

STATE OF THE REGION

2018 - 2019



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The Pacific Economic Cooperation Council (PECC) is a non-profit, policy-oriented, regional organization dedicated to the promotion of a stable and prosperous Asia-Pacific. Founded in 1980, PECC brings together thought-leaders from business, civil society, academic institutions, and government in a non-official capacity. Together, PECC members anticipate problems and challenges facing the region, and through objective and rigorous analysis, formulate practical solutions. The Council serves as an independent forum to discuss cooperation and policy coordination to promote economic growth and development in the Asia-Pacific. PECC is one of the three official observers of the APEC process.

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MESSAGE FROM THE CO-CHAIRS OF PECC

On behalf of the members of the Pacific Economic Cooperation Council (PECC), it is our pleasure to present our thirteenth annual report on the *State of the Region*. This year we have chosen to focus on the future of skills and work. In selecting this topic we were conscious that there are many issues confronting the Asia-Pacific, not least of which is the risks to the region from a trade war. At our General Meeting held in Jakarta in May 2018, the broad conclusion of the community of experts from business, government, the academe and civil society gathered there was on the increased importance of more not less international cooperation. These issues cannot be resolved solely by unilateral actions, they require cooperative solutions.

As we draw nearer to the end of the second decade of this millennium there are important questions on the future course of the global economy. History teaches us that the path towards progress is far from straight, as philosopher George Santayana has said, “those who cannot remember the past are condemned to repeat it.” The last few decades have come with the single biggest reduction in poverty in the history of humankind – thanks to improvements in technology and the increased openness of our economies.

As much as technology and openness have enabled better lives – there are also risks involved. Absent domestic institutions and policies that facilitate the transition of workers into new jobs and encourage entrepreneurs the political consensus for openness will fray and undermine the very progress that has benefitted so many.

As we see from the results of our annual survey the top risk to growth cited by the regional policy community was *increased protectionism and trade wars*. At the same time, *rising trade tensions and the future of the WTO and multilateral trading system* were seen as the top priority for APEC leaders to discuss this year. There is a clear and present risk that unless actions are taken now to resolve issues that have been allowed to fester for many years we will be condemned to repeat the mistakes of the past and fall into the traps that led to conflicts.

For this reason, we believe that there is need for a multipronged approach. We cannot resolve trade conflicts without also addressing the underlying anxiety that comes with rapid change – whether as a result of technological change or greater competition. In this

report we seek to understand the future of work. It is an initial foray to better understand how the Fourth Industrial Revolution will change the nature of work.

We welcome the renewed emphasis on the importance of thinking about the multilateral trading system. While support for it has been a core objective for Asia-Pacific cooperation, it has ranked lowly in the list of priorities of the policy community since the failure to conclude the Doha Round. This year saw a reversal of that view. There is now an urgent need to consider the future of the system, how to improve its functioning and update the rules for 21st century commerce. Above all, we need to emphasize the importance of the WTO as an institution – not just its role as a negotiating forum but as the arbiter for trade disputes.

There are many people we would like to thank for taking the time to help us to provide a gauge on the sentiments of the regional policy community: all of our member committees without whose support this work would not be possible; as well as the many expert groups who sent out the survey to their members, including: the APEC Policy Support Unit; the United Nations Network of Experts for Paperless Trade and Transport in Asia and the Pacific (UNNExT); the Asia-Pacific Research and Training Network on Trade (ARTNET); the Association of Pacific Rim Universities, and the Papua New Guinea Committee on APEC Policy Issues (CAPI).

We thank Mr. Eduardo Pedrosa for coordinating this year’s report and for providing Chapter 1, Dr Kostas Mavromaras for contributing Chapter 2; Dr Chen Bo for his continued dedication to updating PECC’s index of economic integration in Chapter 3; as well as the Association of Pacific Rim Universities (APRU); Mr Scott Price, Ms Lin Shiumei and Ms Kim Le from UPS; and Dr Wang Yan. We also acknowledge the financial support from Google for this year’s survey. We would also like to thank the editorial committee of this report who provide guidance and insight on the various issues it addresses as well as the staff of our International Secretariat for their work on this report.



DON CAMPBELL
Co-Chair



SU GE
Co-Chair

EXPLANATION OF TERMS USED IN THE REPORT

ABAC	APEC Business Advisory Council
AEC	ASEAN Economic Community
AP	Asia-Pacific
APEC	Asia-Pacific Economic Cooperation
APRU	the Association of Pacific Rim Universities
ASEAN	Association of Southeast Asian Nations
B20	Private sector's voice of the G20 community
CAGR	Compound Annual Growth Rate
CGE	Computable General Equilibrium
CPTPP	Comprehensive and Progressive Agreement on TransPacific Partnership
EIU	Economist Intelligence Unit
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
FTAAP	Free Trade Area of the Asia-Pacific
G20	Group of Twenty (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom, United States, and the European Union)
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GNI	Gross National Income
GRIPS	National Graduate Institute for Policy Studies
HKUST	Hong Kong University of Science and Technology
ICT	Information and Communications Technology
IMF	International Monetary Fund
IR	Industrial Revolution
MFN	Most Favored Nation
MSME	Micro, Small and Medium Enterprises
NA	North America
NAFTA	North American Free Trade Agreement
NEA	Northeast Asia
NTM	Non-Tariff Measure
NZPECC	New Zealand Committee of the Pacific Economic Cooperation Council
OCE	Oceania
OECD	Organisation for Economic Co-operation and Development
ORION	On-Road Integrated Optimization and Navigation
PA	Pacific Alliance
PECC	Pacific Economic Cooperation Council
PNG	Papua New Guinea
PSA	Pacific South America
PSU	(APEC) Policy Support Unit
RAASR	Renewed APEC Agenda for Structural Reform
RCEP	Regional Comprehensive Economic Partnership
RTA	Regional Trade Agreement
SEA	Southeast Asia
SME	Small and Medium Enterprises
STEM	science, technology, engineering and mathematics
TACs	Trade Association and Chambers
TPP	Trans-Pacific Partnership
US	United States
USMCA	the US-Mexico-Canada Agreement
WEO	World Economic Outlook
WTO	World Trade Organization

