an initiative by a social enterprise that didn't work out.



A small eco-garden project (possibly by another social enterprise).





A corner being locked up to deter people from using it as a public toilet. The smell and marks of urine and faeces still linger.



An illegally outfitted electric bike, common among the residents here. According to the residents, some of the bikes are capable of reaching up to 120km/h, far beyond the 25km/h allowed by law.

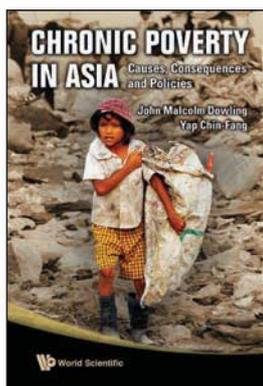
The pavilion where young boys practise the ritual of walking barefoot on glass shards (supposedly grants them strength).



A recent pigeon infestation problem which brings in hygiene and health concerns. Let us hope that we can do something about this.



Blog post reproduced with permission from:
<https://thecollectiveelementsblog.wordpress.com/2016/05/29/the-hidden>



Chronic Poverty in Asia

Causes, Consequences and Policies

By John Malcolm Dowling
(University of Hawaii, USA),
Chin-Fang Yap

Asia contains the bulk of the world's poor, as many as 500 million people. A significant fraction of these poor are chronically poor, which means that they and their families have been poor for years and will remain in poverty unless governmental policies are adopted which can lift them out of poverty.

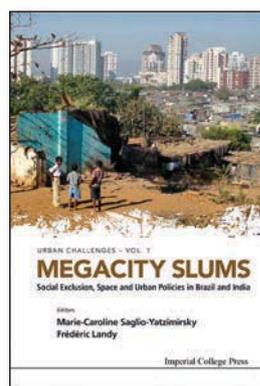
This book focuses on rural poverty and those countries in Asia with the largest number of chronically poor, including the two emerging superpowers of China and India, other countries of South Asia and the Mekong region as well as Indonesia and Philippines in Southeast Asia. Systematic analysis of who is poor, where they live, and why they are poor is carried out. Microeconomic, sector and macroeconomic policies which have been adopted to address this important social issue are also discussed. Through specific country analysis, the book outlines additional concrete measures that can be taken to reduce chronic poverty and improve the welfare of these people.

592pp | Oct 2009

ISBN: 978-981-283-886-5

ISBN: 978-981-4468-66-4 (e-book)

Published by World Scientific



Megacity Slums

Social Exclusion, Space and Urban Policies in Brazil and India

By Marie-Caroline Saglio-Yatzimirsky (INALCO, France & Center for South Asian Studies (CEIAS, CNRS-EHESS), France),
Frédéric Landy (Center for South Asian Studies (CEIAS, CNRS-EHESS), France & University of Paris Ouest-Nanterre, France)

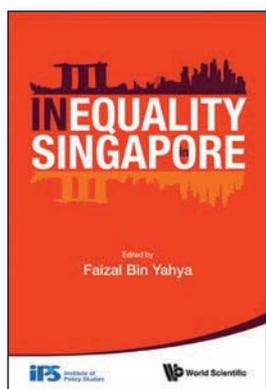
This book looks at slums and social exclusion in the four major megacities of India and Brazil, and analyzes the interrelationships between urban policies and housing and environmental issues. In Delhi, Mumbai, Rio de Janeiro and São Paulo, the challenges they pose have spurred public actors into action through housing, rehabilitation and conservation programs, not to mention civil society and the inhabitants themselves. On the other hand, one must wonder whether these challenges were partly created by the deficiencies of these very public actors and civil society, be it their lack of intervention (as advocates of government intervention would argue), or the flaws and inadequacies of their actions (as supporters of the free market would suggest). Are policies alleviating or aggravating social exclusion? This book explores these questions and more.

464pp | Dec 2013

ISBN: 978-1-908979-59-9

ISBN: 978-1-908979-61-2 (e-book)

Published by World Scientific



Inequality in Singapore

By Faizal Bin Yahya (Institute of Policy Studies, Singapore)

Income inequality has become a global phenomenon. Rapid technological advancement and an expanding global workforce will continue to place huge pressure on wages all over the world, including Singapore. This edited volume is the product of the robust exchanges that took place in a series of closed-door discussions (CDDs) on inequality that the Institute of Policy Studies organised in the first half of 2012. The essays provide a range of views on the multi-faceted nature of inequality in Singapore, discuss candidly the specific challenges we face, and offer some policy recommendations.

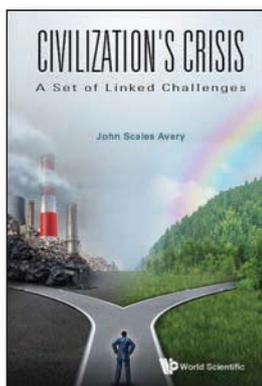
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Published by World Scientific



Civilization's Crisis

A Set of Linked Challenges

By **John Scales Avery** (*University of Copenhagen, Denmark*)

Modern civilization faces a broad spectrum of daunting problems, but rational solutions are available for them all. This book explores the following issues: (1) Threats to the environment and climate change; (2) a growing population and vanishing resources; (3) the global food and refugee crisis; (4) intolerable economic inequality; (5) the threat of nuclear war; (6) the military-industrial complex; and (7) limits to growth. These problems are closely interlinked, and their possible solutions are discussed in this book.

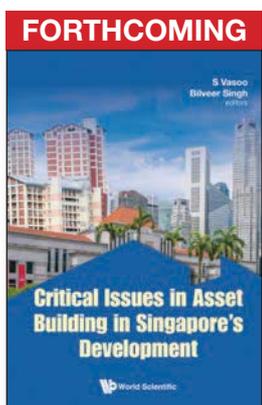
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Published by **World Scientific Europe**



Critical Issues in Asset Building in Singapore's Development

By **S Vasoo** (*NUS, Singapore*), **Bilveer Singh** (*NUS, Singapore*)

Singapore's progress as an independent nation and the uplifting of its people's livelihood have been made possible by stable social and political conditions. A more important factor in driving these positive changes lies with people-centric leadership. One can contrast the case of Singapore with societies led by self-serving leaders whose lack of honesty and integrity brings about immense social and economic hardships to various communities. When people suffer under undesirable circumstances, they often migrate to seek better future for themselves and their families.

This book reveals how Singapore's governance grounded on the principle of asset building facilitates the country's growth and development. Policies being discussed in this volume include multi-culturalism, accessible housing, social mobility for low-income families, water resource management, and national conscription.

Highly relevant for students, policy makers and the general public interested in socio-political and economic development issues, this unique piece of work not only gives readers a documentary account of what has been undertaken to empower and assist citizens in the last 50 years or so, but also prompts them to reflect on Singapore's future trajectory.

228pp | Aug 2018

ISBN: 978-981-3239-75-3

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The Impact of Disruptive Technologies

Chua Fang En
Hwa Chong Institution (College)



Executive Summary

The emergence of new and disruptive technologies is a double-edged sword. The birth of new economic products and sectors (be it artificial intelligence, the sharing economy or the rise of e-commerce), has brought immense convenience and benefits for both consumers and producers, bringing businesses, production and Singapore's productive capacity to new heights. We see the emergence of new products

that highlight immense potential for our future productivity. Yet, these benefits come at a cost. Disruptive technology has interfered with our traditional economic functioning. We see this in the loss of jobs for PMETs and low-skilled workers, as well as the displacement of traditional sectors of our economy. Ultimately, the question remains: do the benefits of disruptive technology outweigh the costs? This essay will attempt an evaluation of the potential harms and benefits of disruptive technology.

The critical issue to consider: we face limitless possibilities, but also endless risks brought by this disruptive technology. To prosper in this new

world means embracing and adapting to changes, how does Singapore then, as a nation with 50 years of miraculous success premised on our high adaptability, deal with harms like the displacement of jobs by disruptive technology while enjoying and maximising the opportunities? Singapore needs to provide sufficient safety nets for those left behind, regulate the growth of disruptive technology and simultaneously promote the utilisation of productive technology. Methods to achieve these will be examined in this essay.

Overall, I propose that while the new age brings change and unpredictability, potential benefits it brings far outweighs the harms, hence as a nation which has continuously and successfully restructured our economy in the past, disruptive technology is a valuable opportunity and propeller for Singapore.

By embracing change, we move towards a new stage of progress and a second economic miracle for Singapore.



The Fourth Industrial Revolution – Disruptive Technology: Bane or Boon?

Today, technological advancements is growing at an unprecedented pace. Private-hire-car drivers disrupt the

taxi industry; robots replace hundreds of blue-collared workers; even start-up companies with minimal experience compared to incumbent firms can triumph when armed with advanced technology. This is the age termed the “Fourth Industrial Revolution”. Disruptive

technology, innovation that creates new markets and products, displace established firms and markets (figure 1). They dismantle, revolutionise and disrupt traditional industries and producers.

