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An Uneven Future?

An Exploration of the Future of Work in Malaysia

Discussion Paper 2/17

Khazanah Research Institute

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This Issues Brief was prepared by the following researchers from the Khazanah Research Institute: Allen Ng, Tan Zhai Gen, and Mohan Mahadeva.

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Discussion Paper

An Uneven Future?
An Exploration of the Future of Work in Malaysia

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SUMMARY

- How will the landscape of employment in Malaysia change in facing the future of work brought about by rapid progress in technology? This essay explores this question by drawing on existing work in the literature and assessments on the latest developments in Malaysia's labour market and the economy in general.

- The landscape of employment in Malaysia is expected to change in a number of consequential and inter-related ways as we move into the coming decades. Polarisation in employment will continue to occur, with more jobs created for both ends of the skill spectrum as labour-saving technology continue to displace middle-skilled jobs. Rapid growth in technology-enabled digital platforms, on the other hand, will continue to intensify the rise of independent work – changing the very nature of employment away from the traditional full-time fixed employment. Finally, as per our experience in the past, the evolving structure of the Malaysian economy – particularly with the continued stagnation in manufacturing and the rapid growth of new modern services – will also reshape the sources of job creation for the Malaysian workforce.

- These changes are in turn underpinned by two salient trends. Firstly, the fast pace of progress in technology would most likely lead to more rapid cycles of obsolescence and renewal in the types of work and industries available – Malaysians entering the workforce now can expect to switch jobs more frequently over their lifetimes. Secondly, together with the first trend, with the rise of independent work, the traditional employer-employee relationship could be eroded, which would simultaneously provide greater autonomy to workers but remove the stability of more traditional full-time fixed employment. In responding to these trends, a serious consideration of inculcating lifelong learning for all, and the development of relevant social safety nets that do not compromise on the flexibility and dynamism of modern jobs and the security of traditional employment are essential.

- In facing this future, it is essential to recognise that the change in the landscape of employment will be uneven – it will not be unequivocally positive for everyone even if it is better for the Malaysian economy overall. Equally important is to realise that we are not passive observers of the change that is coming – just as how technology will inform what is possible for the future of work, so will our responses to these possibilities shape the contour of the changing landscape of employment.

[1] The authors would like to thank Dr Yeoh Oon Tean and his team at the Federation of Malaysian Manufacturers, and Marian Panganiban and Regina Robin Arumugam from Grab Regional Policy and Research and Grab Malaysia respectively for valuable discussions, inputs, and feedbacks for this essay. We are also very grateful for the thoughtful comments by Tan Sri Andrew Sheng, Dr Lin Lean Lim, and Professor Renato Lima de Oliveira. Views expressed in this essay, however, should not be associated to them and the organisations they represent. All errors remain our own.

Contents

"Science and technology revolutionise our lives, but memory, tradition and myth frame our response."
Arthur M. Schlesinger (1999, p xiii)

1. Introduction

In 1921, almost seventy per cent of the working population in the Malay peninsula was employed in agriculture – by far the largest economic sector of the time[2]. Now, almost a century later, this share has dropped to only twelve per cent. Instead, eighty per cent of the Malaysian workforce is currently categorised in the broad economic sectors of services and manufacturing. This change reflects the significant structural transformation of our economy over the decades, which in turn was shaped by our increased integration to the changing global economy, the adoption of technology, and the outcome of our policies for development.

As we move into the future, we can expect the structure and nature of employment in Malaysia to continue to change. But this time, the pace of change will likely be significantly faster than what we have ever experienced before. Unprecedented advances in artificial intelligence (AI), robotics and many other breakthrough technologies, together with new emerging business models enabled by these technologies, and the continued progress in information and communications technology (ICT), has the potential to drastically reshape the economy, upset existing industries, and fundamentally alter the landscape for employment for the country.

How ready is Malaysia in facing the future of work brought about by the rapid improvement in automation technologies and the continued rise of the platform economy? Drawing on existing work in the literature, this essay explores this issue in three parts. The first part is on the changing type and nature of jobs in Malaysia, with emphasis on the technological potential of automation in shaping the future of work on one hand, and the rise of independent work enabled by new technologies on the other. The second part examines the future of jobs in Malaysia from the context of the changing economic sectors, focusing on manufacturing and services. The third part discusses the broader policy implications arising from the changes discussed in the first two parts[3].

Part One: The Changing Type and Nature of Work

2. Technical possibilities – *the potential for automation*

Technology has always improved the productivity of human labour. Indeed, the history of the modern economy is in large defined by the sustained economic growth brought about by the unceasing improvement of productivity since the 18th century. But the onward march of technology is not linear. We have experienced steady periods of incremental improvement in productivity, punctuated by great leaps of progress made possible by certain highly consequential technological advances. These breakthrough technological advances have implications on productivity and the broader economy that are orders of magnitude greater than more typical incremental technologies and can fundamentally transform the underlying productivity potentials of an economy. They dominate macro-economic outcomes – including employment, and the effects are typically uneven and disruptive in the transition as pre-existing social and economic structures are altered. Steam, electricity, and information and communication technology (ICT) are identified as three such technologies. They have led to great economic transformations – the first two industrial revolutions in the 18th and 19th century and the information age in the 20th

[2] Based on one of the earliest available census statistics on employment for the whole Malay peninsula (Saw, 2007).
[3] This essay, while written as a standalone piece, continues from the discussion first started in The Times They Are A-Changin': Technology, Employment, and the Malaysian Economy (Khazanah Research Institute (2017)).

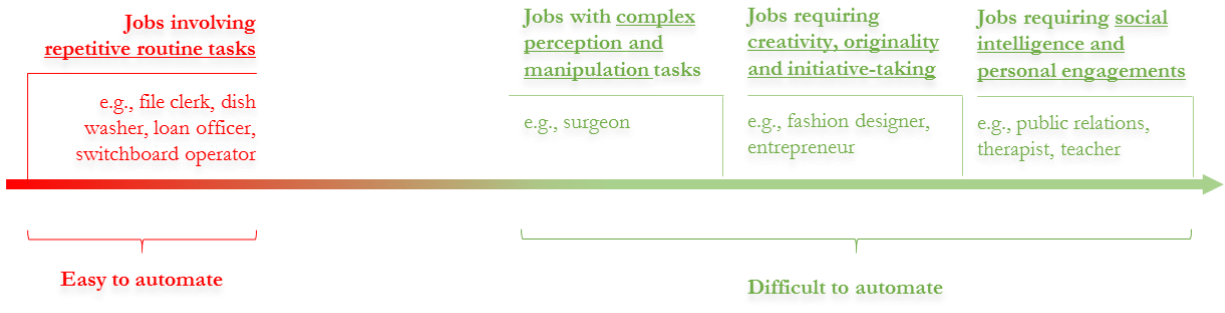
century – which fundamentally shifted human productivity, transformed economies and reshaped the very nature of globalisation[4].

It is likely that we are now at the tipping point of another great technological leap, brought about by a confluence of technological advances – most consequential of which is AI. The field of AI has achieved significant progress in recent years, underpinned by the use of machine learning in which computers improve their perception, cognition, and action with experience, without explicit programming by humans. This in turn is made possible by the continued exponential growth in the processing power of computers, and the massive amount of digital data generated through the ubiquitous adoption of digital mobile devices – the two essential components of machine learning. The application of AI has the potential to transform many, if not all industries and reshape the landscape of work. As Andrew Ng – the former chief scientist of Baidu Research and founder of Google Brain, Google's AI initiative – said, AI is the new electricity; just as electricity transformed industry after industry in the late 19th century, so will AI in the coming years with no major industries left unaffected[5].

Advances in robotics, machine vision, natural language processing, human-computer interactions, and many other sub-fields made possible by the progress in AI has made it technically possible for a vast variety of tasks currently done by human labour to be undertaken by machines – either directly or through a reorganisation of activities, environment and processes. This has raised the concern of human jobs being replaced by new automation technologies in the coming years. On one end of the spectrum, jobs that will most significantly be affected by automation are those mainly involving repetitive routine tasks. On the other end, jobs which require three types of skills – 1) complex perception and manipulation, 2) creativity, originality and initiative-taking, and 3) social intelligence and personal engagements – will be those that are most difficult to automate. This is illustrated, together with examples of occupations in Figure 1. It should be highlighted, however, that technologies automate tasks, not occupations. This is a nuanced but important point. Jobs involve combinations of tasks – some of which could be easily automated, others less so[6].

Figure 1: What kind of jobs will be most affected by automation?

Recent technologies have made it possible to automate many tasks with the potential to affect many types of job



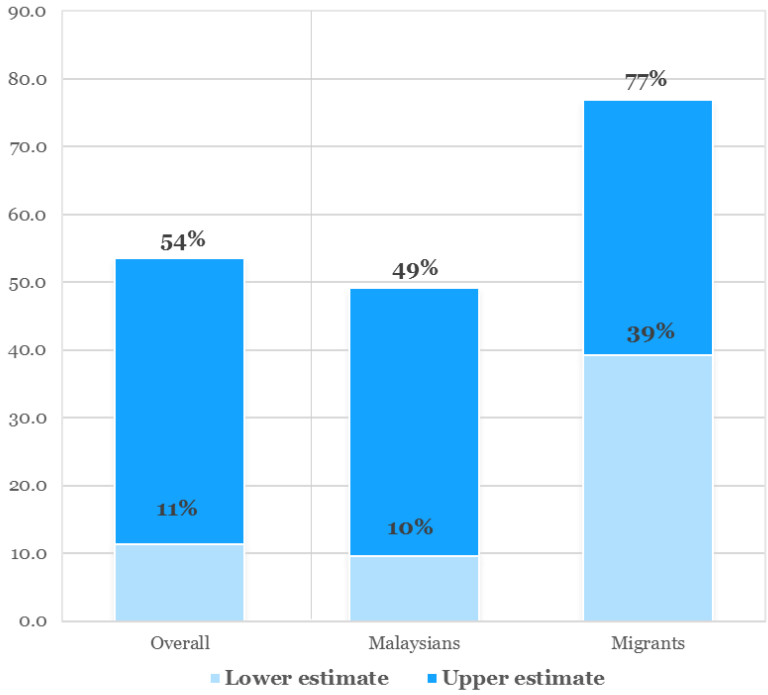
Note: Based on Autor et al (2003) and Frey and Osborne (2013)

[4] For a more complete discussion on these technologies, refer to Khazanah Research Institute (2017).
[5] AI is the New Electricity is the title of Andrew Ng's lecture earlier this year in Stanford's MSx Future Forum, which can be found here: https://www.youtube.com/watch?v=21EiKfQYZXc.
[6] This paragraph draws from the discussion in Autor et al (2003), Frey and Osborne (2013), and Arntz et al (2016).

In the next two decades, it is estimated that between 11 and 54 per cent of the current jobs in Malaysia could be significantly affected by automation – that is, either fully displaced by technology or with their nature considerably changed[7]. Four out of five of these jobs are middle-skilled, while the remaining ones are low-skilled[8]. Malaysians will be most affected as ninety per cent of all middle-skilled jobs are held by Malaysians. Proportionately, however, jobs currently occupied by the predominantly low-skill migrant workers are estimated to be significantly more susceptible to automation given that – up to 77 per cent of all the jobs could be displaced by automation. This is an important point that we will be coming back to in the next two parts of the essay. Figure 2 and 3 present further details on these estimates.

Figure 2: Up to more than half of all jobs in Malaysia could be at risk of automation in the next two decades

Mainly Malaysians affected but greater proportion of migrants' occupations could be automated by technology



Note: Adapted from methodologies in Frey and Osborne (2013) and Arntz et al (2016), authors' calculation

Before proceeding further, it is useful to highlight a few points on the interpretation of these estimates. Firstly, these estimates are based on the technical potential of automation – that is, for each type of occupation that is currently available, what is the probability that it can be automated given the tasks that it involves, based on new automation technologies. But just because a task or job can be automated, it does not mean that it will be. That depends on many other non-technical factors. As such, the estimates should not be interpreted as a prediction of actual employment outcomes for the coming years. The speed and extent of the adoption of automation technologies, and thus the proportion of jobs that would be displaced would depend on labour market conditions and potential economic benefits that could be derived from adopting automation. For example, reliance and relative abundance of low-wage labour could disincentivise firms from adopting more advanced technologies. Similarly, the lack of skilled workers with the required competencies could also prevent firms from using modern labour-saving technologies effectively.