EXECUTIVE SUMMARY

The Asia-Pacific expected to grow by 3.9 percent this year and 3.7 percent in 2019. These are significant downward revisions from forecasts made earlier in the year, as a result of the materialization of risks to growth, in particular trade conflicts, higher commodity prices, rising interests and volatile capital markets.

The results of PECC's annual survey of the regional policy community largely echo current economic forecasts with the general expectation that growth will be at around the same level in 2019 as 2018. Over 42 percent of respondents expect growth to be about the same – in line with current forecasts. Of concern, however, is that the buoyancy at this time last year has dissipated. The top 5 risks to growth over the next 2-3 years were:

- Increased protectionism and trade wars
- Possible slowdown in world trade growth
- A slowdown in the Chinese economy
- Lack of political leadership
- Corruption

While it is clear that trade restricting measures have been on the rise, at the same time economies have also been undertaking liberalizing measures either unilaterally or in trade deals. This includes the conclusion of the Comprehensive and Progressive Agreement on TransPacific Partnership (CPTPP) and the ongoing negotiations on the Regional Comprehensive Economic Partnership (RCEP).

The entry into force of the CPTPP and the conclusion of the RCEP would provide a critical amount of policy certainty that would encourage businesses to invest in these markets. While forecasts for trade growth remain positive albeit at a slower pace, capital markets have demonstrated increasing volatility and bearishness.

Regional stakeholders identified the following issues as the top 5 priorities for APEC leaders' discussions:

- Rising trade tensions and the future of the WTO and multilateral trading system
- The emergence of anti-globalization & anti-trade sentiments

- Progress on the APEC growth strategy to promote balanced, inclusive, sustainable, innovative and secure growth
- Progress towards the Bogor Goals and the Free Trade Area of the Asia-Pacific (FTAAP)
- Investing in human capital development in the digital age

The impact of a trade war would be to reduce global economic growth rates to between 1 to 2.5 percent, levels that would barely lift global per capita incomes. Within economies, modelling suggests that while almost all sectors of society will suffer, the impact will disproportionately fall on low to middle income earners.

Chapter 2 examines the future of work in the Asia-Pacific region. The general context we use is based on the emerging but unsettled literature on the impact of technology on work. It addresses several questions that are already asked by many people, governments and businesses, such as, (i) how is the Fourth Industrial Revolution changing the nature of work, (ii) what kinds of old jobs will disappear and what new jobs will be created, (iii) do we have the right skills in the region for these new jobs, and (iv) what will happen to those who lose their jobs?

While technology has been the driver of much of humankind's material development over history, several pertinent factors appear to be different today, perhaps not necessarily in nature, but certainly in intensity. These include: the speed at which innovation happens; unbundling of production and the presence of global value chains; the co-existence of several new and powerful general-purpose-technologies.

From the 2018 PECC survey we find that the expectations in the region are that the size of workforces will decline due to the introduction of new technologies, the level of skills required will rise and that the occupational and skills structure of the workforces will change, all in ways related to the expectations in the particular part of the region the survey respondents are located.

Respondents from both emerging and advanced economies appear to agree on the direction of change at the sectoral level. The strongest expectations that the number of jobs will increase were expressed in the following sectors: education; arts, entertainment and recreation; professional, scientific and technical activities, human health and social work activities; and information and communication.

The strongest sectors for a decline in jobs were: manufacturing; mining; and wholesale and retail trade. There was only one sector in which there was a difference in views on the direction of change – real estate. More respondents from emerging economies expect that there will be more jobs in this sector, while more from the advanced economies expect that there will be fewer jobs in that sector by 2030.

Worker displacement will create surpluses of workers and skills in some occupations and new jobs will create shortages of workers and skills in other occupations. How well the economy adjusts to technological change will depend on its capacity to match the skills on offer by all available workers (employed or looking for work) with the skills required by all jobs (vacant or filled).

The overall assessment of the preparedness to deal with the training, upskilling and possible disruption coming from new technologies is sobering and should be cause for alarm among the policy circles. Social policy, education systems and labor markets are all deemed by stakeholders as starkly unprepared for dealing with the disruptions that are likely to come. Responses between advanced and emerging economies differed only minimally.