E-commerce is the new favourite platform for exchange of goods and services, with

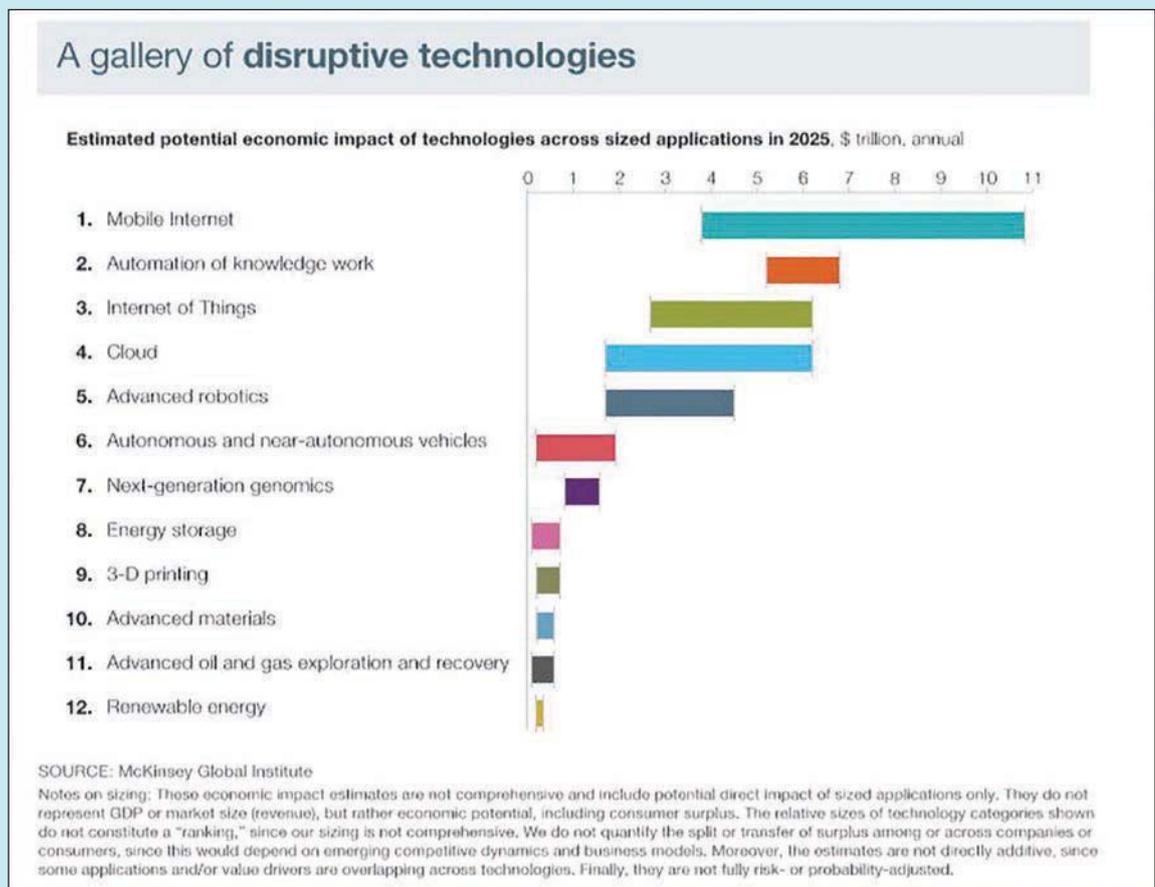


Figure 1: Gallery of Disruptive Technology and its potential economic impact¹

¹ Manyika, James, Michael Chui, Jacques Bughin, Richard Dobbs, Peter Bisson, and Alex Marrs. “Disruptive technologies: Advances that will transform life, business, and the global economy.” McKinsey & Company. May 2013. Accessed February 10, 2017. <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/disruptive-technologies>.

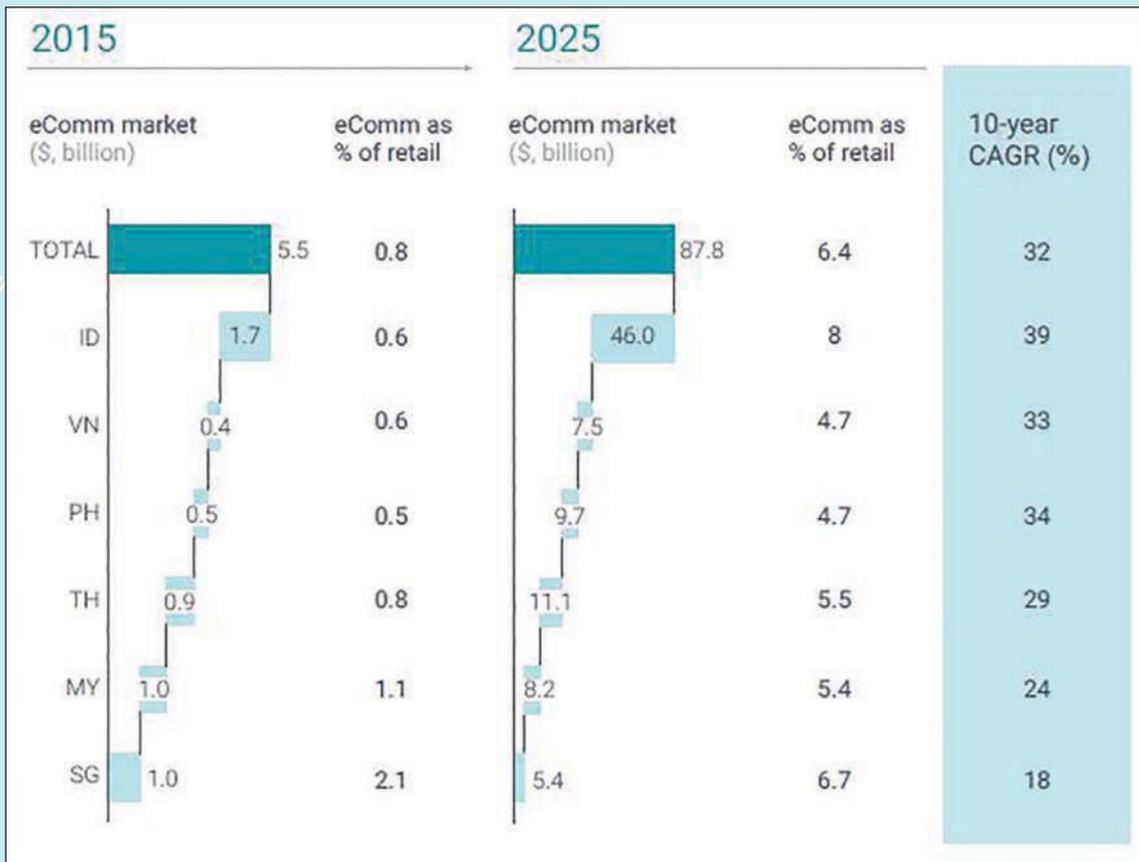


Figure 2: Rise of e-commerce in Singapore illustrated through a growing net worth

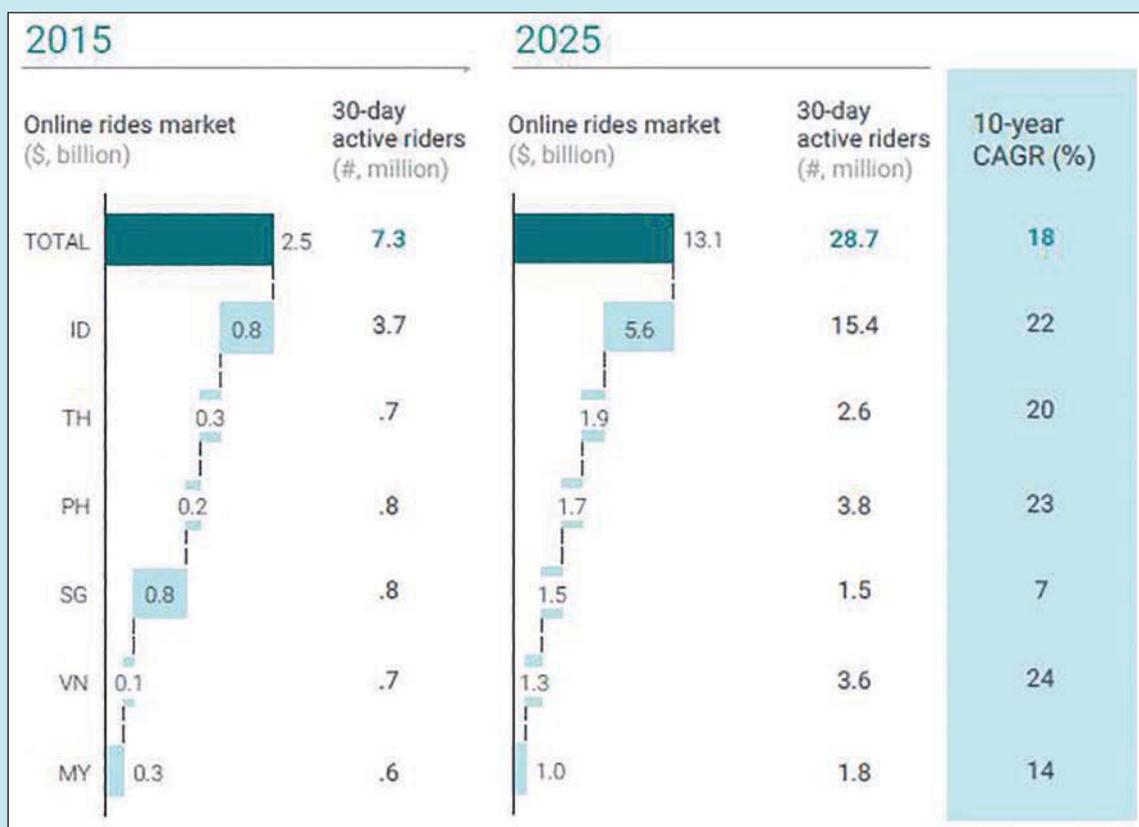


Figure 3: Growth of online rides market illustrated through a growing net worth and active riders

its worth likely to exceed S\$7 billion by 2025² (figure 2). At this rate, it is likely to overtake traditional retail.

Similarly, the sharing economy grows at an unprecedented pace. Uber and Grabcar are formidable competitors for traditional taxi companies, with its net worth estimated to reach S\$13.1 billion by 2025³ (figure 3).

How does this affect Singapore? This essay seeks to analyse the potential costs and benefits of disruptive technology, followed by proposals on how Singapore can cope with disruptive technology. We shall first turn to the costs of disruptive technology.

Trade-Offs in the New Age

Potential Pains of Disruptive Technology

The rise of disruptive technology comes at the decline of traditional production. Before we can fully reap benefits from disruptive technology, we will first feel the impacts of the disruption of jobs and decline of industries, hitting our middle class and those on the lower rungs of the socioeconomic ladder.

First, on the impact on industries.

a) Disruptive technology hits Industries and Businesses

Disruptive technology has revolutionised market structures⁴ (figure 4), creating new markets for consumption and displacing established firms and industries. These new markets have low barriers to entry⁵, drastically increasing competition⁶ in industries (table 1). The high appeal of these new businesses further threaten the incumbent firms.