Secondly, it is crucial to recognise that tasks that are not substituted by technology will most probably be complemented by it. This is a highly consequential point. Jobs that are complemented by the technological change will experience improved productivity and increase in the value of their labour, while the reverse is true for jobs in which technology is a substitute. The introduction of new technologies to the workforce will result in economic adjustments in the labour market –

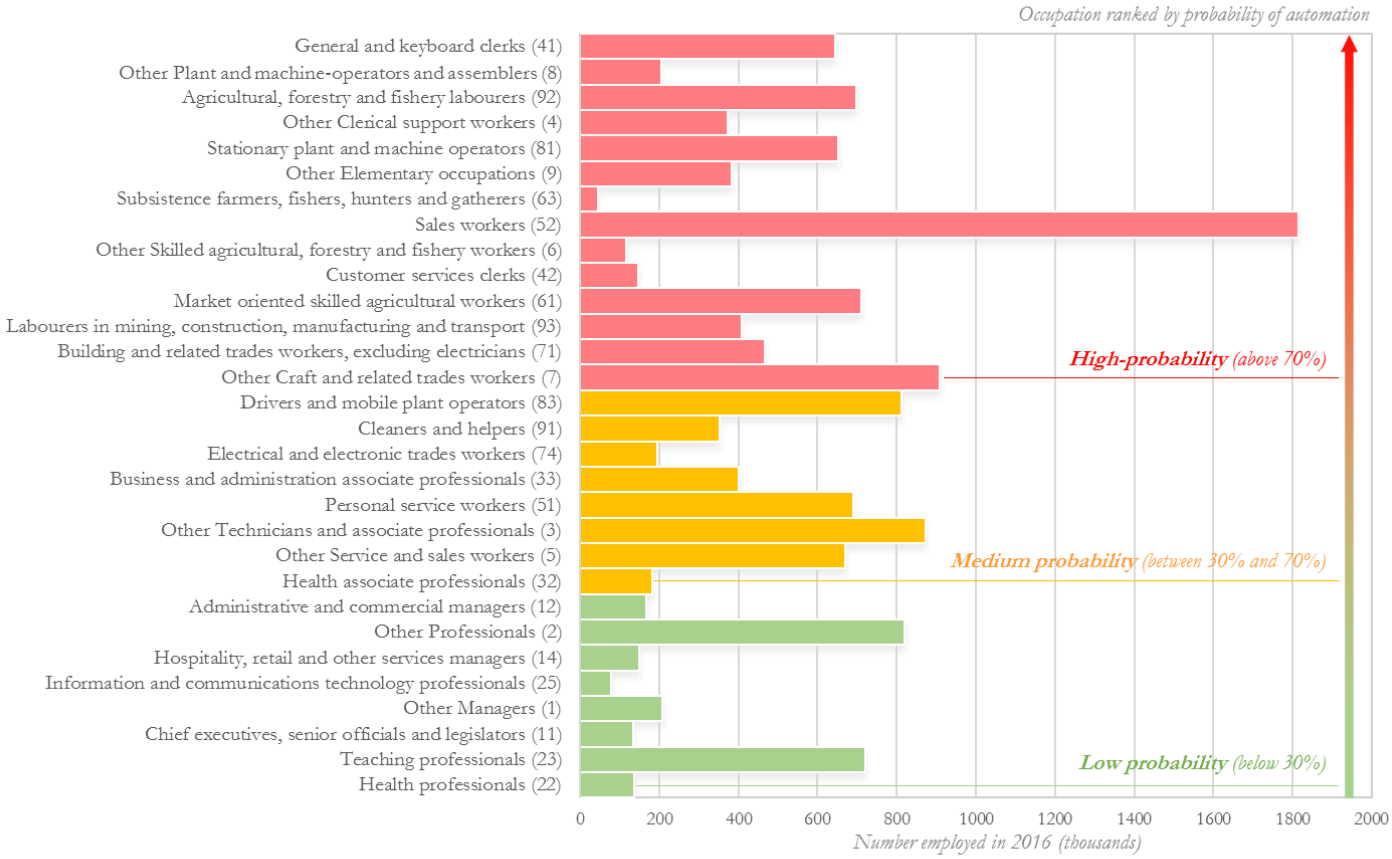
[7] This part builds on the calculation first discussed in Khazanah Research Institute (2017), updated for this essay based on the approximations of the methodologies in Frey and Osborne (2013) and Arntz et al (2016). Refer to Appendix 1 for more details, and Khazanah Research Institute (2017, pp 7-8) for more discussions on the limitations.

[8] The classification of jobs in different skill-levels is based on MASCO 2008. They are defined by the complexity and range of tasks required in the job.

with changes in the relative demand for different types of jobs, leading to a potentially uneven future in our employment landscape. This is the subject of the next section.

Figure 3: Technical potential of automation by occupation

4 out of 5 jobs that could be significantly affected by automation technology in Malaysia are semi-skilled



Note: Numbers in the bracket of the occupation descriptions correspond to ISCO-08 first and second digit. Methodology adapted from Frey and Osborne (2013) and ILO (2016), data from ILOSTAT and DOSM, authors' calculation

3. Vanishing middle – *job polarisation with distinctions*

It is far from certain that the economic impact of technological change is pareto-improving, particularly in the short-term[9]. Often, there would those who gain from the change, and those who would be made worse-off. In the past few decades, the introduction of modern labour-saving technology has been one of the main factors contributing to the phenomenon of job polarisation in the advanced economies – the automation of semi-skilled routine tasks has led to simultaneous employment gains in high-skill, high-wage jobs on the one end, and low-skill, low-wage jobs on the other end, at the expense of middle-skill, middle-wage jobs[10]. A similar observation was also seen, although more nuanced, in the polarisation of wages with middle-skill jobs experiencing stagnation in wage growth. More recent data shows that even employment growth at the higher skill spectrum has slowed, suggesting possible encroachment upwards in the automation of more complex tasks given continued technological progress.

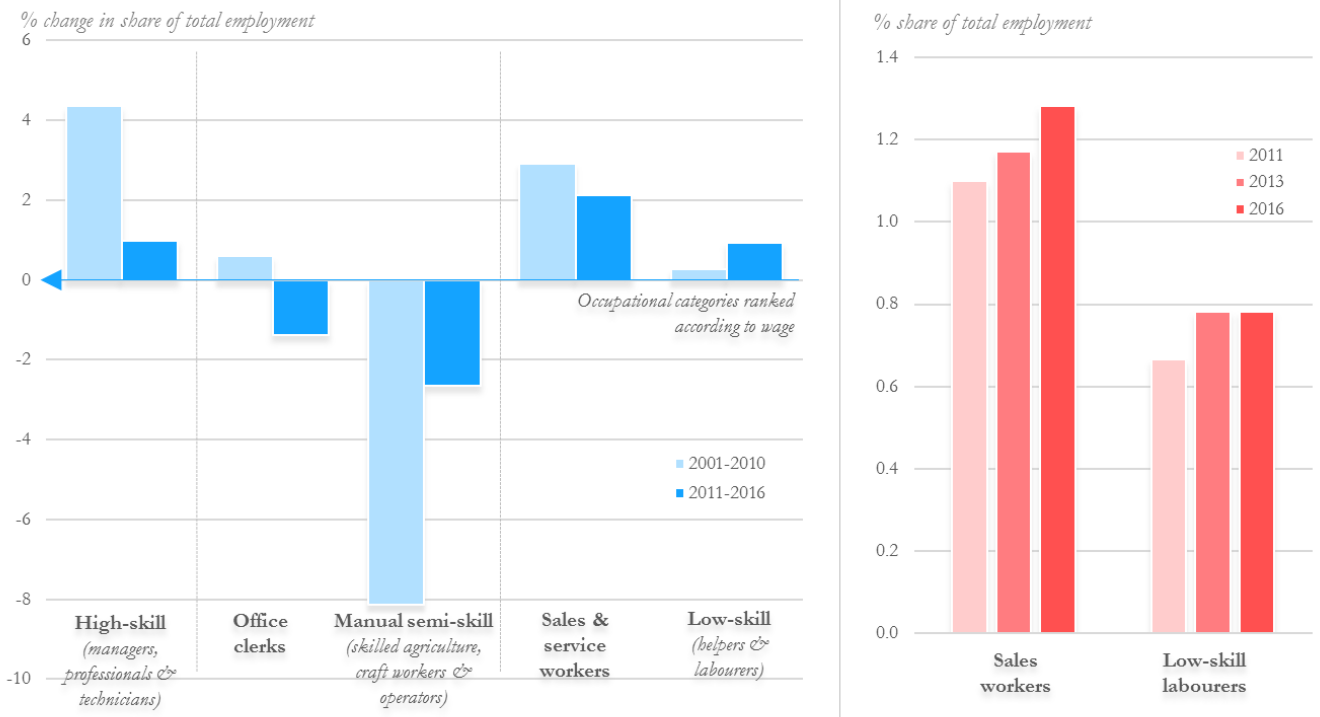
[9] The same is true for globalisation, but that is a topic deserving a full essay by itself.

[10] Acemoglu and Autor (2011) and Autor (2015) provide good reviews of the literature on this phenomenon. Other factors cited for causing job polarisation include off-shoring and globalisation more generally which shrunk the demand of jobs in the mid-skill categories for many industries. One could argue that even these was brought about by technology, albeit less directly.

For Malaysia, the workforce has also broadly experienced jobs polarisation. As per Figure 4, since 2001, semi-skilled occupations such as office clerks, skilled agriculture workers, craft and related trades workers, and plants and machine operators, have experienced declines in the share of total employment, whereas occupations on both ends of the skill-wage spectrum have seen employment gains. At a finer-level however, there are two key differences in the incidence of job polarisation in Malaysia compared to that documented in the advanced economies. Contrary to the experience of these economies, sales workers and low-skill labourers – both the target of labour-saving technology – have continued to record an increase in employment shares in Malaysia. In the case of the advanced economies, the low-skill and low-wage occupations that gain from employment polarisation are in service occupations, mainly in personal services, and help and care work.

Figure 4: Employment polarisation in Malaysia

But we have continued to see increase in the share of sales workers and low-skill labourers



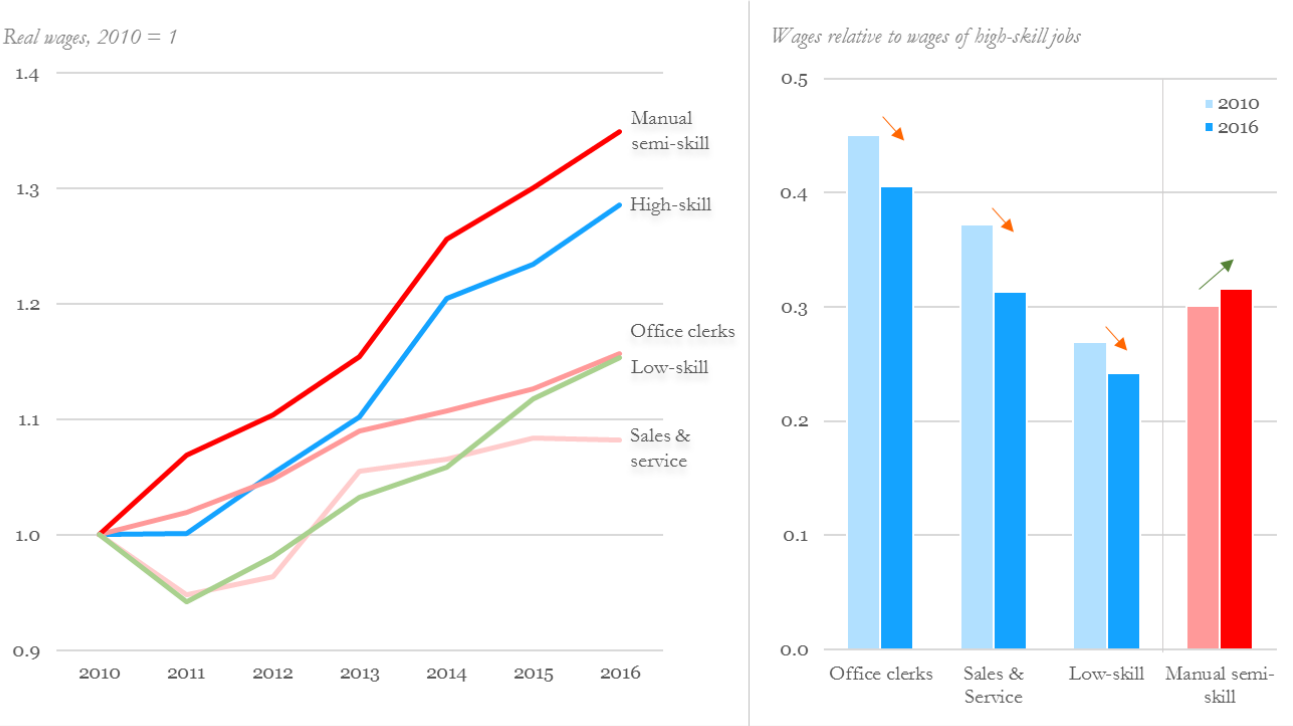
Sources: DOSM and ILOSTAT

On wages, there is no evidence that there has been polarisation across different occupations, based on available data since 2010. In fact, manual semi-skill occupations, which experienced the largest decline in the share of employment, have also seen the fastest increase in real wage across broad occupational categories. As a result, unlike all other occupations, the wage gap between manual semi-skill occupation and high-skill occupation has actually shrunk. In contrast, sales and services workers, which saw the largest increase in employment share has been experiencing almost stagnant real wage growth since 2013. Figure 5 provides a summary of this.