The latest update to PECC's index of economic integration in the Asia-Pacific region shows a rebound after two consecutive years of falling. The rebound comes mainly from growth in intra-

regional flows of tourists as well as greater levels of convergence in educational expenditure. The index measures the degree of integration taking place in the Asia-Pacific region based on intraregional flows of: goods; investment; tourists; and five measures of convergence: gross domestic product (GDP) per capita; share of non-agriculture to GDP; the urban resident ratio; life expectancy; and share of education expenditure in gross national income (GNI).

The index was developed in 2008 as a tool to measure the degree of integration taking place in the Asia-Pacific. Regional economic integration has become a core objective of the Asia-Pacific Economic Cooperation (APEC) forum. When APEC Leaders set out the Bogor Goals in 1994, they set out a vision through which the region would not only maintain high growth rates but also narrow development gaps. While the region has done well in integrating and overall incomes have increased at a dramatic pace, the index shows that there is a long way to go in terms of closing development gaps.

In spite of concerns over protectionism as a risk to growth and the backlash against trade and globalization in some economies, APEC continues to be seen as an important institution among stakeholders. Indeed, APEC's enduring value may well be its non-binding nature and as an incubator for initiatives that can be taken forward in other processes. As much as trade issues dominated concerns from stakeholders in this year's survey, it is also clear that the impact of technological change is likely to be at the forefront of concerns over the coming years as discussed in chapter 2. Those issues should be seen as a part of a broader set of economic policy issues that require cooperation if not coordination. If regional economies are to successfully navigate the changes arising from technology and integration a much clearer focus on structural policies is badly needed.

CHAPTER
01ASIA-PACIFIC ECONOMIC
OUTLOOK

CONTRIBUTED BY MR EDUARDO PEDROSA, SECRETARY GENERAL, PECC INTERNATIONAL SECRETARIAT AND COORDINATOR OF THE STATE OF THE REGION REPORT PROJECT

The Asia-Pacific region is expected to grow by 3.9 percent in 2018, its highest level since the 2010 bounce back from Global Financial Crisis. If achieved, this would be a 'better than expected' result compared to last year's forecast which was for 3.6 percent growth. This forecast is based on the IMF's projections for regional economies that were revised at the beginning of October. This latest revision is 0.1 percent lower than the forecast from April. It is now becoming clear that the headwinds to growth are having a material impact. A regional, if not a global, trade war is putting at risk future economic growth. The revised forecast for 2019 is still for 3.7 percent growth but this is 0.2 percentage points lower than earlier forecasts or a foregone gain of over US\$100 billion. The risk from trade conflicts are coupled with those coming from higher commodity prices as well as rising interests with the potential for significant reversals in capital markets.

This comes at a time when the imperative for cooperation is high with all regional economies facing the challenge of having to deal with the impact of technological change. While technologies such as big data, artificial intelligence, 3D printing and robotics can improve peoples' lives, they are also likely to cause significant

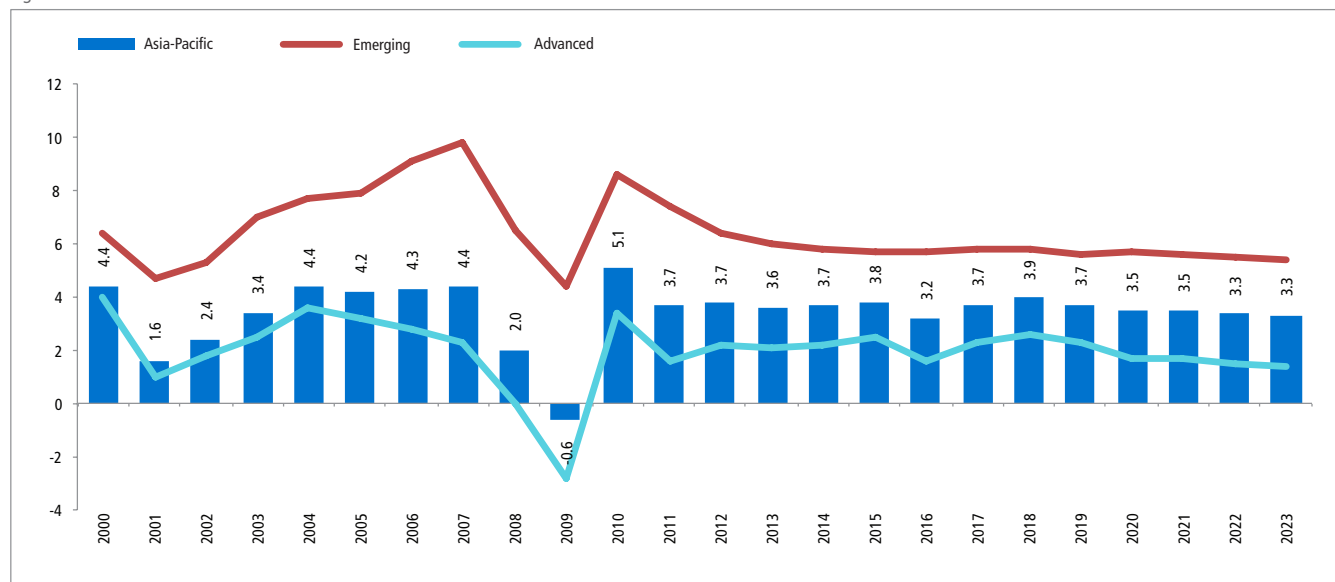
disruptions in labor markets that are still feeling the aftershock of the worst economic crisis since the Great Depression.