In the sharing economy alone, through allowing consumers to bypass firms⁹ and traditional rental industries, the idea of collaborative consumption¹⁰ is popularised. Individuals are able to trade with each other directly, making businesses redundant. The

² "Singapore e-commerce market to exceed S\$7b in 2025: Report." Channel NewsAsia. May 24, 2016. Accessed March 20, 2017. <http://www.channelnewsasia.com/news/business/singapore-e->

³ Ibid

⁴ In Singapore particularly, the transport industry remains heavily affected by the rise of the sharing economy in the form of apps such as Uber and Grabcar which replaces traditional taxis with its high convenience. Similarly, tourist agencies are heavily affected with the rise of Airbnb and online booking sites such as Expedia. The rise of Carousell and Shopback has been an obstacle for retail stores.

⁵ Disruptive technology has allowed for firms or individuals with no physical assets to easily enter industries. Online retail has removed problems associated with physical store rental and the sharing economy remains easily accessible for the layman on the street who is seeking extra income.

⁶ Taxi companies still dominate the on-demand transport market in Singapore with close to 30,000 vehicles, but the number of private-hire vehicles that mostly ply for new entrants, such as Uber and GrabCar, has grown rapidly in the past three years to an estimated 10,000. This indicates growing competition for taxi companies that continues to increase at a rapid pace.

⁷ Grossman, Rhys. "The Industries That Are Being Disrupted the Most by Digital." Harvard Business Review. March 21, 2016. Accessed March 21, 2017. <https://hbr.org/2016/03/the-industries-that-are-being-disrupted-the-most-by-digital>.

⁸ Lim Wei Lu, Jaime Pang, Poh Lip Hang, Nimisha Tailor. "E-Commerce in Singapore - How it affects the nature of competition and what it means for competition policy". December 2 2015. Accessed March 12 2017.

⁹ Consumers can now book their own flights and accommodation online through Airbnb rather than through hotel booking agencies. The emergence of sites matching producers with consumers directly, such as Rent Tycoons has diminished the importance of middleman in businesses, in this case, car rental companies.

¹⁰ This includes any form of initiative allowing people to trade with each other directly, such as Airbnb, PandaBed, Rent Tycoons etc. Collaborative consumption refers to when regular consumers collaborate and work with each other to exchange goods and services and enhance satisfaction and welfare.

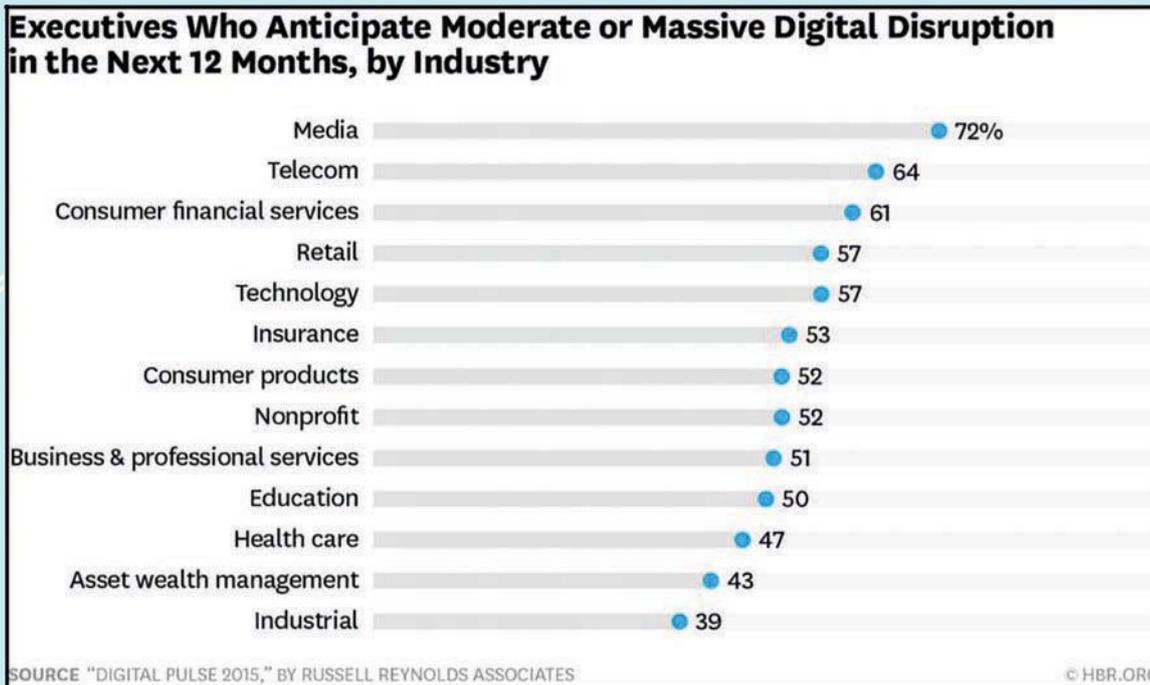


Figure 4: Industries affected by the entry of new businesses with the rise of disruptive technology⁷

Table 1: Entry of new online businesses in Singapore from 2010–2014⁸

Year of Entry	Firm	Industry
2009	Reebonz	Luxury products and services
2010	Qoo10 Clozette Luxola Groupon Deal.com.sg	B2C Marketplace C2C Marketplace Beauty and cosmetics Marketplace for daily deals Marketplace for daily deals
2011	NoQ Store Bellabox VanityTrove	Books Cosmetics/Groceries Beauty
2012	Kwerkee Zalora Carousell Food Panda	Home and lifestyle Fashion marketplace C2C Marketplace Food
2013	Taobao HipVan Omigo	B2C and C2C marketplace Home furnishing, fashion accessories B2C Marketplace
2014	Rakuten Lazada	B2C Marketplace B2C Marketplace

convenience¹¹, novelty¹², lower prices and high efficiency¹³ of this new initiative led to its growing popularity¹⁴, illustrated in the growing worth of this new economic sector, estimated to match traditional sectors by 2025 (figure 5). Users have also doubled to 35,000 in Singapore in 2014¹⁵ and continue to grow rapidly.

What does this mean for Singapore businesses and industries? The popularity of these new initiatives often comes at the expense of traditional industries and businesses losing their consumers to the sharing economy. A shrinking consumer base forces businesses to scale down or even shut down with decreasing revenue.

Putting this into perspective, 73% of traditional financial firms believe that part of their business is at risk of being lost to standalone Fintech companies¹⁷.

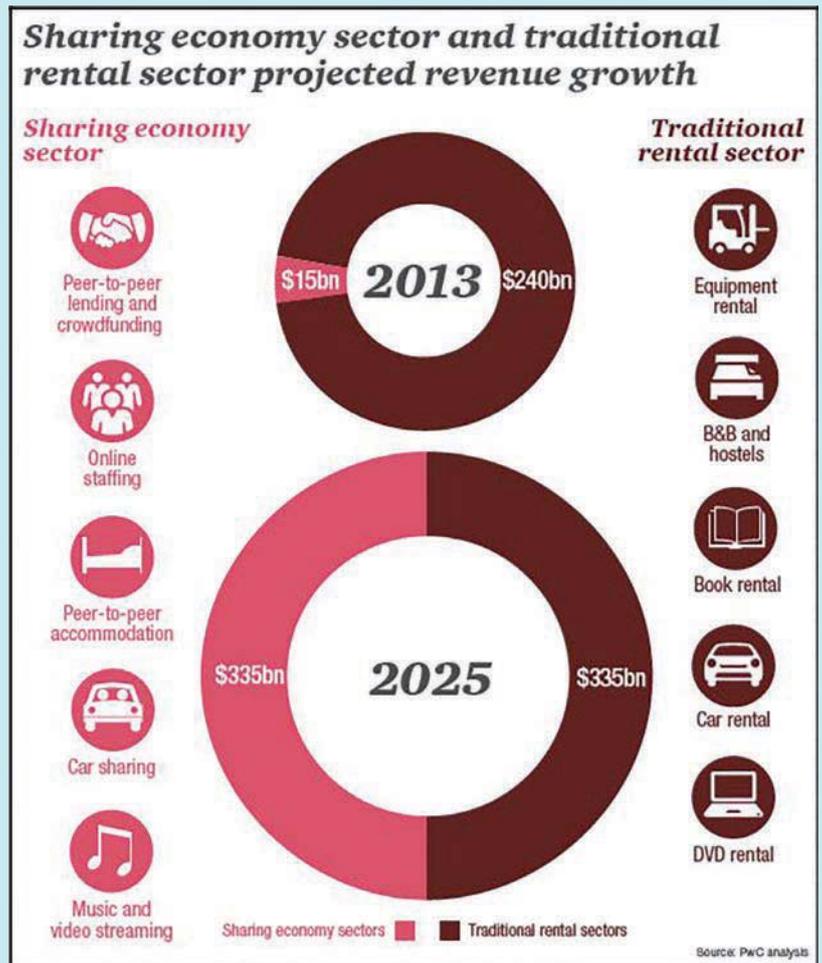


Figure 5: Illustration of growing worth of sharing economy and the displacement of traditional rental sectors¹⁶

¹¹ It takes as little as 30 seconds to put up a listing on the app and the app's messaging system allows for communication between buyer and seller without external applications or emails, asking for more details of the goods or settling transaction details. Users can opt for delivery with their goods delivered right to their doorstep, rather than having to access a physical store.

¹² Airbnb provides a novel experience of living like a local, with houses spread out all over the country and filled with local cultural influences, hence bringing a brand new experience to tourists. The high number of detailed reviews by other tourists also give greater and more accurate insight to consumers, making Airbnb not just convenient, but also highly reliable.

¹³ Flexible pricing used by Uber and Grabcar increases the availability of vehicles during peak hours and offer simpler fare structures, as compared to complicated surcharge systems by taxi companies, thus appealing consumers.

¹⁴ In less than two years, 2,000 owners have signed up for Rent Tycoon, a site directly matching users with individuals wanting to rent out their cars. Airbnb also witnesses increasing popularity and consumer base.

¹⁵ "Singapore's sharing economy is on the rise." TODAYonline. August 11, 2014. Accessed March 27, 2017. <http://www.todayonline.com/business/singapores-sharing-economy-rise>.

¹⁶ "PwC Says Traditional Rental Sectors are in BIG Trouble!" Accessed March 30, 2017. <http://www.phlatbed.com/blogs/?p=136>.

¹⁷ Ang, Audrey. "Disruption in Singapore: Is your industry next?" E27. August 24, 2016. Accessed March 30, 2017. <https://e27.co/disruption-singapore-industry-next-20160824/>.