What could explain the differences experienced in Malaysia? There are two possible explanations. Firstly, Malaysia's reliance on relatively cheap low-skill migrant workers could explain the continued gain in employment of low-skill labourers rather than the adoption of labour-saving technology in automating tasks done by them. As low-skill migrant workers are strong

complements to semi-skill workers[11], particularly within the same industry, this in turn could explain the high wage growth of blue-collar semi-skill workers. Secondly, the shrinking share of employment for semi-skill white-collar and blue-collar workers could have expanded the supply of labour for sales and service workers, thus explaining both the continued growth of employment and the stagnation of wage growth for sale and service workers.

Figure 5: Blue-collar semi-skill jobs have seen the fastest pace of increase in wages
It is the only broad category of jobs that has seen narrowing wage gap with high-skill jobs



Sources: DOSM

Based on these developments, how would job polarisation in Malaysia change going forward? Providing a precise prediction would be an exercise in futility, but some of the current trends could inform us on a possible direction. Firstly, Malaysia's reliance on low-skill migrant workers remain very significant by any standard, but directionally, it could have peaked as a share of employment which has stayed at about 15 per cent of the workforce since 2013. This is likely to continue going forward, in part given deliberate policy actions to reduce the dependence of the Malaysian economy on low-skill migrant workers. Secondly, on sales workers, given the stagnation in real wage and the continued expansion of the labour force with tertiary relative to secondary education, combined with fast growth in non-traditional, internet-driven and more productive retail services, there is reason to expect the continued gain in the share of employment for sales workers will not be sustained. Indeed, in 2016, for the first time ever, the absolute number of sales and services workers actually declined for urban areas. Given these two possible trends, and the rapid technological progress that could further expand the technical possibility of automation, it is likely that the tendency toward greater job polarisation in Malaysian will continue going forward, leading to an even more uneven employment landscape for the future.

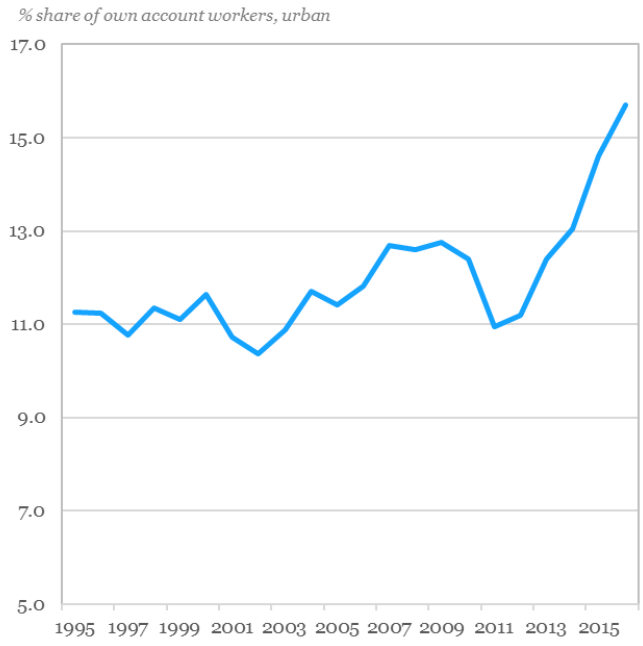
[11] World Bank (2015) found that the biggest gainers from predominantly low-skill migrant workers in Malaysia are semi-skill workers with lower secondary education.

4. Alternative arrangements – *the rise of independent work*

Another important development for the labour market in the past decade is the rapid rise in the incidence of independent, alternative work arrangements – workers who are not engaged in more traditional full-time, fixed employment[12]. In the United States (US), all of the increases in net employment since 2005 can be accounted for by the growth in alternative work arrangements, particularly in contract workers. More than 40 per cent of all US workers earn income through some form of freelance arrangement. Similar experiences of a rapid rise in independent work are also documented in many other advanced economies[13]. This development is driven in part by the emergence of digitally-enabled platforms that are driving greater disintermediation of job tasks, allowing for greater flexibility, efficiency, and opportunities for both labour and firms. Many of these platforms are centered on the commercialisation of personal assets such as in transportation and accommodation[14] for more productive use. A growing number of platforms are also centered on freelance labour – some of them operating globally[15] – offering on-demand labour for a wide variety of tasks, from mobile app design to management consultancy.

Figure 6: Growing share of Malaysians in cities are self-employed

Since 2010, the number of self-employed in urban area has increased by 81 per cent, equivalent to 765 thousand people



Sources: DOSM

This phenomenon is not unique to the advanced economies. In Malaysia, there has been a steady increase in the share of self-employed workers in urban areas since 2010. From about 11 to 12 per cent of urban employment since 1995, it increased to almost 16 per cent in 2016. That is equivalent to 1.7 million people in urban Malaysia who are engaged in independent work, and increase of more than 760 thousand since 2010 (Figure 6).

Looking at the statistics by age-groups, the largest increase came from the younger cohorts – below the age of 35 years. Compared to 2010, the number of self-employed who are below 35-years old more than doubled. For those who are aged between 25 and 29 years, the number of self-employed in fact more than tripled. This contrasts with the change in non-self-employed in the workforce in which variations in the changes across the age cohorts are less evident, as shown in Figure 7.

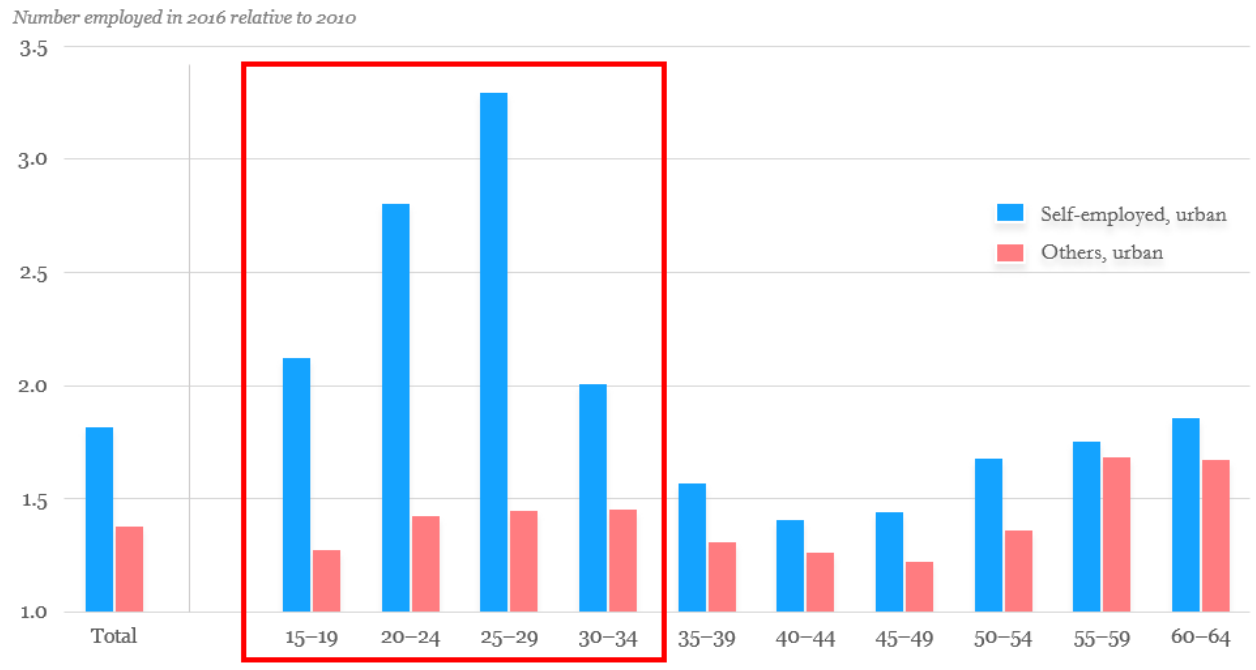
[12] As this phenomenon is relative new by the standard of academic literature, there is currently no one name that is stuck in describing this. Platform, gig, sharing, and on-demand economy are some of the names commonly used in more popular media. Economists, however, seem to be settling for something decidedly more prosaic – alternative work arrangements (Katz and Krueger (2016)).

[13] IMF (2017) provide good overview on the development in the advanced economies on the rise of alternative work arrangements.

[14] Uber and Airbnb being the most widely known.

[15] The best example of this is Upwork.

Figure 7: By age groups, the biggest change in urban self-employed are the millennials
Between 2010 and 2016, urban self-employed for those in the 25-29 age cohort increased by more than three times



Sources: DOSM

A more complete discussion on the rise of independent work within the context of the digital platform economy will be explored in Part Two of this essay. Before moving on however, it is useful to highlight a number of points. First off, the rise in independent work should not be interpreted as completely due to the emergence of digital platforms. A large proportion of the increase in the incidence of alternative work arrangements in the United States and other advanced economies can be explained by more traditional means of independent work – such as through contract work. Despite the lack of publicly available statistics, it is reasonable to assume that the situation is similar here in Malaysia, with some of the increase in self-employment being accounted for by Malaysians working in more traditional independent work such as in small-scale food, craft, and sales activities. In addition, it is important not to consider this development as unequivocally positive. It is very likely not a coincidence that the age group that experienced the largest increase in self-employment is also the one that makes up the largest cohort of the unemployed in Malaysia. This could potentially imply that some of this self-employment arose because those in the workforce could not find opportunities in more traditional employment.

Lastly, and perhaps most importantly, the rise of independent work will have significant implications on the landscape of the workforce. It erodes the traditional employer-employee relationship – simultaneously providing greater autonomy and flexibility to workers but removing the stability and security of more traditional full-time fixed employment. This in turn, calls into question the relevance of the current design of benefits and safety nets for workers which are still pre-dominantly employer-centric and fashioned after the arrangement of full-time employment. We will be exploring this issue in greater detail in Part Three, in our discussion on the policy for the future of work in Malaysia.