REGIONAL ECONOMIC OUTLOOK

The uptick in growth in 2018 largely comes from an improvement in growth among the region's advanced economies, in particular the United States. As a group they are expected to grow by 2.6 percent and 2.3 percent in 2018 and 2019. The prospects for the region's emerging economies remain steady, with growth of around 5.8 percent this year and 5.6 percent into 2019. All of these numbers have been revised downwards by between 0.1 to 0.2 percentage points.

The biggest increases in growth this year are likely to come from commodity rich economies like Chile, Peru, Colombia and Australia where growth in 2018 is expected to improve by over 0.5 percentage points this year. Looking ahead into 2019, while expecting a moderation in growth for the entire region, growth for commodity rich economies Brunei Darussalam; Mexico; and Colombia will improve by over 0.5 percentage points.

Figure 1.1: Asia-Pacific GDP Growth

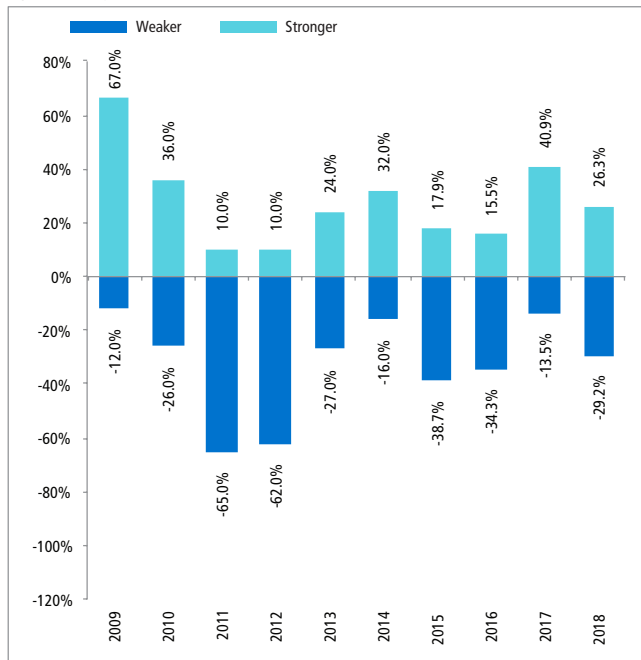


Source: Data from IMF WEO April 2018 database, analysis by PECC International Secretariat

1. ASIA-PACIFIC ECONOMIC OUTLOOK

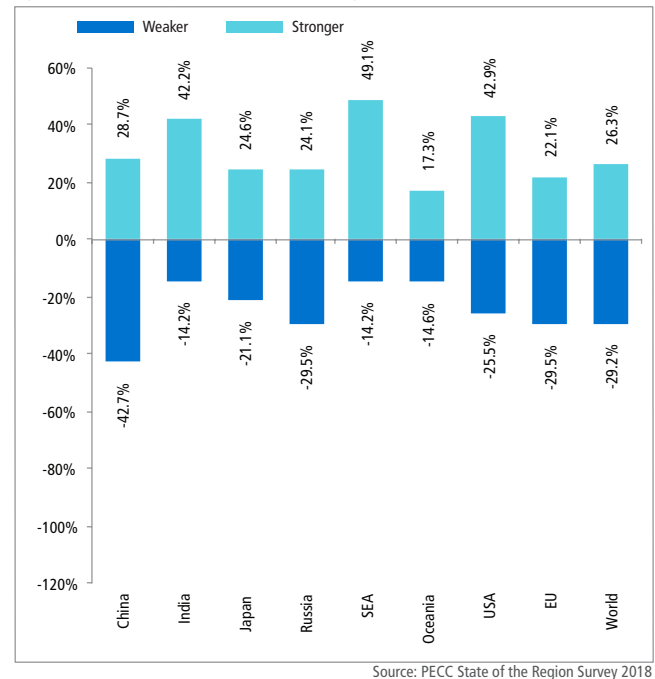
The results of our annual survey of the regional policy community largely echo current economic forecasts with the general expectation that growth will be at around the same level in 2019 as 2018, with 26 percent of respondents expecting stronger growth over the next 12 months compared to 29 percent who expect weaker growth. Over 42 percent of respondents expect growth to be about the same – in line with current forecasts. Of concern, however, is that the buoyancy at this time last year has dissipated.

Figure 1.2: Expectations for Global Growth



Respondents to the survey were sanguine about the prospects for growth for specific economies. While still bullish about the prospects for the United States, Southeast Asia and India, pessimists outweighed optimists with respect to growth for China, the EU and Russia.

Figure 1.3: Growth Expectations for Selected Regions



RISKS TO GROWTH

As shown in Figure 1.4, the top 5 risks to growth over the next 2-3 years were:

- Increased protectionism and trade wars
- Possible slowdown in world trade growth
- A slowdown in the Chinese economy
- Lack of political leadership
- Corruption

By far, increased protectionism and trade wars was the most frequently cited risk, with 62 percent of respondents selecting it as a top 5 risk to growth. Surprisingly, the list of risks is largely unchanged from last year, with the exception of corruption which has replaced failure to implement structural reforms as a top risk to growth. What has changed, not surprisingly, given the announcements of tariffs by the United States and retaliations by other economies, is the level of concern over increased protectionism and trade wars.