Transcab¹⁸ could be losing S\$3 million a month to Uber and Grabcar. Traditional retail is increasingly threatened by the popularity of e-commerce (figure 6) (figure 7).

Increasing unpredictability from the rapidly evolving technology scene can further erode competitive advantages overnight. Even when businesses evolve, innovations can be disrupted as well²¹, making adaptation difficult.

With competitors armed with strong technology, traditional industries and businesses approach sunset.

b) Disruptive technology hits Workers and Employment

When businesses are hit, workers are sacrificed. MOM's recent report²² showed that 9510 workers were retrenched,



Figure 6: Infographic depicting rise of e-commerce and increasing consumer taste and preference towards convenient online shopping¹⁹

Retail Sales Index¹

	Total	Total (excluding motor vehicles)
	↑ 1.7% Month-on-Month ²	↓ 1.1% Month-on-Month ²
	↓ 3.2% Year-on-Year	↓ 9.6% Year-on-Year
% Change in Retail Sales		
	Month-on-Month ²	Year-on-Year
Department Stores	↓ 1.8	↓ 10.5
Supermarkets	↑ 2.7	↓ 7.1
Mini-marts & Convenience Stores	↓ 3.2	↑ 0.8
Food & Beverages	↑ 0.9	↓ 34.7
Motor Vehicles	↑ 15.0	↑ 51.3
Petrol Service Stations	↓ 7.4	↓ 7.6
Medical Goods & Toiletries	↑ 2.7	↑ 4.1
Wearing Apparel & Footwear	↑ 5.2	↓ 12.7
Furniture & Household Equipment	↓ 5.9	↓ 13.5
Recreational Goods	↓ 3.1	↓ 4.8
Watches & Jewellery	↓ 1.2	↓ 12.4
Telecommunications Apparatus & Computers	↑ 4.6	↓ 16.6
Optical Goods & Books	↓ 5.7	↓ 5.9

Figure 7: Table indicating a fall in revenue in most retail sales in 2016²⁰

¹⁸ This is the second largest taxi operator in Singapore. A recent Straits Times article had reported that about 800 Trans-Cab taxis were left idling in a yard at Sungei Kadut, instead of plying the roads, a sign of the problems taxi operators face in the new age.

¹⁹ Poh, Joanne. "Why retail shopping in Singapore is in real trouble." AsiaOne. April 14, 2017. Accessed April 30, 2017. <http://news.asiaone.com/news/business/why-retail-shopping-singapore-real-trouble>.

²⁰ Williams, Ann. "Singapore retail sales disappoint with 3.2% drop in February." The Straits Times. April 15, 2016. Accessed April 10, 2017. <http://www.straitstimes.com/business/economy/singapore-retail-sales-fall-32-in-february>.

²¹ For instance, driverless cars can disrupt Uber. Prime Minister Lee Hsien Loong in the National Day Rally Speech mentioned this phenomenon, where he highlighted the constant changing economic environment and the problems this has posed for businesses. "Everywhere where there's Uber and Grab - or in China, Didi Kuaidi and in other cities, different names - they are disrupting the taxi industry," he said. "Disrupting, but commuters are benefiting: Better service, more responsive, faster - but taxi companies and drivers find their business affected. I think we all know that we cannot stop progress. Even Uber and Grab are going to be disrupted!"

²² The overall unemployment rate rose from 1.9 per cent in March to 2.1 per cent in June. Among citizens, unemployment rose from 2.6 per cent to 3.1 per cent and rose from 2.7 per cent to 3 per cent among residents. Economists and Members of Parliament explained that several factors were at play, including predominantly older workers displaced by disruptive technology who are reluctant to accept jobs that pay lower wages, or who are not equipped with the skills to cope with new technology. MOM's report on the job situation in the third quarter also showed a drop in the total number of people employed, and the number of layoffs for the first nine months of this year rose to the highest since the 2009 global financial crisis. Jobseekers continued to outnumber the vacancies available for the second quarter in a row, figures showed. (Source: Today and MOM)

the highest since 2009²³. In Singapore's manufacturing industry alone, 22,400 fewer workers were employed in 2016²⁴.

The rise of automation – one of the key components of disruptive technology – has replaced jobs of low-skilled labourers²⁵, as witnessed in America (figure 8) and potentially in Singapore. Retrenchment is especially harmful as these labourers earn low incomes and lack skills for better jobs, thus are trapped in unemployment.

Even for those employed, the decreasing demand for their labour stagnates their income, while high-skilled income rises, increasing income inequality²⁶.

The rest are not spared. For self-employed individuals, such as taxi drivers, the entry of strong competitors²⁷ decreases their customers and income²⁸. Having to operate at higher costs, with new businesses bypassing rental fees and operational costs²⁹, further reduces their revenue. AI³⁰ can also replace lawyers, accountants and doctors³¹,

threatening traditionally stable professions.

However, the worst effects are on the PMETs³² (figure 9) belonging to the middle-class. The scaling down of businesses in sunset industries³³ and entry of disruptive technology³⁴ decreases demand for their labour, causing retrenchment. While high-tech sunrise industries³⁵ create jobs, they require skills most PMETs lack. Hence, those retrenched fail to obtain jobs or are forced to take up poorer jobs³⁶, increasing structural unemployment.

²³ "Unemployment in Singapore rises, more workers made redundant in Q2." Channel NewsAsia. September 15, 2016. Accessed April 10, 2017. <http://www.channelnewsasia.com/news/business/unemployment-in-singapore-rises-more-workers-made-redundant-in/3128434.html>.

²⁴ Chuan, Toh Yong. "Local workers, note where the job compass is pointing." The Straits Times. January 29, 2016. Accessed April 10, 2017. <http://www.straitstimes.com/singapore/manpower/local-workers-note-where-the-job-compass-is-pointing>.

²⁵ Printing prototypes for Ford now takes under a week and only a few thousand dollars with barely any labour required, as compared to the past where workers are needed to manually produce prototypes. 3D printing can reduce production processes to 3-4 steps. Automation simplifies production and replaces the processes traditionally labour-intensive, hence, reduces demand for labour.

²⁶ With the entry of disruptive technology, individuals with skills equipped to fill the gaps of researchers, innovators are priced, driving up the demand for their labour. For these individuals, they may witness rising or at least high income. However, for low-skilled labour, the decrease in demand for their labour, due to decreasing demand in the industry and automaton, is likely to further stagnate or worse, decrease their income. The rise of disruptive technology is hence, likely to further increase Singapore's income inequality.

²⁷ Uber, Grabcar or any other private-hire transport services

²⁸ Several taxi drivers working for the traditional operators to said that their earnings have dropped by at least 20 per cent since the apps came onto the scene. Comfort maxi cab driver Mr Henry Tay, 45, who has been driving a taxi for eight years, noted that the customer typically pay lower fares for taking Uber or GrabCar. (Source: Channel News Asia)

²⁹ Uber and Grab operate with lesser restrictions, as they work on a network of independent contractors. For instance, uber drivers need to send their cars for service regularly and pay significantly lower rental of around \$50 a day, instead of the approximate \$150 taxi drivers pay.

³⁰ Artificial Intelligence

³¹ AI can review and create contracts, identify potential fraud and other legal misconducts or do legal research for lawyers. For accountants, AI takes over sifting and sorting of data and other mathematical calculations. Similarly for doctors, rapid growth in medical technology can replace certain jobs of doctors in the future.

³² Professionals, Managers, Executives, Technicians

³³ These industries are typically the industries that employ the most PMETs, such as the traditional banking industry that has been increasingly threatened by Fintech.

³⁴ Artificial Intelligence can increasingly replace of jobs of PMETs, making them redundant. In the finance industry, the rise of AI can completely replace the job of a professional, completing all logistics and documentation at a high speed.

³⁵ Examples include Medtech, Fintech, Robotics etc

³⁶ Only a rough 40 per cents of PMETs are fortunate enough to get back into a job that is similar in grade and salary while 60 per cent have to reinvent themselves or do something totally different.

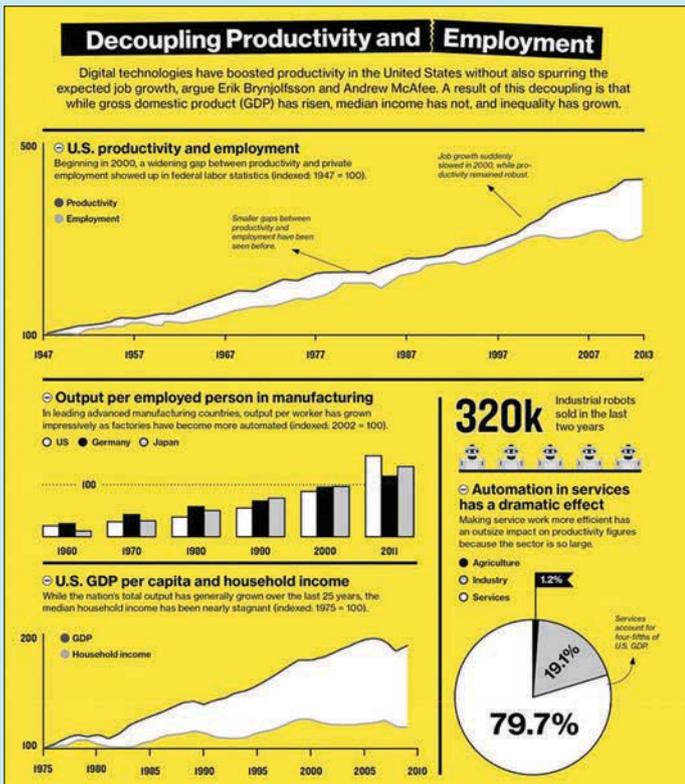


Figure 8: Trends of unemployment caused by automation in US

Even when employed, real income grows slowly³⁷, given decreasing demand. These harms can potentially lead to the “hollowing out”^{38,39} of our middle-class, with worrying consequences⁴⁰.

Ultimately, technology disrupts careers and leaves many vulnerable to unemployment.