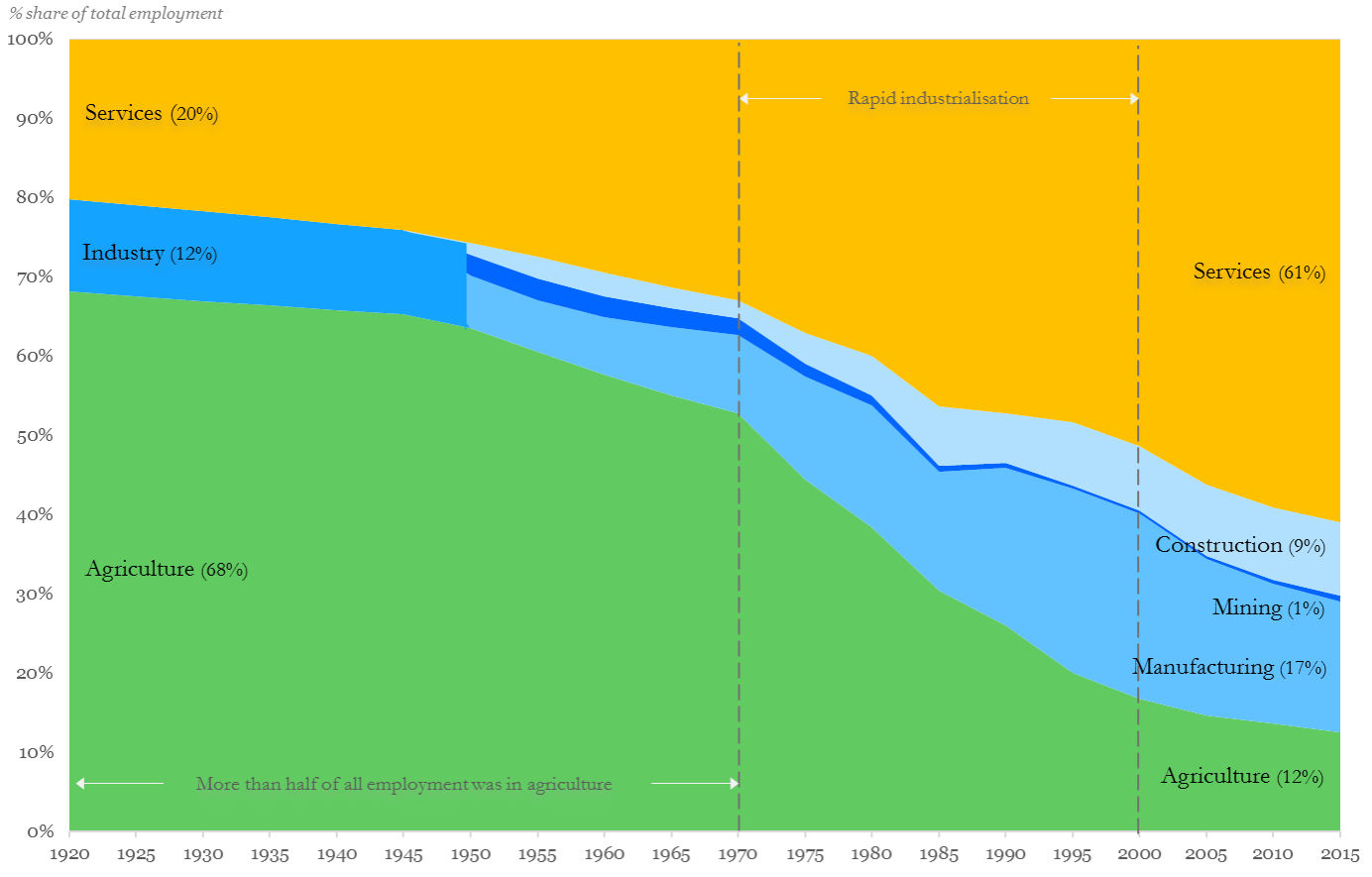
Part Two: The Changing Landscape of Industries

5. Shifting sectors – *long-view of the employment landscape*

The employment landscape of the Malaysian economy has changed dramatically over the many decades of economic development since the turn of the century, reflecting the structural transformation of the economy. Based on earliest available data on employment for the whole Malay peninsula, in 1921 more than two third of the population was working in agriculture, predominantly in the rice fields. Being a primarily agrarian economy, agriculture remained the dominant sector for employment for the economy up to the early 1970s, employing more than fifty percent of the working population.

Figure 8 : Shift in the share of employment by economic sectors since 1920s

From mainly in agriculture almost a century ago, employment has since diversified into services and manufacturing



Sources: DOSM, Saw (2007), authors' calculations. Notes: Data before 1957 includes the Malay peninsula and Singapore. Data after 1970 includes the peninsula, Sabah & Sarawak. Data for mining, construction and manufacturing are included under "industry" before 1950.

From 1970s onwards, this changed as the economy witnessed rapid industrialisation and modernisation. Employment share in both services and manufacturing began to increase substantially. This was especially so in the manufacturing sector which experienced rapid development in the 1980s with the fast-pace growth of the electric and electronics sub-sector. From around 10 percent in 1970, the employment share in manufacturing increased to almost a quarter of all employment in the economy in the early 1990s.

Since 2000 however, the share of employment in manufacturing began to decline, plateauing at above 15 percent since 2010. Nevertheless, the growth of employment in the services sector continued to expand, mirroring the diversification and development of the services sector in the

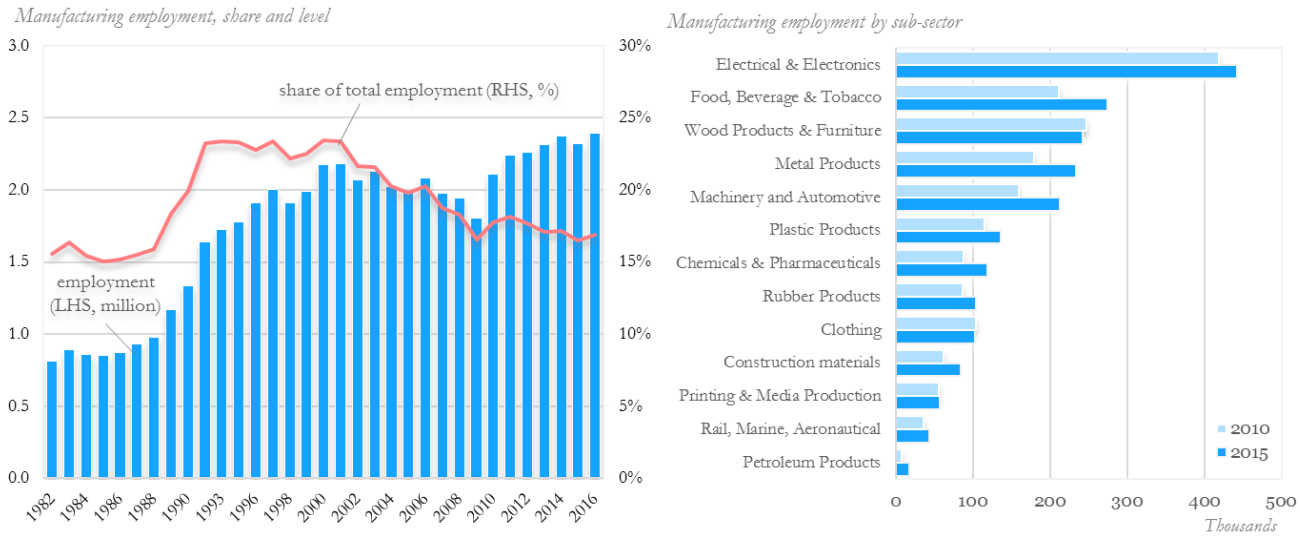
Malaysian economy. The share of employment in the services is now more than 60 percent total employment in the economy, primarily in the wholesale and retail, and the accommodation and food services sub-sectors. The rise of the services sector employment and the plateauing of the manufacturing sector in the last 15 years shaped much of how the landscape of employment in Malaysia is currently. In the subsequent two sections, these developments in the manufacturing and services sectors are explored in greater depth, with discussions on the possible future directions of these sectors.

6. Moderating manufacturing – *challenges in manufacturing*

The manufacturing sector in Malaysia reached its peak in the late 1990s, both in terms of share of employment and gross domestic product (GDP). Since 2000, these numbers have gradually but substantially declined. This process of deindustrialisation – the diminishing relative importance of the manufacturing sector – has significant implications on the overall development of the Malaysian economy going forward. Manufacturing is typically the most productive and technologically dynamic sector, and given its external-orientation it also exhibits unconditional convergence with global economic frontier. For a developing economy to prematurely deindustrialise before becoming a high-income economy risk removing the main channel for it to converge to the advanced economies[16]. Within the context of this essay, understanding the challenges faced by the Malaysian manufacturing sector within this broader perspective is important for us to appreciate the potential for the sector in being a source of employment for the economy in the future.

Figure 9: Manufacturing employment in Malaysia

Employment share in manufacturing has peaked since 2000, with the electrical & electronics as the biggest sub-sector



Sources DOSM, World Development Indicators, sub-sector categorization by authors

It is important to recognise that the manufacturing sector is a highly heterogenous economic sector involved in the manufacturing of a myriad of different products. The biggest sub-sector by far within manufacturing – in terms of both value-added and employment – is the electrical and electronics (E&E) sub-sector[17]. This is followed by sub-sectors involved in the processing of primary resources, given Malaysia's relative abundance in commodities such as palm oil and

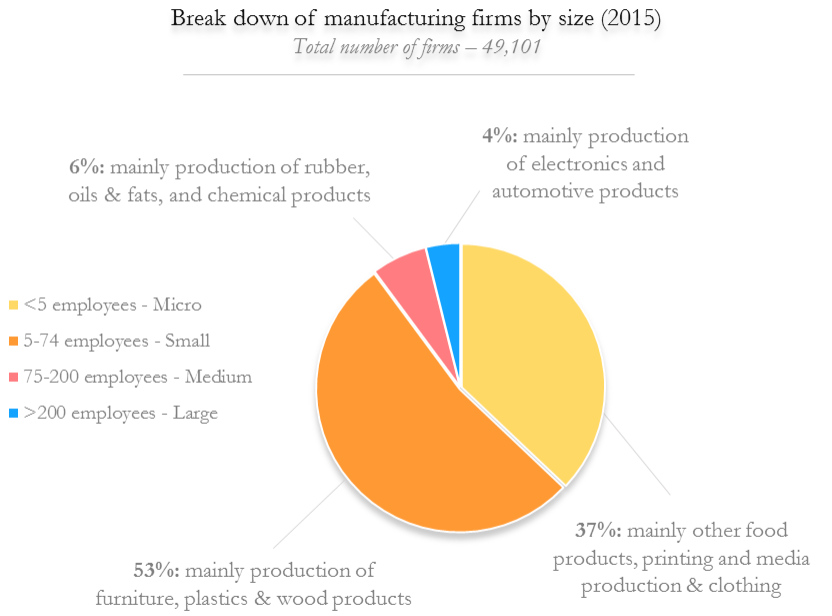
[16] This point is discussed in Khazanah Research Institute (2017), based primarily on the pre-mature industrialisation argument by Rodrik (2016)

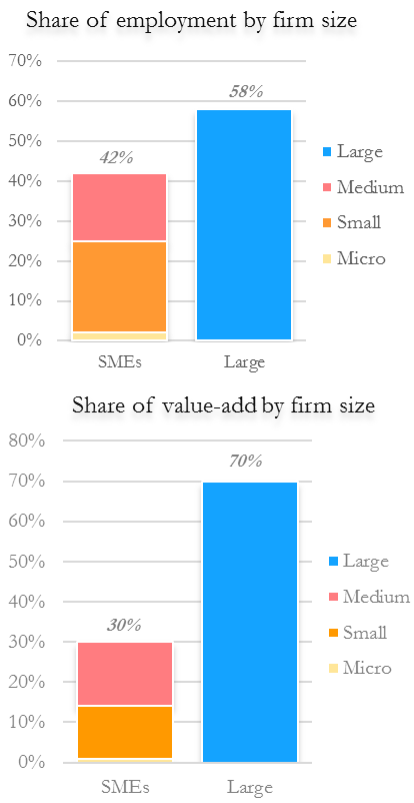
[17] In 2015, E&E accounted for 24% of value-added and 20% of employment of the entire manufacturing sector.

petroleum. Besides the different products manufactured, an important dimension of the heterogeneity lies in the different sizes of the manufacturing firms. Based on the latest available data in 2015, only 4 per cent of the firms within the sector can be considered large - with more than 200 workers each. In fact, 90 percent of manufacturing firms have less than 75 workers each, with most of them involved in lower value-added, non-high tech manufacturing activities[18]. The skewness in the distribution of the manufacturing sector toward smaller firms has important implications, as we explore next.

Figure 10: Manufacturing firms by size

96 percent of all manufacturing firms are micro, small & medium enterprises (SMEs), but large enterprises contribute the majority of value-added and employment





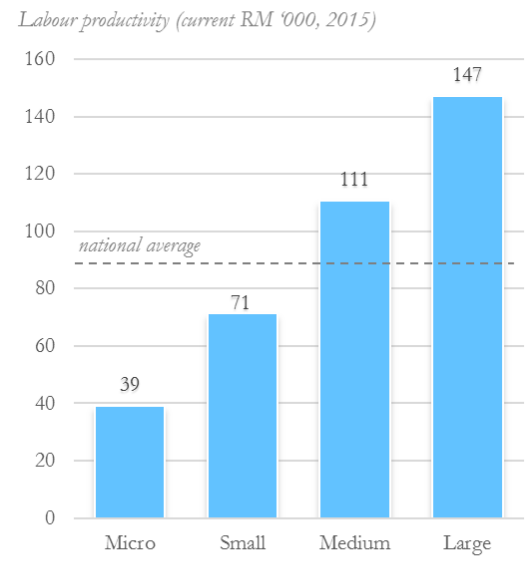
Source: DOSM

Although accounting for 4 percent of firms, large firms contribute to 70 percent of the total value-added of the manufacturing sector, and employ 58 percent of the workers. This translates to significant differential in productivity levels of the firms by their sizes. As per Figure 11, the larger the firms, the higher the labour productivity[19] – large firms are in fact more than three times more productive than micro enterprises, that is those with less than 5 employees. Only large and medium-sized firms have higher labour productivity than the national average, implying that 90 per cent of all firms have productivity levels that are lower than the national average. The differentiation across sizes of firms goes beyond productivity – it is very evident with regards to innovation too. Smaller manufacturing firms in Malaysia are much less likely to spend on research and development, and on introducing new products or services, unlike larger firms[20]. Overall, given the skewness in the distribution of manufacturing firms toward smaller enterprises, Malaysia fares relatively worse-off compared to our regional peers and international comparators in general for

[18] Categorisation for high tech manufacturing can be found in Khazanah Research Institute (2017), based on R&D intensity relative to value-added and gross production.
[19] Here measured as nominal value-added per worker for the year 2016. As we are comparing within the same sector and for the same year, the use of nominal value-added rather than real is not consequential for the analysis.
[20] This is based on the World Bank Enterprise Survey, 2016, which is based on a survey of 585 manufacturing firms.