Figure 1.4 shows the top 5 risks to growth. The chart shows 3 different aspects to this – the percentage of respondents who chose these issues as risks (horizontal axis); the seriousness that those who selected it as a risk (vertical axis); and the overall weighted risk – taking into account both the frequency and magnitude of the risk (size of bubble). While most risks tend to cluster – protectionism stood out in terms of the frequency and impact that respondents thought it would have on the prospects for the growth of their economies.

Over the past 7 years, the percentage of respondents selecting protectionism as a risk to growth has been steadily rising. In last year's survey 44 percent of respondents selected increased protectionism as the top risk to growth for their economies making it the top risk to growth overall. This year the percentage increased to 62 percent.

Figure 1.4: Risks to Growth

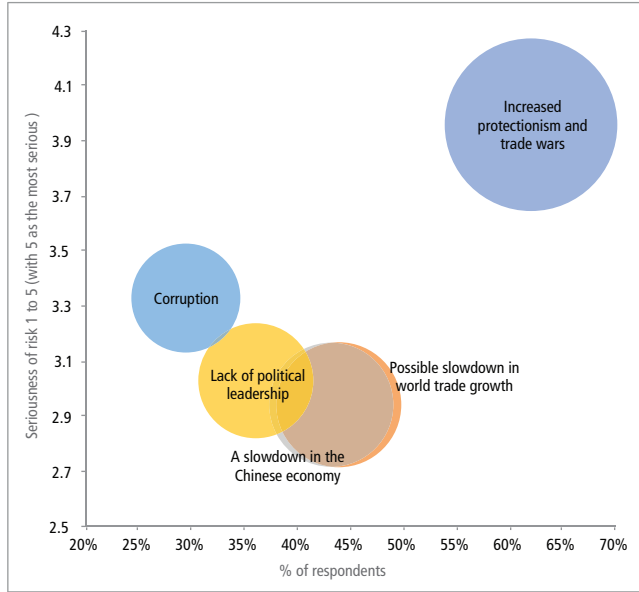
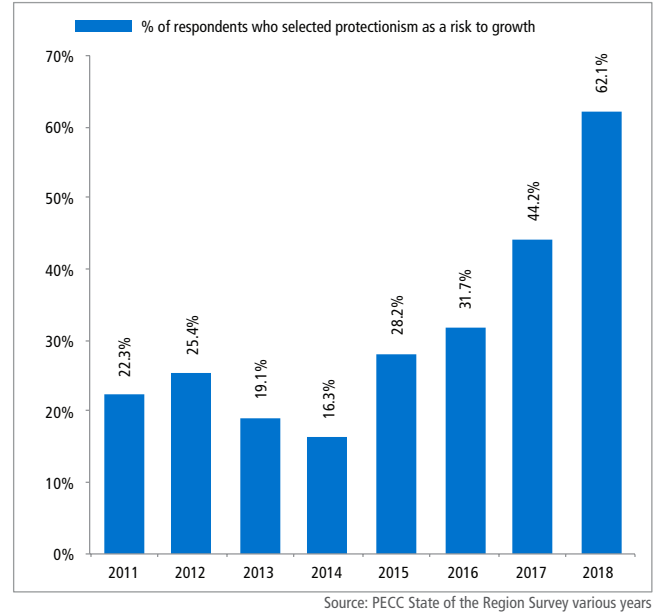


Figure 1.5: Rising Concerns of Protectionism



TRADE GROWTH FILTERING

The announcements of increases in tariffs is now having an impact on forecasts for trade. Export growth is expected to drop from last year's 6.1 percent growth to 4.3 percent this year and to 3.5 percent in 2019.

The slowdown in the region's export growth this year is unevenly spread, but with economies highly integrated into regional supply

chains affected the most. A similar story occurs on the import side, with import growth slowing from 6.9 percent growth in 2017 to 5.3 percent growth this year and 4.9 percent in 2019. Importantly no immediate bounceback is expected within the forecast period.