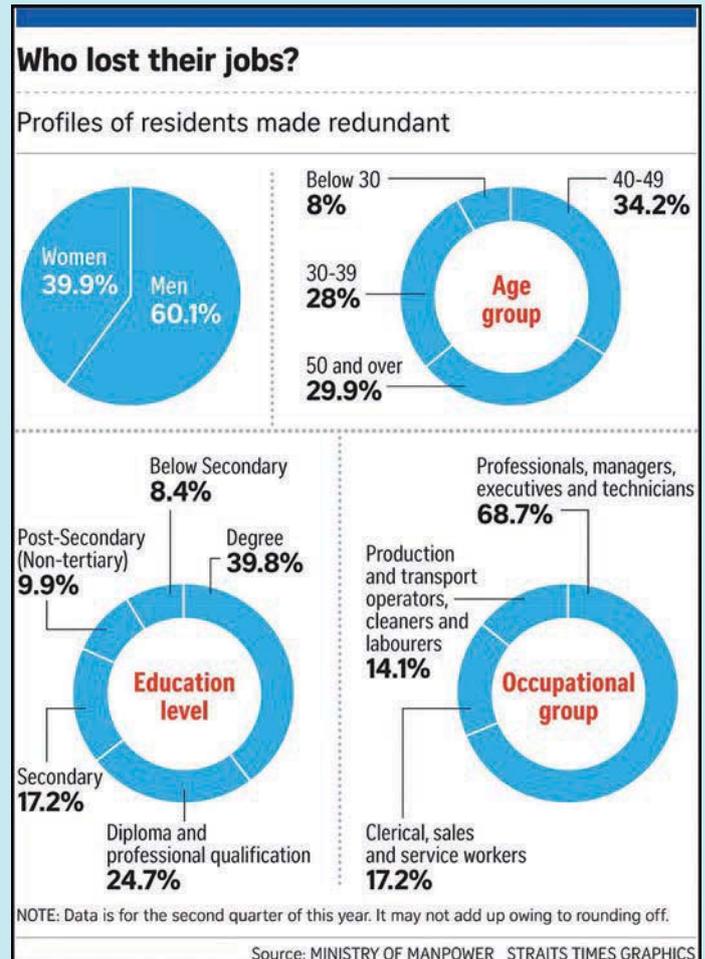


Figure 9: Infographic depicting job loss for Singaporeans because of technology, particularly hitting labourers and PMETs

³⁷ Middle-class citizens saw the slowest rise in their monthly real incomes, compared with households at the top and bottom, going by the latest official figures. Wages for households in the middle 60 per cent of income earners here rose an average of less than 5 per cent last year from 2013, after adjusting for inflation, compared to a 5.9 per cent average gain in real wages for the bottom 20 per cent of households, and a 6.2 per cent average rise in incomes for the top 20 per cent, according to the Department of Statistics' latest annual Key Household Income Trends survey. (Source: Straits Times)

³⁸ This refers to a phenomenon where the middle class increasingly see their incomes being squeezed by the loss of jobs and shrinking sectors, yet their income is not low enough to qualify for a huge portion of state benefits while they bear the brunt in any increase in taxes or cost of living. This is a common phenomenon in OECD economies, and with the rise of disruptive technology, will be a growing concern for Singapore, as middle-class citizens employed as PMETs witness job loss.

³⁹ Liang, Lim Yan. "Middle-income families feeling salary squeeze." The Straits Times. February 22, 2015. Accessed March 01, 2017. <http://www.straitstimes.com/singapore/middle-income-families-feeling-salary-squeeze>.

⁴⁰ See Appendix A

Opportunities in the New Age

Potential Gains of Disruptive Technology

“We in Singapore believe in hard work. We believe that we must adjust ourselves to changing situations. We believe in seizing economic opportunities and not let them go past us. Finally, we believe in self-reliance..... These are human qualities that have helped to transform an island-swamp into a thriving metropolis. They are the traditional virtues of Singaporeans and so long

as we retain these virtues, we can face the future with confidence”

Dr Goh Keng Swee

However, short-term losses are not entirely harmful. As Dr Goh says, as long as Singapore seizes opportunities and remains resilient, endless opportunities lie in the future.

a) New age, new jobs, new industries

While disruptive technology shuts down industries, it similarly opens new industries, as history has shown⁴¹. New industries create new jobs and

with retraining, technology makes every job a better job, every career a better career⁴².

Locally, the emergence of Fintech⁴³, Medtech⁴⁴ and Artificial Intelligence⁴⁵ generated many jobs in knowledge-based sectors⁴⁶. While traditional jobs were lost, about 15,000^{47 48} knowledge-based and technology jobs were created.

While these jobs require new skills, they provide higher wages⁴⁹ and more room for skills upgrading⁵⁰. Jobs displaced are often “muscle jobs⁵¹” low-skilled and inefficient. This has been witnessed in America

⁴¹ Motor industry developed only when old inefficient sectors of transport industry were shut down.

⁴² This is quoted from Mr Lim Swee Say’s speech on the impacts of disruptive technology in Singapore.

⁴³ Financial technology (Fintech) refers to an industry composed of companies that use new technology and innovation with available resources in order to compete in the marketplace of traditional financial institutions and intermediaries in the delivery of financial services, such as digital payment methods. MAS intends to move towards building a Smart Financial Centre.

⁴⁴ Medical technology (Medtech) refers to development in technology in the medical sector, such as the development of high technology medical equipment, surgery processes, stem cells research and other medical related R&D that disrupts current existing medical processes. This includes Immunotherapies, Liquid Biopsy etc. Specific to Singapore, 30 global medical technology companies, as well as local start-ups, now carry out R&D in areas such as technology and product development locally. In 2015, Singapore’s medical technology sector contributed about S\$10 billion in output and about 16,000 jobs across manufacturing, R&D and HQ functions. The sector continues to grow rapidly, employing more people with higher productivity. (Source: EDB)

⁴⁵ Artificial Intelligence is one of the main forms of disruptive technology, directly taking over manufacturing and production by storm, threatening the jobs of low-skilled labour. The global robotics industry is projected to grow from US\$20 billion today to US\$80 billion by 2025, on the back of deployment of such advanced robotics in industrial applications, and the potential for deployment in services sectors, creating new jobs in the robotics sector. (Source: EDB)

⁴⁶ Singapore’s medical technology manufacturing sector employs more than 12,000 workers in high-value and complex roles, and this number is set to grow with more than 20,000 science and engineering graduates entering the workforce from Singapore’s tertiary institutions each year. Similarly, there are more than 1,000 professionals employed in the new space industry, and this is expected to grow by 300 professionals over the next five years. Similarly, the growth in tourism related industries create new jobs that require simple skills retraining for Singaporeans. (Source: EDB)

⁴⁷ Hui, Calvin. “More tech professionals needed in Singapore: IDA.” Channel NewsAsia. December 30, 2015. Accessed April 01, 2017. <http://www.channelnewsasia.com/news/singapore/more-tech-professionals/2387798.html>.

⁴⁸ A new industry transformation map to develop Singapore into the leading food and nutrition hub in Asia was launched and it aims to create about 2,000 new jobs for professionals, managers, executives and technicians (PMETs) for the sector from now till 2020. These jobs lie in new additions to the sector, such as Food Innovation Cluster which aim to encourage the development and commercialisation of new products and the establishment of shared R&D and production facilities. (Source: Channels New Asia)

⁴⁹ In Singapore, while unemployment increased, the median income rose from \$3,566 in 2014 to \$3,798 in 2015, a 7 per cent increase in real terms. Ministry of Trade and Industry says “ If Singapore succeeds in restructuring its manufacturing sector, both companies and workers will benefit” (Source: MOM, MTI)

⁵⁰ Jobs created are focused on creating a knowledge-based economy, which hence means jobs created are higher skilled, white collar jobs with higher pay, given the higher requirements placed on workers in a knowledge-based economy. There is more room for skills improvement as such jobs often do not have a limit to productivity nor do they degenerate with age, as opposed to muscle jobs (limit on physical strength, speed etc).

⁵¹ This refers to jobs that are largely repetitive, labour intensive and low skilled, such as factory production. These are also the jobs most affected by automation and other disruptive technology.

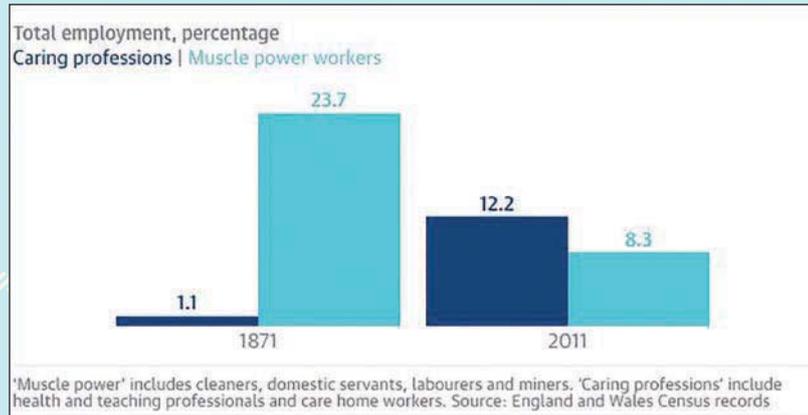


Figure 10: Decline in muscle labourers in US due to technology; jobs transferred to new sectors⁵²

(figure 10) and will likely occur in Singapore, technology makes jobs *better jobs*.

Industry wise, disruptive technology has popularised start-ups and knowledge-based industries. Technology squeezes out inefficient old industries and usher in better ones. The transformation of BLK71⁵³ from an old unproductive industrial estate facing demolition, to a thriving technology cluster with more efficient products⁵⁴ (figure 11) illustrates this. These industries are highly productive and provide valuable opportunities for workers.

Furthermore, the rise of the gig economy has lowered barriers to entry⁵⁵ for jobs, providing rising (figure 12) income⁵⁶ for more Singaporeans, thus cushioning the impacts of unemployment.

Therefore, technology also makes careers better careers.



Figure 11: BLK71 at a glance, showing the sheer number of start-ups, venture capitalists and events



Figure 12: Uber drivers witness a rising income per hour from \$18.87/h in 2014 to \$26.08 in 2016.

⁵² Allen, Katie. "Technology has created more jobs than it has destroyed, says 140 years of data." The Guardian. August 18, 2015. Accessed March 01, 2017. <https://www.theguardian.com/business/2015/aug/17/technology-created-more-jobs-than-destroyed-140-years-data-census>.