Figure 11: Large firms are significantly more productive

Labour productivity in large firms are more than three times higher than micro enterprises



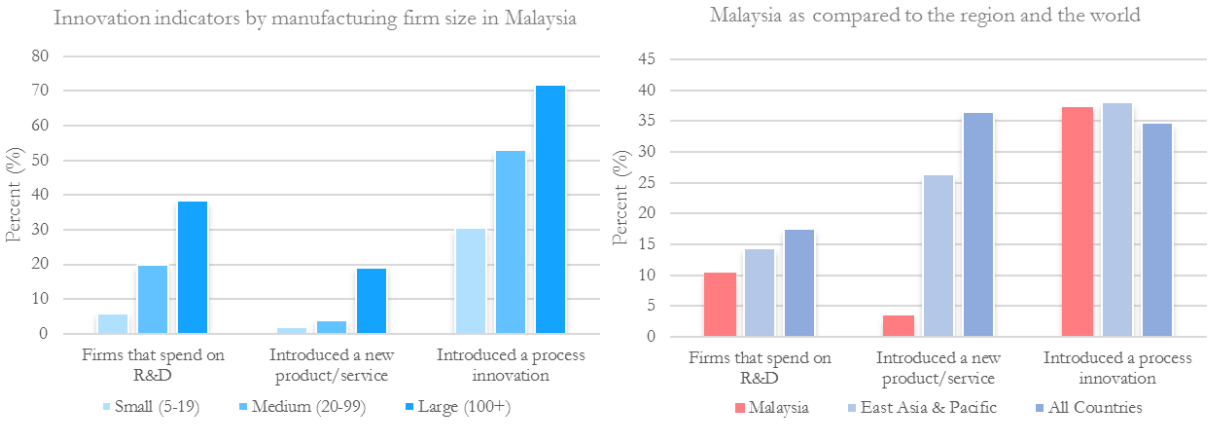
Source: DOSM, authors' calculations

the two innovation indicators. Malaysian manufacturers are, however, comparable globally in innovation relating to process improvement, a point that we will come back to (Figure 12).

The concentration of smaller firms within the manufacturing sectors, and the evidence on the lower productivity and innovation amongst the smaller firms, provide a perspective on the challenges faced by the sector in upgrading its production technology and moving up the value-chain[21]. In part, it also sheds light on the potential reasons underlying the plateau of the sector since the 2000s. Malaysian manufacturing firms, given their small size, face the challenge of low volume and cannot effectively leverage on scale. Low and inconsistent production volume is one of the main factors hindering the adoption of higher level of automation. Firms that are producing low volumes, or do not have consistency in demand for their products are unlikely to embrace automation as it is often costly, capital intensive, and has a longer payback period. This can be seen in the usage of industrial robots by Malaysian manufacturers – based on available data, while the stock of industrial robots that Malaysia has is relatively comparable to regional peers, the pace of adoption is appreciably slower (Figure 13). For export-oriented firms, this problem of scale is exacerbated by the fact that the majority are part of international production and do not in fact have ownership of important final products – which

Figure 12: Manufacturing and innovation

Malaysian firms are behind in the R&D and product innovation, especially for smaller firms

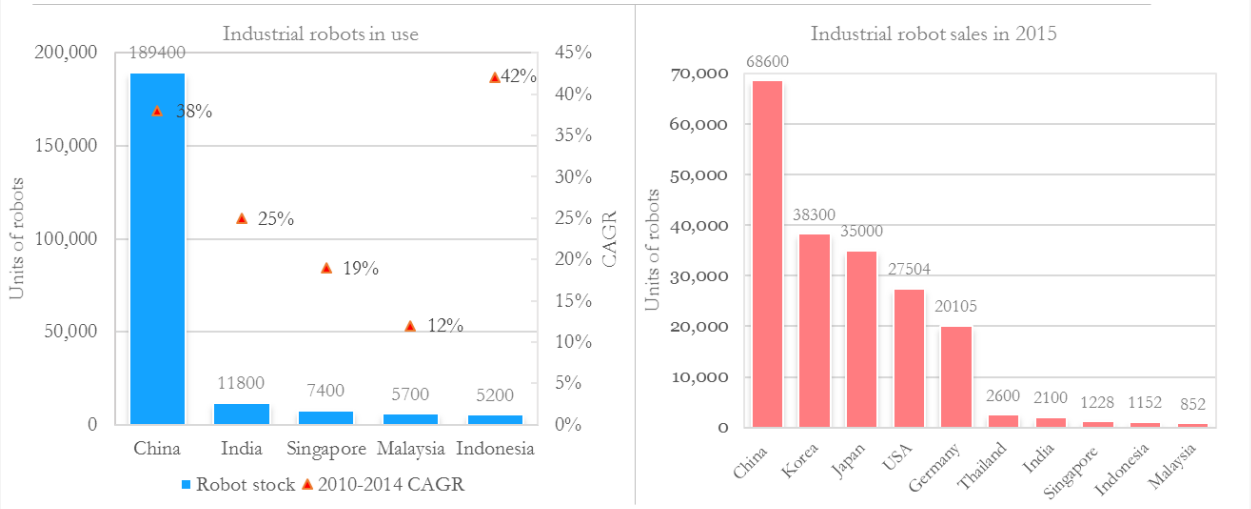


Source: World Bank Enterprise Survey 2016. Note: SME definitions used by here are different from DOSM

[21] In this part of the discussion, the authors benefitted from engagement with the Federation of Malaysian Manufacturers (FMM), which was initially aimed at understanding the level of automation within manufacturing in Malaysia. Based on a survey they conduct twice a year, the FMM found that the average automation levels within firms in Malaysia is still low and 80 percent of firms have less than 50 percent automation within their processes. When asked the reason behind not automating, 71 percent of their 370 respondents indicated high cost to be the main factor hampering efforts to automate. We would like to emphasise however, that the assessment of the manufacturing sector here is the authors', and does not represent the views of FMM.

limits the scope for Malaysian firms to take on innovation in introducing new products and to move up the value-chains. This dual problem of scale and scope provides a perspective on why Malaysian manufacturers do not adopt a higher level of automation, and lags regionally and internationally in research and development, and product innovation. It does not, however, impede the adoption of process innovation or to rely on lower skill production technology to reduce costs – an element that Malaysian firms could still compete in for now[22]. This, in fact, could also lower the risk of direct technical displacement of labour within the manufacturing sector as discussed in Part One. But, it should be recognised that with more advanced technological adoption in other countries – such as in robotics and additive manufacturing – the cost advantage of Malaysia could be eventually be eroded, leading to further decline in the relative importance of the sector within the economy[23]. Relevant to the landscape of employment in the future then, is less on jobs in manufacturing being displaced by automation but more on the fact that less jobs will be created overall underpinned by continued deindustrialisation.

Figure 13: The use of industrial robots in Malaysia is low by international standards
Including amongst our regional peers



Sources : IFR - World Robotics 2015 , World Robotics 2016

Overall, it can be said that the challenges faced by the manufacturing sector in Malaysia is significant and the risk that we are left behind globally is real. This, in large, can be surmised from the structure of the sector that is mainly concentrated in smaller firms which face greater difficulty in leveraging on scale and scope to adopt technology and to move up the value-chain. Without a significant shift in the current direction of the sector, it is unlikely that the manufacturing sector – as important as it has been and still is – will be able to materially reverse the trend of deindustrialisation for the Malaysian economy and be a primary source of additional employment creation for the country as how it did between the late 1980s and the 1990s.

[22] The authors acknowledge that the problem of scale and scope could in fact be a proximate factor contributing to the challenge of Malaysian manufacturers in moving up the value-chain or in adopting automation. Other more fundamental factors could be relevant, including the relative abundance of cheap low-skill migrant labour on one end, and the retrenchment in overall global value-chains and global trade in general since the Global Financial Crisis on the other.

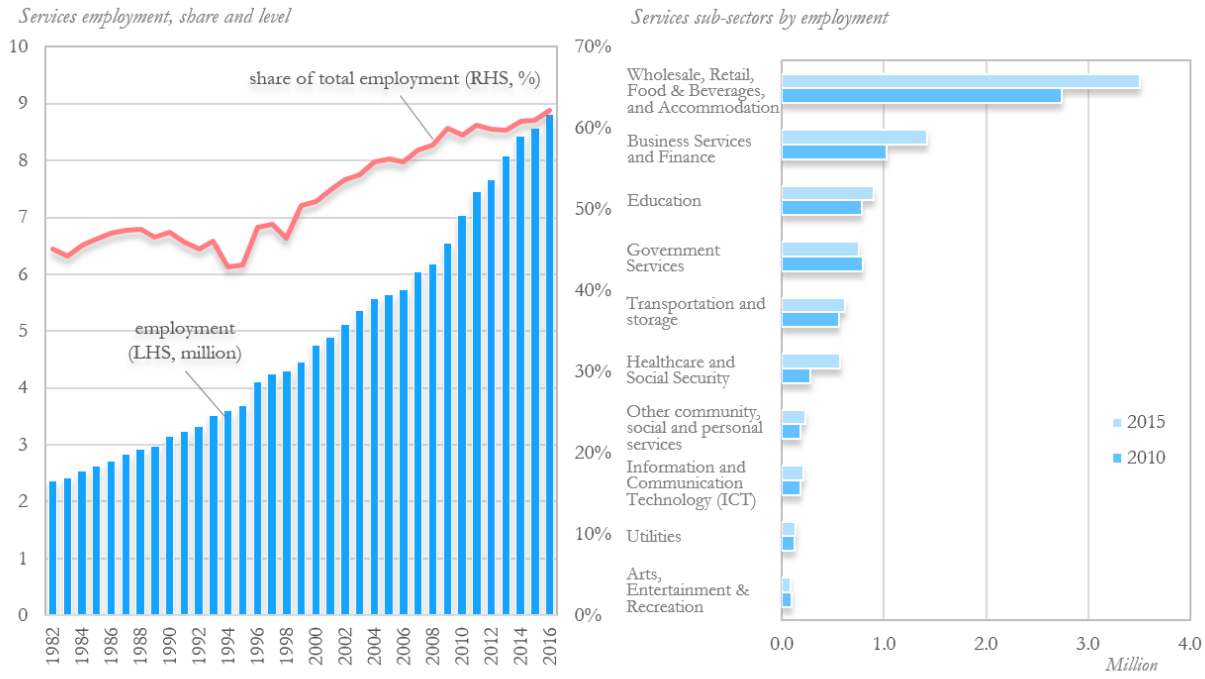
[23] This point is discussed in greater length in Khazanah Research Institute (2017).

7. Stirring services – *rapid growth of new modern services*

The services sector is the largest broad economic sector in the Malaysian economy, contributing more than half of the entire GDP of the economy currently. In 2016, employment in the sector was nearly 9 million – or 61 percent of the total employment in Malaysia. Growth of employment in the sector, both in terms of level and share, has been steady over the recent decades particularly since 2000. The sector is very diversified – with both more traditional sub-sectors such as wholesale and retail and newer modern services such ICT, growing in tandem with the overall sector (Figure 14).