Figure 1.6: Export Growth

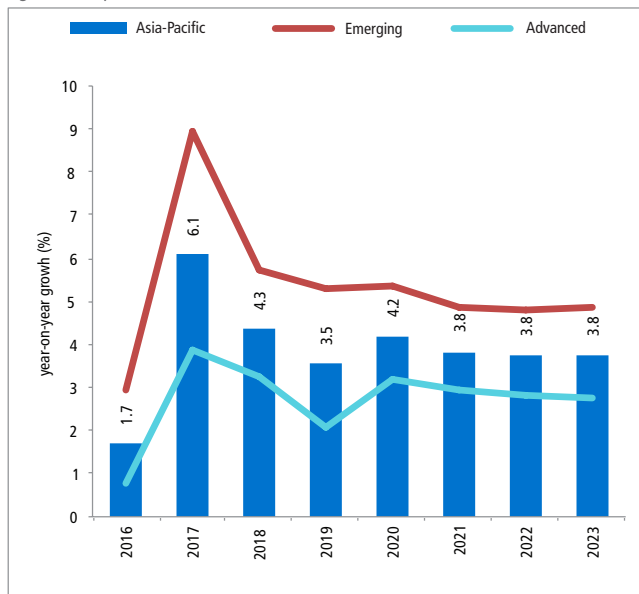
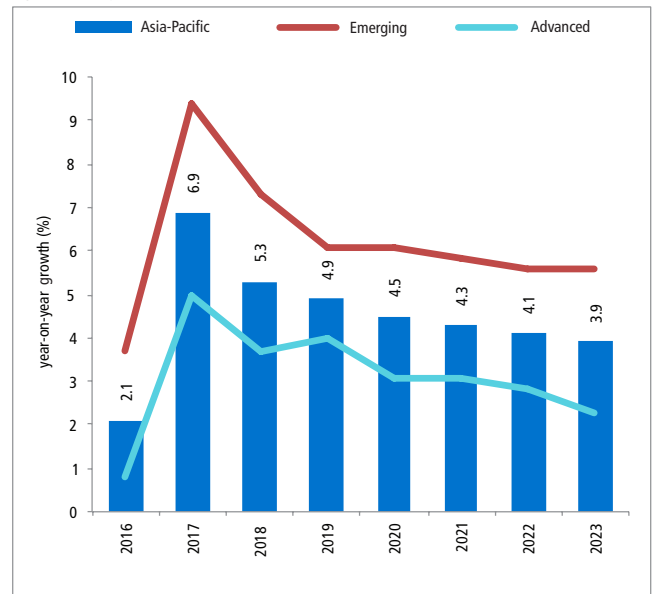


Figure 1.7: Import Growth



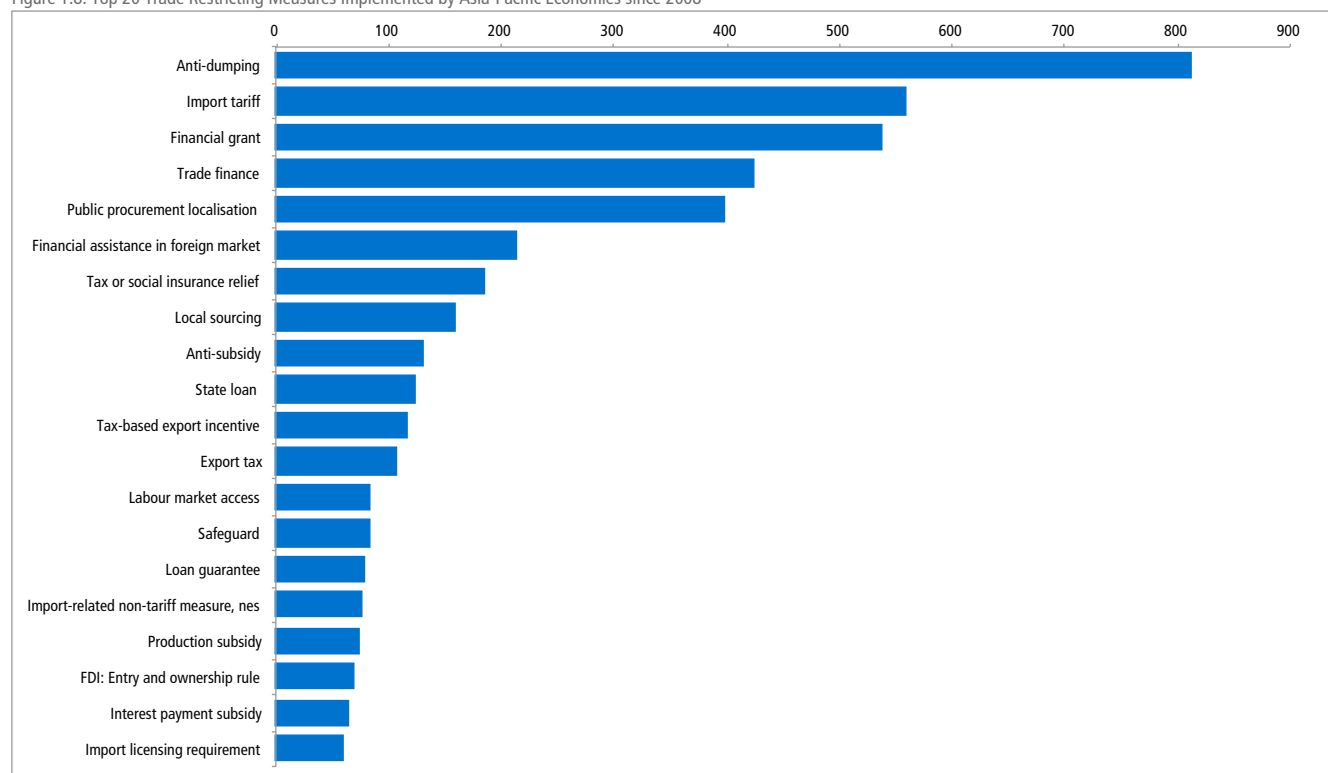
TRADE RESTRICTIONS NOT LIMITED TO TARIFFS

As shown in Figure 1.5 concerns over protectionism have been on the rise over the past few years. While much attention has been focused on more recent announcements, particularly by the United States and China's reactions to them, Figure 1.8 shows that import tariffs have not been the most frequently used trade restricting measure since 2008. It is clear that regional economies have been implementing what was described as 'creeping protectionism'

for years, despite well-intentioned high-level political statements eschewing the use of all protectionist measures.

While there is some debate on whether recent events can be described as a trade war – as shown below, the issues go well beyond tariffs.