⁵³ BLK71 in Ayer Rajah was one of the oldest industrial estates in Singapore and by 2010, was slated for demolition for re-development. In 2011, it was turned into a technology start-up, pulling together scattered startups to one common location for increased synergy and economies of scale. It currently continues to grow at an unprecedented pace and has the potential to be the *Silicon Valley* of Singapore.

⁵⁴ T.Ware was produced by a start-up in BLK71, which develops a wearable technology that provides deep pressure to calm autistic children.

⁵⁵ Any individual can become a "producer" by selling their goods and services. This is compare to the past where people needed an established firm to trade goods and earn an income. This gives low-income entrepreneurs, who would otherwise be priced out of the market through costly occupational licenses the opportunity to flourish in a market.

⁵⁶ Airbnb says hosts in San Francisco who rent out their homes do so for an average of 58 nights a year, making \$9,300. Car owners who rent their vehicles to others using RelayRides make an average of \$250 a month; some make more than \$1,000. Uber drivers similarly see a rising income, seen in figure 11.

b) Better manufacturing, better products

Secondly, technology allows for production of previously unconceivable products, increasing quality, convenience and variety of goods for consumers. Internet of Things⁵⁷, Uber⁵⁸ and Rotimatics⁵⁹, which simplifies and quickens the whole process of roti making, illustrate this. Furthermore, production using advanced technology increases productivity at lower costs⁶⁰ (figure 13), which culminates in lower consumer prices.

Better products are also important for the public sector. Drones allow for safer and more efficient fire-fighting⁶¹. Robots can operate on patients

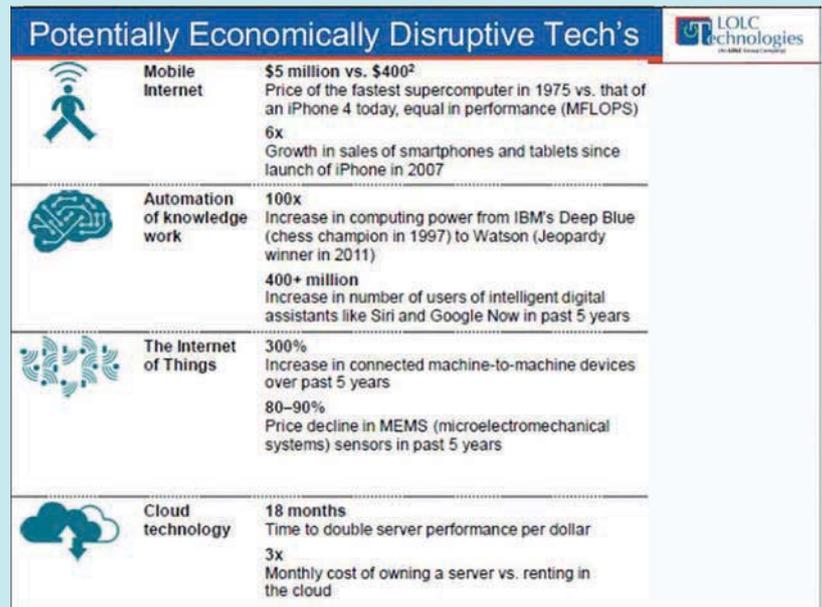


Figure 13: Disruptive technology can reduce costs of production, while increasing efficiency in production (Source: LOLC Technologies)

less invasively, lowering risks (figure 14). 3D printing aids the disabled⁶² and space exploration⁶³.

Hence, the entry of technology produces new innovative products, increasing Singapore's standard of living.

⁵⁷ Internet of Things (IoT) refers to the new concept of connecting all devices to the internet. The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.

⁵⁸ Uber operates with dynamic pricing, allowing for a far greater supply of drivers available to cater to consumer demands and less complicated pricing allowing for a simple consumer experience. The ability to track exact location of drivers, contact the driver and other mechanisms not present in taxis further enhances the consumer experience.

⁵⁹ Artificial intelligence produced in BLK71, the machine can make up to 20 cooked roti in under 30 minutes, using only whole wheat flour, oil and water. Users can also the thickness of the roti, roast level, amount of oil and number of roti required, simply pressing a button to start the process. Nearly 8500 were sold out in a few days after its launch. The machine can even be wifi operated. This serves as a success story of BLK71 and was specially mentioned by PM Lee in the National Day Rally. (Source: Straits Times, Rotimatics Website)

⁶⁰ A survey conducted among 3000 SMEs found that businesses who relied more on cloud solutions, a new technology, saw higher revenue growth, lower costs and more than twice as much profits as those who used fewer cloud services. Another example is seen in China. Self-charging robots used in China delivery services can sort up to 200,000 packages a day, and are self-charging, making them operational 24/7. The company estimates its robotic sorting system saves around 70% of the costs a human-based sorting line would require.

⁶¹ Singapore Civil Defence Force has announced the development of drone technology, to be employed in fire-fighting. The use of drones, or unmanned aerial vehicles (UAVs), is being developed for use in major operations. They will complement other unmanned and electric vehicles. Together with other new technology, fire can be detected extremely quickly and fought in safer, faster methods. (Source: The New Paper)

⁶² 3D printing brings art to life for the blind, allowing for the blind to "feel" famous art pieces. 3D printing can also print science models to educate blind students in disability schools, allowing them to learn objects they are unable to see visually.

⁶³ Home-grown start-up Gilmour Space Technologies successfully launched a self-made rocket in Australia in 2016, being the first in the world to use 3D printed fuel from combining two materials, which drastically decreases the cost of space exploration and rocket launches. (Source: Spring Singapore)

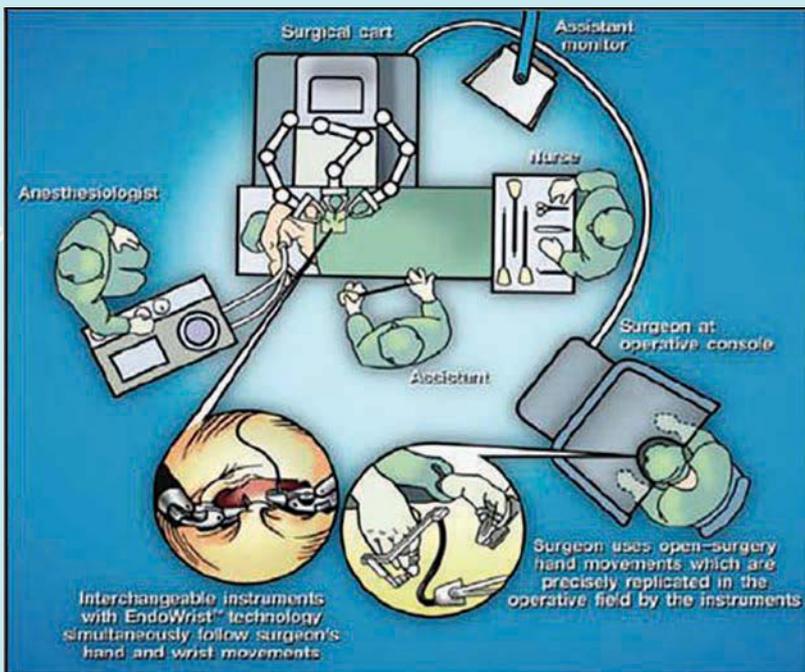


Figure 14: Robot-assisted laparoscopic surgery (Da Vinci robotic surgery), a minimally invasive surgical technique for complex urological surgery used in Singapore⁶⁴

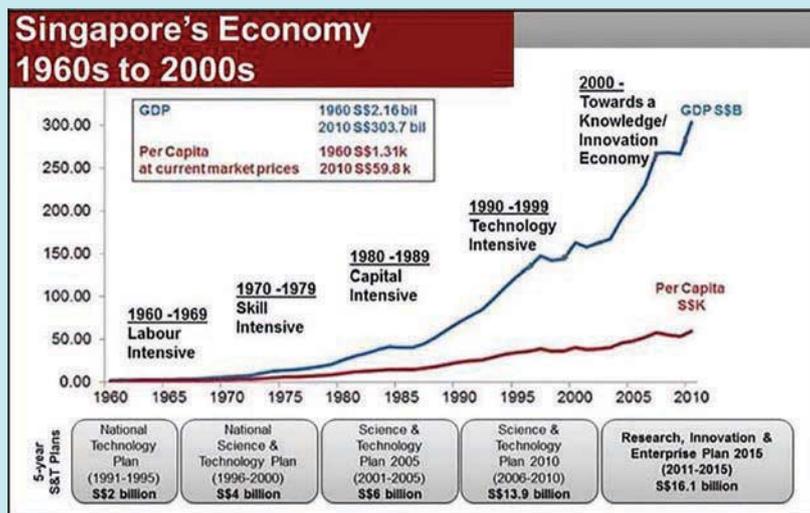


Figure 15: Restructuring of Singapore's economy from a labour intensive one to an innovative one to adapt to the world's changing demands

c) A better economy: A more competitive Singapore

“Madam, technology is the main driving force of future growth, globally. We can either use it to our advantage or allow our competitors to use it to our disadvantage. The choice is clear.”

Mr Lim Swee Say

On a macro level, seizing technology can increase Singapore's competitiveness. Increasing isolationism⁶⁵ in the world has led to world trade weakening⁶⁶, negatively affecting trade-dependent Singapore⁶⁷. Rising technology expertise in other countries and Singapore's lack of natural resources has made retaining comparative advantages⁶⁸ in niche sectors harder. To solve this, learning from our past successful changes (figure 15), it is time to shift towards value-creation.

⁶⁴ “Da Vinci Robotic Laparoscopic Surgery - minimally invasive surgery for urology procedure.” Accessed March 01, 2017. <https://www.singhealth.com.sg/PatientCare/ConditionsAndTreatments/Pages/Minimally-Invasive-Surgery-Urology-robotic-surgery.aspx>.

⁶⁵ Countries are slowly turning isolationist and protectionist. This is evident in US and its backing out from the TPP and in China, which is increasingly more cautious of trade partnerships. The impact of Brexit and wave of populism across Europe can also have significant impacts on turning European countries more isolationist than ever.

⁶⁶ Chinese industry is becoming less increasingly reliant on imported components for its exports. The cancellation of Trans-Pacific Partnership further enforces the weakening demand for Singapore commodity exports.