Figure 14: Services employment in Malaysia

More than 60 per cent of all employment in Malaysia is in the services sector



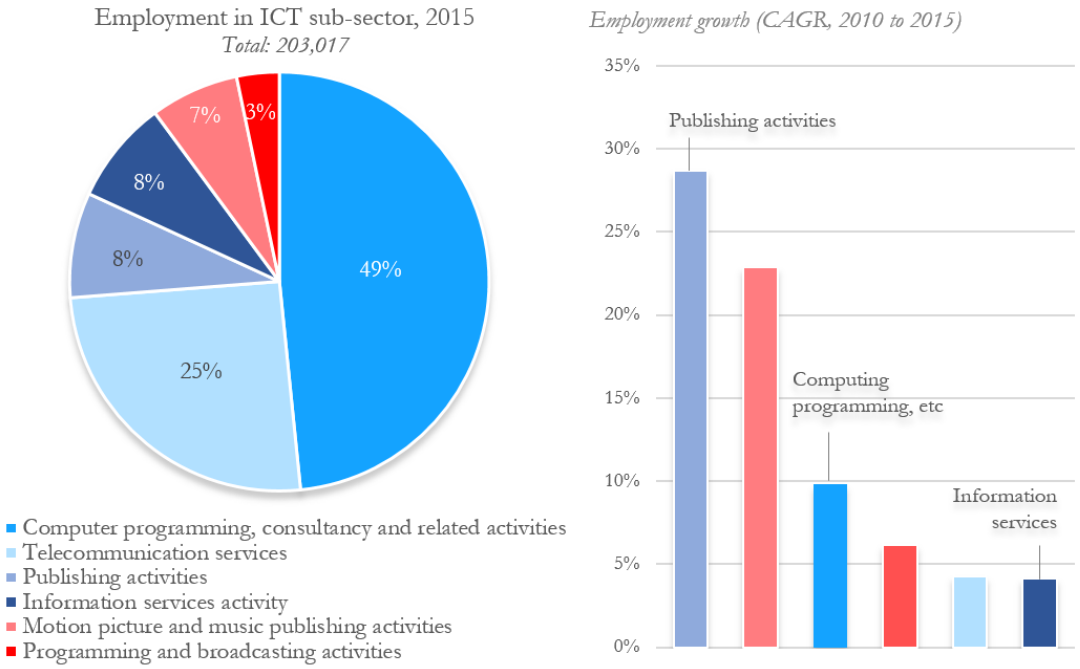
Source: DOSM

In this essay, the discussion is focused on the modern services which are characteristically – but not exclusively – enabled by progress and possibilities brought about by new technologies. Three inter-related developments are explored, namely the rapid growth in the ICT sub-sector, e-commerce, and the rise of digital platform economic activities.

The **ICT services sub-sector** has been experiencing rapid growth in the recent years. From 2010 to 2015, annual employment growth in the sub-sector was 9 percent, more than twice as fast as the overall employment growth in the Malaysian economy of 3.4 percent. While high, this average figure in fact masks the very rapid growth in the various industries within it. For example, the number of workers in publishing activities, which includes software and online publishing, grew by nearly 30 percent annually, while employment in motion picture and music publishing industry grew by 23 percent. Overall, more than 200,000 people work in the ICT sub-sector, with nearly half of the workers working in computer programming, consultancy and related activities, which includes activities such as software programming, system integration, and general IT support (Figure 15). Jobs created within ICT also has higher wages than national average in general. The wages in programming and broadcasting activities, and telecommunication services, for example more than twice as high as the average wage for the overall economy. Perhaps more striking is the

pace of growth experienced by smaller ICT firms employing less than 30 people - SMEs. Between 2010 and 2015, the annual growth of gross output and employment by these firms were between 30 to 40 percent. Overall, the experience in the ICT sub-sector in recent years suggest that it has been a small but fast-growing source of employment for the economy.

Figure 15: Employment in ICT increased by 9% per annum between 2010 and 2015
This is more than twice the rate of employment growth for the overall Malaysian economy of 3.4%



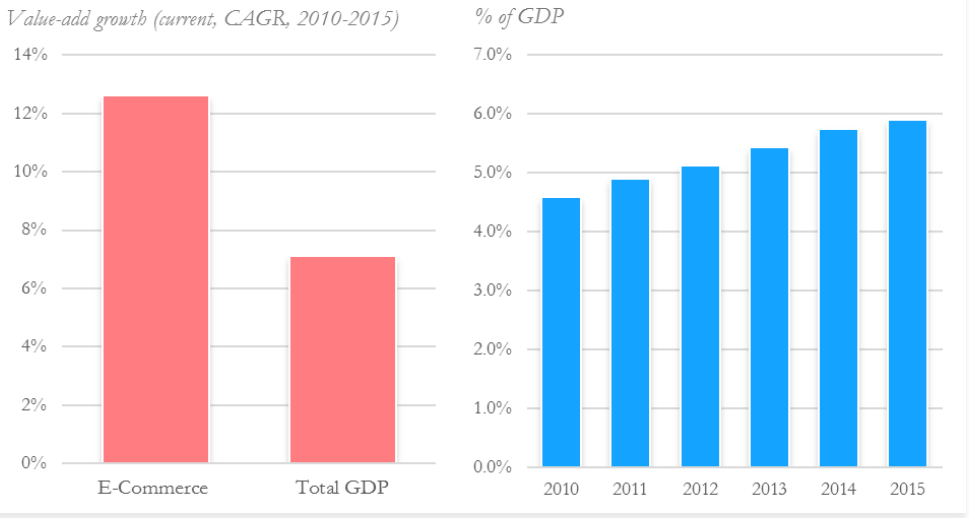
Source: DOSM

Another important development in the growth of modern services in Malaysia is **e-commerce**. Given the relatively nascent nature of the activities, there are less economic statistics available on e-commerce compared to more conventional economic activities. Nevertheless, the available evidences are pointing towards a relatively rapid pace of growth. In terms of nominal value added, between 2010 and 2015, e-commerce has been growing at an annual rate of 12.7 percent. This is in comparison to the 7 percent growth in overall nominal GDP. Consequently, the share of e-commerce in GDP has increased from 4.6 percent in 2010 to 5.9 percent in 2015. More anecdotal evidences on performances of Malaysian e-commerce platforms in the last two years do not show that the trend of growth is abating[24]. While precise data on employment is not available, it is not surprising that e-commerce could have provided new opportunities for more people to earn a viable income – either as their primary or secondary source, and expanded the employment in related industries such as in logistics.

[24] For example, Lazada Malaysia recorded a 100 percent increase in sales for 2016, while 11Street saw 30 percent increase in sales by sellers within 6 months in 2015 (The Star (2017), Kumar (2016)).

Figure 16: E-commerce is currently at 5.9% of GDP

With value-add growing at 12.7% per annum between 2010 and 2015, in current terms



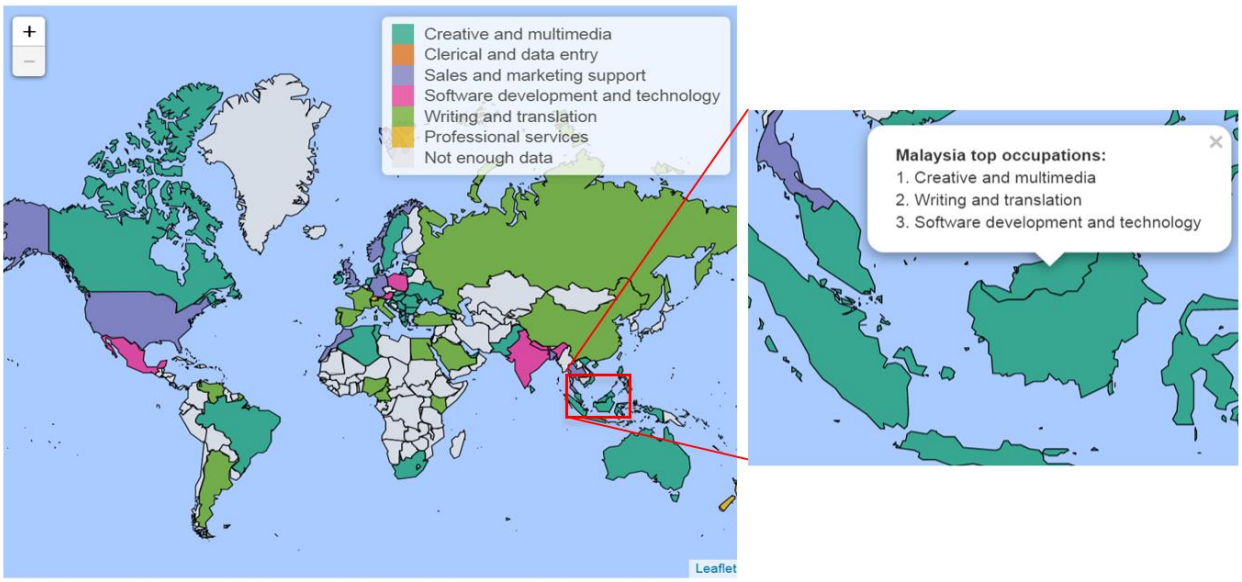
Source: DOSM

The development of e-commerce is part of a broader phenomenon within the Malaysian economy that has been made possible through technology – **digital platforms**. Platforms are based on a new business model that creates value by facilitating exchanges between two or more interdependent groups, usually consumers and producers, enabled by new digital technologies. As discussed in Part One on the rise of independent work, platforms can be broadly divided into two groups: asset rental platforms and goods and services platforms. Asset rental platforms allows independent service providers to commercialise their personal assets. For example, AirBnB facilitates homeowners to rent out their spare rooms and houses, while Grab and Uber enable private car owners to offer their cars and driving services as alternative to taxi services. Goods and services platforms on the other hand allows sellers and independent workers to sells goods and provide services to customers. This includes e-commerce, but also other platforms such as food delivery. Less common in Malaysia but increasingly gaining ground are labour services platforms, such as Upwork and Rev. These platforms allow independent workers to provide a variety of services on a freelance basis. It is important to highlight that the rise of platforms is not a marginal development – digital platforms have the potential to dramatically change how industries work and alter the nature of employment. As an example, in less than five years since their introduction, it is currently estimated that there are 50,000 to 60,000 Grab and Uber drivers in Klang Valley compared to only 37,000 taxi drivers [25]. In addition, digital platforms also enable the internationalisation of independent work. Based on data from six of the largest English-language labour platforms worldwide, between July 2015 and June 2016, the global labour platform economy – measured by tasks and project done – grew by nearly 26%, primarily in software development and technology work[26]. More than 25,000 Malaysians offer their services in these platforms – mainly in ICT and creative services (Figure 17).

[25] These figures are quoted in: http://ongkianming.com/2017/07/06/media-statement-spad-should-ensure-a-level-playing-field-between-taxi-and-ehailing-drivers-and-provide-these-drivers-with-proper-protections-and-safeguards/

[26] To learn more about the internationalisation of independent work, visit the Online Labour Index at http://ilabour.oii.ox.ac.uk/online-labour-index/ (Lehdonvirta (2017), Kässi & Lehdonvirta (2016))

Figure 17: Internationalisation of independent work
Malaysians mainly provide ICT and creative services through international platforms



Source: Oxford Labour Index

Overall, the development of new modern services in Malaysia – through the rapid growth of the ICT sub-sector, e-commerce, and the more general rise of digitally-enabled platforms – has provided new sources of growth and employment creation in the economy, and led to increase in new types of jobs available for the Malaysian workforce as well as the nature of work. The increase in modern independent and alternative work arrangements that was explored in Part One can be traced to these changing characteristics of the services sector. This has important implications, which will be discussed in Part Three.

Part Three: Preparing for the Future

8. Future ready – *rethinking learning and safety nets*

The landscape of employment in Malaysia will change in a number of consequential ways as we move into the next decades, shaped in no small part by technology. Polarisation in employment will continue to occur, with more jobs created for both ends of the skill spectrum as labour-saving technology continue to replace middle-skilled jobs. Rapid growth in technology-enabled platforms, on the other hand, will continue to intensify the rise of independent work – changing the very nature of work away from the traditional full-time fixed employment. Finally, as per our experience in the past, the evolving structure of the Malaysian economy – particularly in manufacturing and modern services – will also reshape the sources of job creation for the Malaysian workforce. All these imply that the notion of having only a single, stable job with one employer in one narrow industry throughout one's working lifetime is increasingly a thing of the past.

Two key implications to the future of work are particularly salient. First, with the rise of independent work, a greater proportion of the population would have greater flexibility and autonomy in the work they do, but could also be subjected to less job security with greater volatility in income. Second, and perhaps more crucially, the fast pace of progress in technology would most like lead to more rapid cycles of obsolescence and renewal in the types of work and industries available – a Malaysian entering the workforce now can expect to switch jobs more frequently over the course of their lifetime as a norm.