Figure 1.8: Top 20 Trade Restricting Measures Implemented by Asia-Pacific Economies since 2008



Source: Global Trade Alert

FORWARD MOMENTUM ON TRADE REMAINS (DESPITE APPEARANCES TO CONTRARY)

While it is clear that trade restricting measures have been on the rise, at the same time economies have also been undertaking liberalizing measures either unilaterally or in trade deals. This includes the conclusion of the Comprehensive and Progressive Agreement on TransPacific Partnership (CPTPP) and the ongoing negotiations on the Regional Comprehensive Economic Partnership (RCEP).

The entry into force of the CPTPP and the conclusion of the RCEP would provide a critical amount of policy certainty that would encourage businesses to invest in these markets. For the CPTPP to enter into force, 6 of the 11 signatories need to ratify it. To date,

Mexico, Japan and Singapore have already ratified the agreement, leaving just 3 more until it enters into force. Perhaps of greater significance is that several others have signaled their desire to join including Indonesia, Korea, Chinese Taipei and Thailand. Even though President Trump withdrew the United States from the original TPP, he has also indicated a willingness to join an improved agreement.¹ In addition to APEC members, Colombia, the only Pacific Alliance member not a party to the CPTPP, has indicated its desire to join and the United Kingdom – a long way from the Pacific – has also begun consultations on joining the CPTPP as part of its potential post-Brexit strategy.²

¹ <https://www.straitstimes.com/world/united-states/donald-trump-eyeing-return-to-tpp-tade-pact-us-senators>
² <https://consultations.trade.gov.uk/policy/consultation-on-uk-accession-to-the-cptpp/>

The RCEP would create the world's single largest trade zone comprising over 3 billion people. If achieved, the importance of the RCEP would grow over time as its members become increasingly middle-class and consumption increases. Indeed, that forward momentum is an additional contributing factor in the continued robustness in trade growth in spite of ongoing trade disputes. While the baseline forecasts for trade growth remain positive, the trade conflict adds another variable to an extremely complex but still positive macroeconomic and financial backdrop.

In addition to the CPTPP and RCEP, regional economies have continued to conclude deals both with regional partners and beyond. For example, Canada has concluded its negotiations with the EU and is seeking to begin negotiations with ASEAN. The Pacific Alliance is now negotiating as a group with associate members Australia, Canada, New Zealand, and Singapore.

While new trade deals continue to be negotiated, older trade deals are also being changed. One of the oldest in the region, the North American Free Trade Agreement (NAFTA) has been updated and renamed to reflect changes and will be known as the US-Mexico-Canada Agreement (USMCA) which was concluded on 30 September 2018.³ Reports suggest that the USMCA will differ from NAFTA in several key provisions, including higher requirements for regional value-add, changes in the dispute settlement process, as well as a clause on negotiating an agreement with non-market economies.⁴

TROUBLING SIGNS IN CAPITAL MARKETS

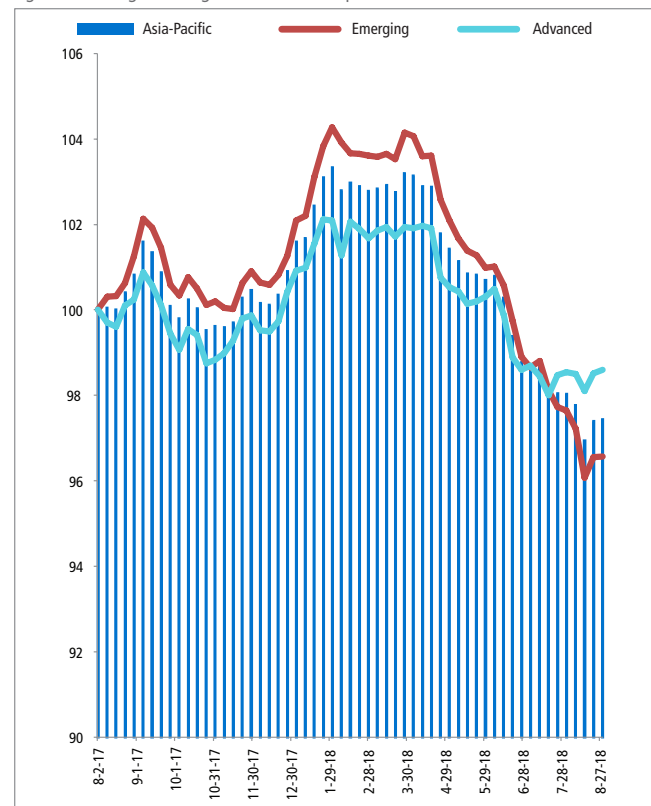
While forecasts for trade growth remain positive albeit at a slower pace, capital markets have demonstrated increasing volatility and bearishness. Since August 2017, regional currencies have lost, on average, around 2.6 percent of value against the US dollar. However, emerging market currencies have depreciated considerably more than advanced economies. On average, Asia-Pacific emerging economies currencies have lost 3.4 percent of value against the US\$ compared to 1.4 percent for advanced economies (see Figure 1.9). The flipside of this is the strengthening of the US dollar, reflecting rising US interest rates, and its impact on its export competitiveness. Given the current environment this trend may further exacerbate trade tensions.