⁶⁷ Singapore is the most trade-dependent and Singapore's external trade is three times the size of its GDP.

⁶⁸ In the highly globalised world, comparative advantages can get lost quickly, since countries constantly employ new technology to produce goods at a lower opportunity costs. This is worsened as Singapore's lack of resources and a cheap labour force means we can never produce commodities at as low prices as other countries such as China. Furthermore, the flow of capital and investments into emerging economies have led to rapid existing technology and skills transfer into other countries and Singapore can no longer depend on producing our current value-adding exports to develop economically.

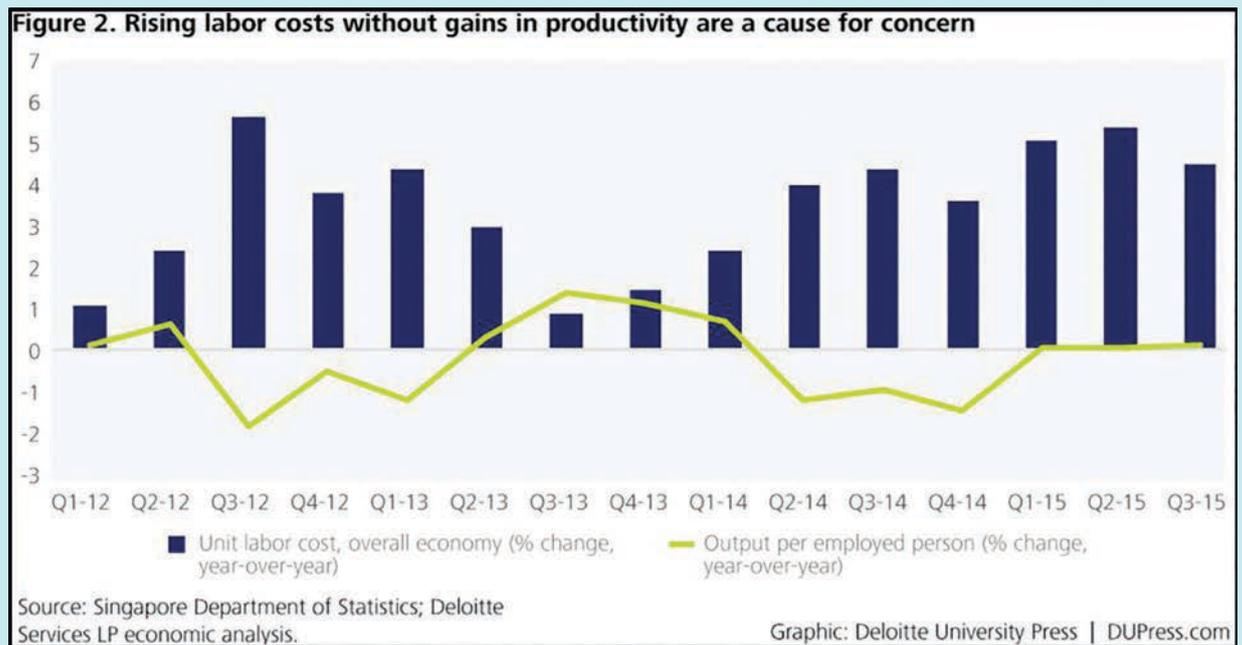


Figure 16: Rising labour costs without gains in productivity seen in recent years in Singapore

Should we seize and develop new technologies, we can revolutionise our exports and increase competitiveness by becoming an innovation-led value-creating⁶⁹ economy.

Value-creation means we create new ideas and products using technology. Innovations like Rotimatics, advanced

medical equipment and self-driving cars⁷⁰ grants us a first-mover's advantage⁷¹ in new industries. With successful movement to value-creation, we can lead in producing unique goods and services, increasing export competitiveness.

Furthermore, a knowledgeable workforce well-

equipped⁷² with new technology attracts MNEs⁷³ and emerging companies to Singapore, providing valuable jobs and skills transfer opportunities. Moreover, advanced technology resolves the problem of rising labour cost and stagnant productivity (figure 16) as technology creates

⁶⁹ We have been a value-adding economy for the past years, by producing goods part of the supply chain. Value-creating economy means rather than focusing on producing goods in the value chain, Singapore needs to move towards innovation, new ideas and piloting new products unseen in the global world using new technology. This makes having a high-skilled workforce necessary. If successful, it can make our exports extremely competitive and turn Singapore into a technological hub.

⁷⁰ Singapore launched the world's first self-driving taxi, collaboration between nuTonomy and Grab.

⁷¹ *First mover's advantage* refers to when Singapore becomes the first entrant in value-creating technological goods, thus granting Singapore a competitive advantage and a monopoly-like status as a leader in value-creation.

⁷² This is already slowly observed. 126,000 Singaporeans picked up new skills in 2016 as a result of the S\$500 credit provided by the SkillsFuture. The high employment in Medtech and Fintech industries, especially in MNEs subsidiaries also illustrate the growing skills and attractiveness of our workforce.

⁷³ As of now, more than 30 of the world's leading biomedical sciences companies (including GlaxoSmithKline, Novartis and Takeda) are leveraging Singapore as a key home base to drive innovation, growing the nation's biotechnology and pharmaceutical industry by more than 30% in 2011. (Source: EDB)

efficient production methods, increasing productivity⁷⁴ and lowering unit labour cost⁷⁵, further attracting firms.

Ultimately, the rise of disruptive technology is inevitable. As Mr Lim says, it is either we use it or we lose it to competitors and the choice is clear for Singapore.

Dealing with the New Age

The Four Keys to Success with Technology for Singapore

“In the end, the location of the new economy is not in the technology... it is in the human mind.”

Alan M. Webber

While potential impacts can be discussed, ultimately, our future

does not lie fully in technology, but in how Singapore copes with it. I propose that four keys⁷⁶ unlock the door to success and a better Singapore.

1. Better Protection
2. Better Workforce
3. Better Economy, Better Jobs
4. Better Laws

a) Better Protection

The first key: protecting the vulnerable.

Existing wage credits schemes⁷⁷ can be enhanced to prevent high retrenchment of workers. The government can co-pay a percentage of wages if the company continues employing these workers⁷⁸ and train⁷⁹ them with skills to handle automation. To

complement this, existing workfare income supplement⁸⁰ schemes can be expanded⁸¹. For the retrenched, unemployment help and retraining should be provided. Singapore has thrived with minimal unemployment welfare due to consistently low unemployment⁸². However, structural unemployment is likely to peak with economic restructuring, hence short-term pensions should be considered. These benefits can be conditional on workers actively seeking jobs or undergoing skills upgrading. Through collaboration with companies, workers can be employed while on-job training will be provided for workers to adapt, protecting the retrenched.

⁷⁴ Automation increases speed and ease of production, thus, when complemented with workers, it allows for higher productivity per worker, while decreasing cost of production.

⁷⁵ Disruptive technology maximizes our productive capacity, as it can bring new, more efficient production methods. This prevents Singapore from being caught in a development bottleneck while allowing for Unit Labour Cost to decrease with the increase in quality of our workforce.

⁷⁶ This analogy is adapted from Mr Lim Swee Say's speech, where he states "This will not be easy, because to open a door to a future of good jobs and better careers for all our people, we must have four keys in hand.". The four keys refer to better job creation, more adaptable workforce, inclusiveness and a fair, progressive workplace.

⁷⁷ As of now, over the period of 2016 to 2017, the Government will co-fund 20% (instead of 40%) of wage increases given to Singaporean employees earning a gross monthly wage of \$4,000 and below.

⁷⁸ A maximum retrenchment count can be enforced. Should companies retrench beyond a fixed number of workers, wage credits and subsidies will not be offered.

⁷⁹ Beyond the need to meet government requirements, a natural incentive is provided for firms to enhance skills training to maximise the value of workers especially given that they are forced to continue employing them to receive government subsidies.

⁸⁰ WIS is paid out in cash and CPF up to 4 times a year for employees earning lower income. Self-employed persons are paid annually to complement their existing income for low income individuals.

⁸¹ A possible extension is to give more frequent payouts to self-employed persons, as many self-employed individuals, such as those in retail, taxi drivers etc are heavily hit by the rise of the sharing economy and e-commerce. Hence, measures must be adapted accordingly to provide for them.

⁸² Singapore's unemployment rate averages around 2%, as a result of consistent growth rates.

b) Better Workforce

Second key: Better Workforce.

Skills upgrading is necessary to maximise our labour force potential. MOM's existing Adapt and Grow⁸³ initiative and SkillsFuture (figure 17) can be expanded. Focus should be on promoting technological skills and familiarising Singaporeans with new technologies (ie. Internet of Things, Artificial Intelligence). Programmes should be revised constantly, ensuring that skills remain relevant as technologies develop.

Enhancing existing incentives to participating companies for these programmes can increase participation. To incentivise workers, wage credits conditional on skills upgrading can be increased. These enhance the adaptability of our workforce, minimising structural unemployment.

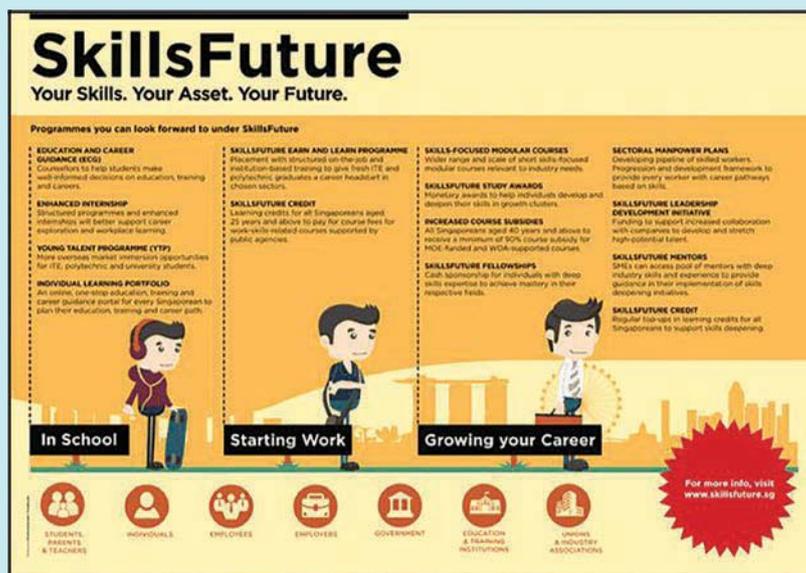


Figure 17: SkillsFuture programme aimed at helping Singaporeans acquire skills relevant to demands in the economy

c) Better Economy, Better Jobs

Third key: Successful restructuring to a value-creating economy that encourages innovation and risk-taking, creating better jobs for all.