What needs to be done to ensure that the Malaysian workforce will be ready for future of work? Many things are essential, but at the core of it, it comes down to one fundamental question: will individuals be able to renew and reskill themselves to keep abreast with the pace of change – to complement rather than be displaced by the new advances in technology? A positive answer to this question will require a fundamental rethinking of education as we know it, centered on individuals taking the personal responsibility and having the capacity, opportunity and motivation to continuously learn and relearn – **lifelong learning**[27]. The most important skill that all Malaysians need to have to ready themselves for the future is the ability to learn throughout their lives. This will require us to develop a deep culture and provide an enabling system that will inculcate true lifelong education for all, in which formal learning is not limited to the first two decades of our lives. Learning should also be **self-directed** but supported – which will require us to have a norm and an environment that would motivate a person to take responsibility and initiative to best realise their own potentials. Lastly, to ensure no one is left out, access to lifelong education must be available for every individual in Malaysia, **equal opportunities** regardless of who they are in terms of age, sex, and ethnicity, and where they are from.

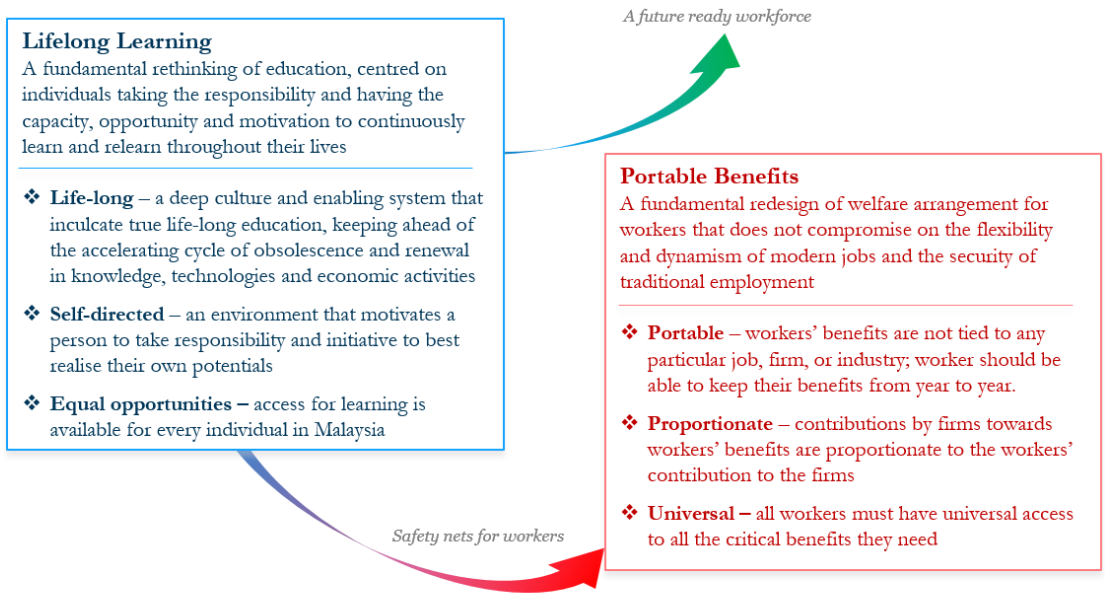
A comprehensive discussion on policy proposals to reform the landscape of learning in the country is beyond the scope of this essay, but it is useful to highlight a few points[28]. The first is on the relevant competencies and skills that would become more important in a rapidly changing, technology-driven environment. The life and work environments of the future will require far more than purely content knowledge. To adequately equip learners to face the new challenges and pressures, educational institutions would have to adopt curricula that are comprehensive yet flexible, and centered on content that extends thinking and reasoning, interdisciplinary in focus, and blend informal and formal learning in an effective manner. Problem-solving, reflection, creativity, critical thinking, risk-taking, communication, collaboration, innovation, and entrepreneurship are key competencies for the future. While mathematic, scientific, and digital forms of literacy will remain essential building blocks, it will become increasingly important for learners to have a solid grasp of civic issues. A dynamic modern curriculum will enrich these new competencies and skills, while reaffirming the importance of core academic subjects and forms of literacy.

Secondly, the approach to pedagogy will also need to evolve. In a modern educational landscape, learning will become more personalised and customised to reflect learners' individual needs and interests, and informal learning opportunities will become recognised alternatives to traditional formal education. Transformed learning environments will encompass customized learning for each learner, wider availability of diverse sources, and collaborative group learning. Real-world experience will permeate learning activities, from the community and with the private sector. The latter is particularly important to ensure that learning is relevant to the changing needs of the new economic landscape. One way to achieve this is to have both learners to be more engaged with the private sector throughout their education, and for experienced private sector individuals to be more involved in education. Education will be supplemented by virtual opportunities – particularly through new, potentially revolutionary educational platforms made possible by modern digital technology[29]. Technology, in general, will support personalised learning processes and facilitate inclusion and equity.

[27] For further reading on this, the following are useful resources: World Economic Forum: Future of Education, Gender and Work, the Estonian Lifelong Learning Strategy 2020, and Institute for the Future: Learning Futures Research. The discussion here is drawn mainly from insights from these resources.
[28] Discussion here draws from the comprehensive review in UNESCO Education Research and Foresight Working Paper series - The Futures of Learning 1, 2, and 3 (Cynthia Luna Scott, 2015a, b, c).
[29] Refer to Appendix 4 on the new exciting developments in MOOCs – massive open online courses.

The last point relates to adult learning and formal reskilling. An ecosystem that facilitates workers to retrain in their own capacity – and crucially not tied to employers or industries – will allow movement into different sectors and support workers to prepare in entering new fields. This means removing barriers for training opportunities previously organised mainly by employers themselves. One way to do this is through providing adult learning subsidy, such as training vouchers, directly to the workers instead of through employer- or industry-based arrangements. This is particularly useful for independent workers who would not have permanent employers[30].

Figure 18: Core principles in enabling a future ready workforce
Lifelong learning and portable benefits as the foundation for the future



In many ways, the best safety net for workers in the future is the capacity to continuously learn throughout their lives. But while necessary, this by itself is not sufficient for a more comprehensive welfare arrangement for the future workforce in facing multiple eventualities. In particular, how can the current social arrangements that is designed primarily with the traditional relationship of employers and employees in mind be changed to better adapt to the fast-changing landscape of work? In this regard, **portable benefits** may provide a promising answer to a redesigned safety net arrangement that does not compromise on the flexibility and dynamism of modern jobs, particularly in alternative work arrangements, while retaining stability and security provided by more traditional safety nets. A system of portable benefits would have three characteristics - portability, proportionate and universal[31]. The **portability** of benefits is where workers' benefits are not tied to any particular job or firm; the workers own their own benefits. Typically, benefits are attached to a specific job but this does not match the reality of work of the future in which many could be deriving their incomes from multiple sources simultaneously or regularly switch

[30] An example of national worker-based adult learning subsidy is SkillsFuture Singapore. This scheme provides workers of different levels of experience with different opportunities for training, with corresponding subsidies available. Subsidy schemes are targeted for skills important for the future of the economy and work. Starting from 2016, a SGD 500 opening credit is also provided to every citizen above 25 to subsidise training expenses, including for use on online course providers.
[31] The discussion here is adapted from the Aspen Institute report on portable benefits (Rolf et al, Capretta (2016)). We also benefitted from our engagement with Grab on this point.

jobs or employers. A portable benefits system would allow a worker to select and maintain their benefits from year to year, across multiple jobs or employers. In addition, each firm should be able to contribute to a worker's benefits at a rate **proportionate** to how much the worker works, or earns. For example, if a person works an hour for a delivery platform and an hour for a ride-sharing platform, both would contribute an amount toward that worker's benefits on a per hour basis[32]. Finally, in a broader sense, a portable benefits model will also need to be **universal** in which all workers are given access to the essential benefits they need such as access to critical protection for disability or workers compensation insurance.

In a way, Malaysia already has social arrangements that have many of the elements discussed and is continuing to move towards the right direction. While other countries have fragmented, non-transferable system of social protection system that may be industry specific, Malaysia has long enforced a retirement savings scheme under the Employees Provident Fund (EPF) and a social protection insurance scheme under the Social Security Organisation (SOCSO), both supported by the government to provide social protection for the workforce regardless of the industry. This has been extended to independent workers – where once EPF participation is tied to the employer, the 1Malaysia Retirement Savings Scheme (SSP1M) was established in 2010 for the self-employed to participate in the provident fund. Some employers within the new modern services are also actively engaging in providing benefits for a more flexible workforce. For example, Grab Malaysia is pioneering the provisions of various benefits for their drivers that are related to some of the portable benefits characteristics discussed (Appendix 4).

Before ending the discussion in this part, it is worth highlighting that while the provision of the foundation for a true lifelong learning system and a redesigned social safety net arrangement for a modern workforce is essential, there are many other elements that would shape how well Malaysians will fare in the future economy. At the macro-level, this fundamentally narrows down to the potential of the economy to thrive in a new landscape altered by the rapid advances in technology, and thus its capacity to create sufficient high-quality jobs for all Malaysians. From the discussion in Part Two on the stagnation in manufacturing and the rapid growth in new services, it is clear that for Malaysia to truly thrive in the future, it will require the ability for us to overcome the weaknesses of our existing industries, exploit new sectors of growth, and discover new areas of economic advantage for the Malaysian economy.

In this, industrial policy could play an important role[33]. But unlike in the past, it should be recognised that the policy environment is very different – with significant uncertainty, growing complexity, and rapid changes. In this environment, policy-makers have significantly less informational advantage than previously. Policies thus need to be continuously informed and be driven from the ground-up – from the private sector – where the informational advantage lies. Industrial policy, in this regard, should be considered as a process of discovery requiring strategic cooperation between the public and private sectors. In an environment of significant uncertainty, this is crucial in both discovering new growth opportunities – with the emphasis of promoting new activities and not in preventing exits – and averting lock-in situations driven by conservative path-dependent decisions that discourage upgrading of the industries over the longer term. Policies are most effective when they are market-informed, provide certainty and are not unnecessarily distortionary. For example, in the case of lowering the reliance on migrant workers in low-skill jobs, an effective policy would be one that increases the relative cost of migrant workers – such as

[32] A good example is a program piloted by Grab and the Central Provident Fund (CPF) board in Singapore, where Grab matches their qualifying partner-drivers' Medisave contributions up to SGD200 through the Insurance Matching Programme. Medisave is the national savings scheme in Singapore for use in future medical expenses.

[33] Discussion here is based on Rodrik (2011) and Aghion et al (2011), recently reviewed in Aiginger (2014), as well as useful insights from authors' engagement with Andrew Sheng and the Federation of Malaysian Manufacturers.

through levies – that is gradual and with a clear time-path over. This would provide certainty for firms to adjust their production technologies over time to be less dependent on low-cost labour. In addition, the public sector also plays important facilitating roles in positioning the Malaysian economy for the future. This includes investing in new modern infrastructures, enhancing access to financing for especially for entrepreneurial activities, and adopting of modern technology in upgrading the efficiency of public services. The Malaysian Government has been making encouraging commitments on all these fronts in recent years. On infrastructure, particularly crucial is the need to upgrade the standards of our digital, energy, and logistics infrastructures that can support the digitisation and modernisation of businesses, government, and the society at large, which in turn can improve Malaysia's readiness in the new rapidly changing landscape. Enhancing access to financing is also key in ensuring financing will not be a binding constraint to entrepreneurs and business activities especially at early stages of growth. Reducing the reliance on traditional lending products by financial institutions, and opening up access to early stage capital and the capital market general is an important step in this regard[34]. Lastly, public sector's adoption of modern technology, if executed effectively, can be instrumental in improving the efficiency of public services, thereby enhancing the ease of doing businesses and providing a more enabling environment for new economic activities in general. In addition, by doing so, the public sector could also play a catalytic role in kick-starting the more wide-spread adoption of modern technology for businesses and the society at large[35].

9. Conclusion – *an uneven future?*

The future of work in Malaysia will be very different from what it is currently – shaped in no small part by the increasingly rapid advances in technology. The type of jobs available and the nature of work itself will evolve, alongside a continuously shifting structure of the Malaysian economy. Given the nature of the technological progress, the pace of change in the landscape of employment is likely to be more rapid than what we have experienced before, within the context of an environment that is highly uncertain and complex.