Firstly, start-ups and new initiatives should be encouraged. Seed funds can

be provided to start-ups with potential while SMEs can be subsidised for investments in new technology. Competitions and events should be held to discover innovative ideas, where winners are awarded grants or attachments to well-established technological companies to develop their initiatives⁸⁴. More technological zones⁸⁵ should be created to concentrate start-ups, reaping economies of scale and cultivating synergy. The government can assist and encourage SMEs engaging in joint ventures with advanced MNEs⁸⁶. Through collaboration, SMEs gain access to mentors, networks and resources, which enable them

⁸³ Includes three schemes: Career Support Programme (CSP) introduced in October 2015, Professional Conversion Programme (PCP) and P-Max. CSP encourages employers to hire mature long-term unemployed Singapore Citizen PMETs into mid-level PMET jobs. PCP help PMET job seekers re-skill themselves to take on new jobs in different sectors or different job scopes. Individuals are employed by companies and go through a period of structured training, to acquire the skills required for the new job. Under P-Max, SMEs will benefit from a one-time \$5,000 grant if they successfully implement the recommended HR processes and retain PMETs hired under the programme for at least six months. (Source: MOM)

⁸⁴ Rotimatics was a product of the Start-Up@Singapore Business Plan Competition, where the founders won the top prize of \$40,000 in 2009, giving them the opportunity to start working on their idea.

⁸⁵ Similar to BLK71

⁸⁶ Relevant Ministries can act as the connection between SMEs and MNEs, giving small firms access to mentors, networks and financing within MNEs. Joint projects between the government, SMEs and well-experienced MNEs can also be piloted, giving small firms an opportunity to learn from bigger companies.

to scale-up, internationalise and engage new technology.

Furthering this, increased training in STEM industries should start early. More innovation should be encouraged in schools via innovation programmes, competitions, attachments and disruptive technology⁸⁷ modules to encourage interest in students. Internships to start-up companies in emerging industries can be encouraged for students to gain first-hand experience.

Together, these bring Singapore closer to value-creation and generate better jobs.

d) Better Laws

Lastly, embracing technology does not mean they are left without control. Technology such as drones and self-driving cars should be

subject to regularly revised legal regulations⁸⁸ to prevent unwanted externalities⁸⁹, such as creating no-drone-areas and clear penalties for accidents involving self-driving cars.

Possible dangers arising from lack of accountability in the gig economy should also be mitigated to prevent fraud or scams, such as through stringent limits on purchase and background checks. This can be complemented with mandatory licensing for e-commerce and the shared economy.

Protection of workers should be enforced too. Proper labour regulations must be strictly enforced for new industries⁹⁰, through mandating firms, like Uber, to provide insurance, CPF and additional labour rights⁹¹.

With better laws, we master technology.

Conclusion: Masters of the New Age

Even after proposing possible keys to success, the rapid technological developments mean we can never *know* what to expect. While we can estimate potential costs and benefits of disruptive technology, the overall impact is still yet to be seen.

The loss of jobs for workers and the sunset for traditional industries is likely in the short-run. However, we must not lose sight of the potential benefits these changes can bring to Singapore. In the long-run, a successful transformation of our economy into a value-creating one may bring a second economic miracle. We may see better jobs, better products and better lives. How do we strike a balance?

⁸⁷ Additional modules on new technology can be done in courses include engineering, technology, biomedical science, finance courses and any other discipline relevant to emerging industries. This is done through including new technology in teaching, such as operation of drones, 3D printers and surgery robots etc, or by educating students on the impact and potential of disruptive technology.

⁸⁸ This can include the creation of no-drone areas, the banning of drones for spying and other illegal uses. Self-driving cars should also be regulated, laws concerning liability and penalties must be set clearly for unexpected situations such as car accidents, illegal driving etc. Legal regulations need to be constantly updated as technology develops at an extremely rapid pace, thus new technologies have to be regulated fast and loopholes in the regulations need to be filled fast. Possible methods to do this can be via setting up a committee with members from both the Law and technology sector, specially to revise regulations for new technologies, so as to ensure flexibility and adaptability of regulation.

⁸⁹ Possible dangers can be illegal actions by users of new technology, such as scamming cases through new financial transaction methods, the use of drones to spy, self-driving cars being a danger on the road et cetera. Ambiguous areas also need to be dealt with, such as the concerns of privacy with the use of drones, the areas where drones can be used without it being considered an intrusion to a shared community, level of taxes for automation, exploitation and unsustainable use of shared resources in the gig economy (ie. Tragedy of the Commons) et cetera.

⁹⁰ This includes Uber drivers, e-commerce workers and other relevant new industries that are currently not covered heavily as official workers under traditional labour laws.

⁹¹ Protections such as company provided health insurance, work hours regulations and existing wage schemes can be expanded to cover workers in these new economic sectors. Grab has already led in the industry in providing CPF boost for GrabCar drivers under the GrabCar Medisave Programme as of March 2017.

Ultimately, our future never lies in technology. It lies in Singapore's adaptability and resilience, in constantly evolving our labour force and ensuring our workers' skills remain relevant. It lies in courage, risk-taking and determination.

Technology can disrupt our economy, but not our success. By embracing the possibilities and moving ahead, we shape the uncertain future into miracles.

We master technology, we master fate.

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Appendix A: “Hollowing Out” the Middle-Class

With the retrenchment of PMETs due to technology, many individuals in the middle-class lose their income and are left unemployed. This, coupled with the rising living costs, has slowly diminished the sense of security typically associated with being middle class. The middle class are left vulnerable in such situations; they are not living below poverty line, thus mostly do not qualify for social benefits, yet they are not sufficiently rich enough to sustain high standards of living when hit with a sudden economic shock (such as retrenchment). The “hollowing out” of the middle class thus, occurs as economic developments leave out the middle-class and squeeze their income. Opportunities, income and jobs for the middle-class slowly disappear in such societies. This has been an increasing trend in developed countries, such as Japan, leading to the creation of a “M-shaped” society, with a squeezed middle income and polarisation of income. In Singapore, this can also mean a further increasing

A huge part of our narrative of success is hinged on the increasing affluence and hard work of the middle-class. Hence, the hollowing out of our middle class will be particularly pernicious, since it will have particularly significant effects on economic outlook, social mobility and social stability, ideals that form the basis of our society.

Gini Coefficient from 0.458 in 2016, indicating worsened income inequality in Singapore. These effects harm our society and economy, as the middle-class is typically seen as the key to maintaining the stability and balance of a society, acting as the “back-bone” of a society.

Economically, the middle class plays a huge role in consumption in an economy. Low-income households have limited ability to consume and save little. High-income households save a lot but consume little, relative to

their incomes. Middle-income households provide an important balance in consumption and savings, thus key to our economic development. Singapore particularly has a large middle class, who plays a huge part in investments and consumption.

Socially, William Esterly, a US Economist, states that middle class income often affects other indicators, such as life expectancy, infant mortality and education. In Singapore, the middle-class aspirations typically consist of good

education, proper housing and job security. The hope that these aspirations bring play a huge part in motivating people to work hard and contribute to the economy, and drives high investment in public goods and infrastructure.

More importantly, in Singapore, middle class aspirations have long been inherent in our economic culture and the motivation to work hard. A huge part of our narrative of success is hinged on the increasing affluence and hard work of the middle-class.

Hence, the hollowing out of our middle class will be particularly pernicious, since it will have particularly significant effects on economic outlook, social mobility and social stability, ideals that form the basis of our society. A more negative outlook on social mobility can lead to fewer aspirations among Singaporeans to improve their positions, leading to the disappearance of values of diligence and resilience. This lack of confidence also affects sense of belonging to Singapore and can potentially lead to a

weakened national identity, further affecting our social stability.

Therefore, in light of an increasingly squeezed middle class, measures must be implemented to create security for the middle class and prevent the “hollowing out” of our middle class in Singapore.

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Event	Dates
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The Singapore Economic Policy Forum (SEPF) in conjunction with the Outstanding Economics Teacher Award (OETA)	25 October 2018
The French–Singapore Symposium (Rencontres Economiques in Singapore 2018)	1–2 November 2018
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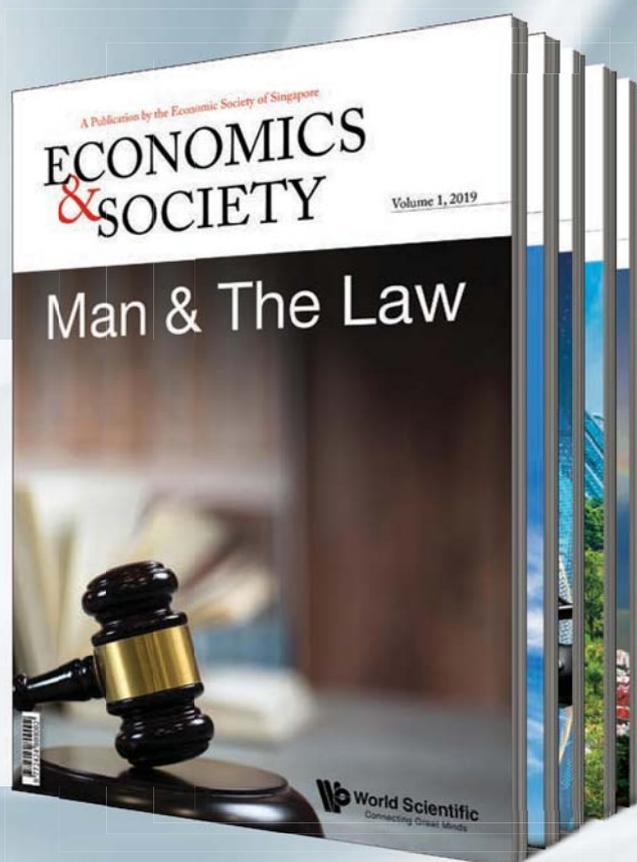
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