In facing this future, it is essential that we recognise two key points. First, the change in the landscape of employment will be uneven – it will not be unequivocally positive for everyone even if it is better for the Malaysian economy overall, especially in the short term. Some employment will continue to shrink even as new jobs are created, and it is unlikely that those displaced by the changing landscape of employment will also be the ones to benefit from the new opportunities that will emerge. To not acknowledge the potential hardship that will be faced by some is a mistake that we need to avoid. This leads us to the second point. We are not passive observers of the change that is coming – just as how technology will inform what is possible for the future of work, so will our responses to these possibilities shape the contour of the changing landscape of employment.

The uneven future that we face will only be undesirable if we ourselves allow it to be so.

[34] The recently launched Leading Entrepreneur Accelerator Platform ("LEAP") Market by Bursa Malaysia is a move towards this direction - to provide SMEs with fund raising access and visibility through the capital market. Malaysian Global Innovation & Creativity Centre (MaGIC) provides a lot of informational resources for fund raising opportunities for start-ups - http://resource.mymagic.my/startup/funding/#sthash.cvhhucJv.BCQkjeiG.dpbs.

[35] The Malaysia Productivity Report 2016/2017 (2017), Chapter Seven, provides a comprehensive discussion on this matter in the context of improving public sector productivity in Malaysia.

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Appendix 1: Estimation of the technical potential of automation based on Frey and Osborne (2013) and Arntz et al (2016)

Discussion on the approximation of the methodology employed in Frey and Osborne (2013) can be found in Khazanah Research Institute (2017), Appendix 1. The estimation here is updated with 2016 employment figures for Malaysia.

Direct replication of the methodology employed in Arntz et al (2016) to Malaysia is not possible, as it requires additional information from the OECD Survey of Adult Skills (PIAAC) in which Malaysia does not participate it. Estimation for this essay is based instead on two rough approximations – 1) via the mapping of probability of automation based on education-level published in the paper to workforce of Malaysia, and 2) estimating a relationship between the probability of automation for the countries covered in the paper with their respective ratio of skilled to low-skilled workers, and fitting that relationship to the case of Malaysia.

This results in three estimates of technical potential of automation – one based on the approximation of Frey and Osborne (2013), and two based on Arntz et al (2016). The lowest of the three estimates are used as the lower estimate, while the highest, the higher estimate. Consistent with the nature of the two studies, for the numbers in Figure 2, all three lower estimates are based on Arntz et al (2016), while all three higher estimates are based on Frey and Osborne (2013). The ranges for the estimates in this figure should not be interpreted as statistical upper- and lower-bounds with central point estimates at the middle, but instead conceptual upper and lower estimates of the technical potential of automation based on the assumptions of the two studies – namely, automation at the occupation-level (Frey and Osborne, 2013) which results in higher estimates, and automation at task-level (Arntz et al, 2016) which gives lower estimates. This is akin to White House, 2016 (pg 2, 14-15).

Appendix 2: Categories in the manufacturing sector

Category	Details
Food, Beverage & Tobacco	Includes the processing and preserving of meat, fish, crustaceans, molluscs, fruits and vegetables; Manufacture of vegetable and animal oils and fats, dairy products, grain mill products, starches and starch products, other food products, prepared animal feeds, beverages, tobacco products
Clothing	Includes the spinning, weaving and finishing of textiles; Manufacture of other textiles, wearing apparel, articles of fur, knitted and crocheted apparel; Tanning and dressing of leather; Manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur; manufacture of footwear
Wood Products and Furniture	Includes the sawmilling and planning of wood; manufacture of products of wood, cork, straw and plaiting materials, paper and paper products; manufacture of furniture
Printing and Media Production	Includes printing and service activities related to printing, reproduction of recorded media
Refined Petroleum	Includes the manufacture of refined petroleum products
Chemical Products and Pharmaceuticals	Includes the manufacture of basic chemicals. Fertilizer and nitrogen compounds, plastics and synthetic rubber in primary forms, other chemical products, man-made fibres, pharmaceuticals, medicinal chemical and botanical products

Rubber Products	Includes manufacture of tyres, other products of natural or synthetic rubber, unvulcanised, vulcanized or hardened, rubber gloves, remilling and latex processing, other rubber products
Plastic Products	Includes manufacture of semi-manufactured plastic products, finished plastic products, plastic articles for packing of goods, builders plastic ware, plastic tableware, kitchenware and toilet articles, diverse plastic products
Construction Products	Includes manufacture of all types of cement, concrete, refractory and non-refractory ceramic goods, lime and plaster
Metal Products	Includes manufacture of basic iron and steel, basic precious and other non-ferrous metals, casting of metals, structural metal products, other fabricated metal products; metal working service activities
Electrical & Electronics	Includes manufacture of electronic components and boards, computers and peripheral equipment, communication equipment, consumer electronics, manufacture of measuring, testing, navigating and control equipment; watches and clocks; irradiation, electro medical and electrotherapeutic equipment; optical instruments and photographic equipment; Manufacture of magnetic and optical media, electric motors, generators, transformers and electricity distribution and control apparatus, batteries and accumulators, wiring and wiring devices, electric lighting equipment, domestic appliances, other electrical equipment
Machinery and Automotive	Includes manufacture of general-purpose machinery, special purpose machinery, motor vehicles, coachwork for motor vehicles, trailers and semi-trailers, parts and accessories for motor vehicles
Rail, Marine, Aeronautical and other transportation	Include the manufacture of ships and boats, railway and rolling stock, air and spacecraft related machinery, military vehicles and transport equipment
Other manufacturing	Includes the manufacture of glass and glass products, jewellery, musical instruments, sports goods, games and toys, medical and dental instrument and supplies, other manufacturing

(Adapted from Malaysian Standard Industrial Classification 2008, DOSM)

Appendix 3: Categories in the Information and Communication Services Sub-sector

Category	**Details**
Computer Programming, consultancy and related activities	Includes the following activities of providing expertise in the field of information technologies such as writing, modifying, testing and supporting software to meet the needs of a particular customer; planning and designing computer systems that integrate computer hardware, software and communication technologies; on-site management and operation of clients' computer systems and/or data processing facilities; providing infrastructure for hosting or data processing services; and other professional and technical computer-related activities.
Telecommunication services	Includes the activities of providing telecommunications and related service activities, i.e. transmitting voice, data, text, sound and video. The transmission facilities that carry out these activities may be based on a single technology or a combination of technologies. The

	commonality of activities classified in this division is the transmission of content, without being involved in its creation.
Publishing activities	Publishing of books, brochures, leaflets, dictionaries, encyclopaedias, atlases, maps and charts; publishing of newspapers, journals and periodicals; directory and mailing list and other publishing, including software publishing, in any form other than motion picture. Includes acquisition of copyrights of content and reproduction.
Information services activities	Includes the activities of web search portals, data processing and hosting activities, as well as other activities that primarily supply information.
Motion picture and music publishing activities	Includes the production of theatrical and non-theatrical motion pictures whether on film, video tape or disc for direct projection in theatres or for broadcasting on television, supporting activities such as film editing, cutting, dubbing, etc. Distribution of motion pictures and other film productions to other industry, as well as motion pictures and other film productions projection. Also includes buying and selling of motion picture or other film productions, distribution rights is also included. Sound recording activities, i.e. production of original sound master recordings, releasing, promoting and distributing them, publishing of music as well as sound recording service activities in a studio or elsewhere.
Programming and broadcasting activities	Includes the activities of creating content or acquiring the right to distribute content and subsequently broadcasting that content, such as radio, television and data programs of entertainment, news, talk, and the like. Also included is data broadcasting, typically integrated with radio or TV broadcasting. The broadcasting can be performed using different technologies, over-the-air, via satellite, via a cable network or via internet. This division also includes the production of programs that are typically narrowcast in nature (limited format, such as news, sports, education, or youth-oriented programming) on a subscription or fee basis, to a third party, for subsequent broadcasting to the public.

(Adapted from Malaysian Standard Industrial Classification 2008, DOSM)

Appendix 4: Massive Open Online Courses (MOOCs), a short explainer

Massive Open Online Courses (MOOCs) are revolutionising how education is done. MOOCs are online platforms which provide individual courses for a multitude of subjects, from photography to calculus. MOOCs have been around for the last decade, it is increasingly gaining popularity, with massive numbers of learners all over the world and a mushrooming of new portals and platforms.

Different platforms deliver these courses in different course content creation and engagement, to different outcomes. However, these different flavours of MOOC generally work in a similar fashion: the platforms work with different course providers from universities and institutes. This material, a combination of video lectures, discussion questions and other methods, is then provided for a fee. Some platforms such as Coursera require payment in order to take the course and, if qualified, obtain a certificate. Platforms such as EdX instead provide the materials for free, but payment is required if the learner wishes to go through assessment and certification. While previously an issue, different avenues are also provided for student-teacher and student-student

communication, including forums. However, one of the largest issue in this system is how certification can be verified and assessments be placed at the highest quality. Different MOOC providers get around this with different ways. For example, EdX overcomes this issue by licensing physical assessment centres for examination.

The rise of MOOC radically alters the way skills are being learnt, assessed and certified by the traditional system of education. Education institutions such as universities traditionally served as the major guarantor for skill level of a worker, hence selective intakes of students bound to a single institution to ensure the reputation of the institution, charging high fees for that service. MOOC now allows students of any background to learn any skills, with stringent assessments to award students who deserve the certificate even when the total number of students for a course is way beyond what traditional education institutions can offer. Reputable universities provide the course content while certain courses are endorsed by major industry players, lending credibility of MOOC certificate quality from both academia and the industry. In fact, EdX has recently launched its MicroMasters Credentials, a series of graduate level courses from top universities with endorsements from the industry.

Students pay a fraction of the price to learn these skills due to less need for physical infrastructures, democratising education not just within borders but internationally. Certain universities are allowing credits to be taken from courses provided by universities from other countries on MOOC platforms, especially when the courses are given by some of the leading figures in the particular field.

Appendix 5: Grab Malaysia's list of arrangements for drivers
(click on the links for more information)

Drivers' education and training

1. The current regulations on e-hailing apps like Grab in Malaysia includes provisions that require increasing the content of the current syllabus to hone drivers' skills on road safety, defensive driving, and etiquette. Grab will provide the access to updated syllabus and training programme through existing Grab driver centres.
2. Grab also offers the following skills development programmes for drivers and their families.
    - **Grab and International Federation of Red Cross and Red Crescent Society.** This partnership equips Grab fleet drivers with life-saving skills and road safety knowledge across the region. The partnership will upskill Grab drivers with first aid and road safety techniques and draw on Grab's driver fleets and call centres as a first-responder network during disaster and emergency situations. To date more than 1,300 Grab drivers in Southeast Asia have been trained as first-responders in medical emergencies.
    - **Grab School** is an innovation workshop to encourage entrepreneurship as a viable future career for drivers' children.
    - **Grab Academy for Wives** trains housewives of GrabTaxi and GrabCar drivers to better manage small enterprises and augment their family income. This was piloted in the Philippines and will soon be launched across the region.

Drivers' welfare arrangements

1. Grab has multiple arrangements to support drivers to have access to the critical resources they need to earn a viable and sustainable income. The upcoming regulation on e-hailing apps give drivers the option to part of a benefits scheme under the Social Security Organisation.
2. Some examples of the various partnerships and programmes in place to support drivers' economic security include:

Vehicle financing schemes

- Grab-Perodua partnership. This partnership aims to provide Bezza, Myvi, and Alza at a reduced price for GrabCar drivers. It will also offer a speedier car registration for Grab drivers and a one-stop centre for servicing and spare parts, insurance and road tax (issuance and renewal).
- **Project Gold** is Grab's vehicle leasing and rental programme for part-time and full-time drivers who wish to focus on earning without worrying about vehicle maintenance.

Livelihood support

- GrabAllStars Rewards Programme is a tiered program that provides partner-drivers with benefits to support costs of driving (e.g. fuel and car maintenance) and other living costs (e.g. telecommunications and shopping). More info on GrabAuto programme (also referred to in the Grab Rewards Programme).
- Grab-Petronas partnership. This partnership offers GrabCar partner drivers fuel savings, lubricant deals, Kedai Mesra promotions, and special rewards for purchases at PETRONAS stations nationwide.
- In-car advertising opportunities – Grab offers drivers the opportunity to earn supplementary income by having in-car advertisements from companies. This is now being piloted in Malaysia. Similar campaign in Singapore here.

(Adapted from information provided by Grab Regional Policy & Research, and Grab Malaysia)