The averages belie more significant movements for individual currencies, some of whom have lost as much as 10 percent in value against the US dollar. Part of this may be due to more general

worsening sentiments towards emerging markets due to situations elsewhere – particularly debt crises in Argentina and Turkey. For example, Indonesia's Finance Minister and former Managing Director of the World Bank, Sri Mulyani said that, "we are monitoring global dynamics and need to be vigilant because the dynamics caused by the sentiment on Argentina is very high. The situation there is not yet finished, so we're anticipating these dynamics will continue."

⁵ Since the end of August 2017, emerging market equities have been struggling. The Morgan Stanley Emerging Market Fund, for example, has lost around 9 percent of value in spite of the strong macroeconomic performance in most emerging markets. The IMF's October Outlook notes that "after a buoyant start to the year, capital flows to emerging markets weakened considerably in the second quarter and beyond ... nonresident portfolio flows, which were strong during 2017 and early 2018, turned negative in May–June of 2018, consistent with foreign exchange market pressures on several emerging market economies."⁶

Figure 1.9: Foreign Exchange Movements over past 12 months



Source: Currency data from <http://fx.sauder.ubc.ca/data.html> weighted for trade in goods and services

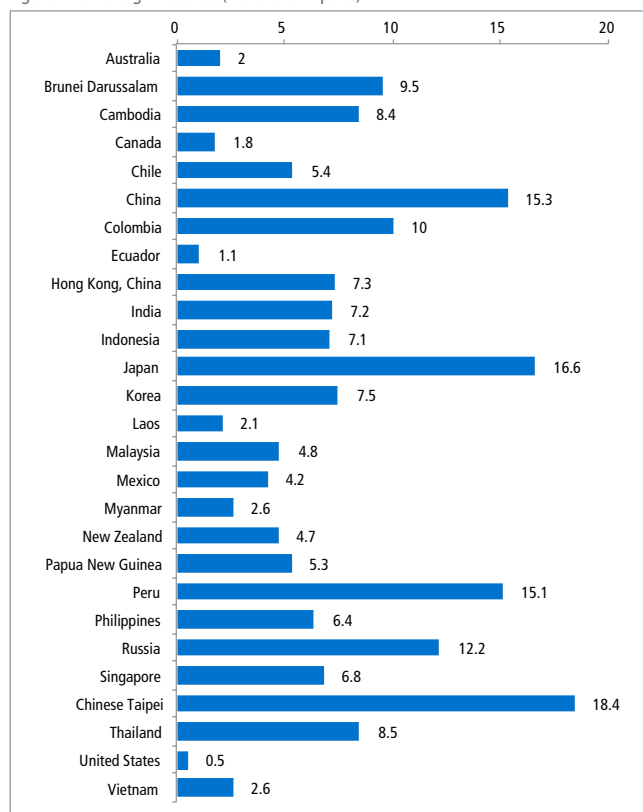
³ <https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/september/joint-statement-united-states>

⁴ The agreement is still subject to legal review. The text is available at: <https://ustr.gov/trade-agreements/free-trade-agreements/united-states-mexico-canada-agreement/united-states-mexico>

⁵ <https://www.channelnewsasia.com/news/indonesia-rupiah-minister-darmin-nasution-depreciation-illogical-10682688>

⁶ <https://www.imf.org/en/Publications/WEO/Issues/2018/09/24/world-economic-outlook-october-2018>

Figure 1.10: Foreign Reserves (months of imports)



Source: Data from IMF WEO April 2018 database and WTO Statistics, analysis by PECC International Secretariat

The weakening of regional currencies against the US dollar has precipitated actions by central banks. For example, on 24 August the People's Bank of China announced that it was introducing a "counter-cyclical factor" to mitigate pro-cyclical market behavior and stabilize market expectations.⁷

As shown in Figure 1.10, against traditional benchmarks most regional economies have more than adequate reserves (traditionally 3 months of imports), however the IMF warns that traditional measures of reserve adequacy have limited relevance, *'the reserve losses that many economies experienced during crises did not show any relationship with needs. This reflects the fact that each crisis is unique and that the impact of crises vary greatly, resulting from withdrawal of foreign capital, while others involve the loss of export income, or capital flight by domestic residents.'*⁸

Part of the complexity and potential for swift reversal is the

massive injections of liquidity into the financial system. This has supported very high debt levels. According to estimates by the Institute of International Finance, global debt levels now stand at around US\$247 trillion. Of this, 75 percent was household, non-financial corporate and general government debt and 25 percent in the financial sector.⁹ At the end of 2007, Asia-Pacific economies had around US\$13 trillion in short and long-term debt as equity and investment fund shares. At the end of 2017, this had risen to US\$22 trillion or 46 percent of the region's GDP (as measured at current prices) an increase of 5.6 percent over the last decade. There are, however, considerable differences within the region. In regional emerging economies this has dropped by 3.1 percent over the same period while it has increased for the region's advanced economies by 17 percent.

Given this situation, it is somewhat surprising that only 18 percent of respondents to PECC's survey selected unsustainable debt as a risk to growth, a similar percentage to those who selected unfavorable currency alignments. Even fewer, 14 percent of respondents, selected a sharp fall in asset prices as a risk to growth. While that result may indicate that these are not immediate concerns, they might also show complacency or an inability to price risk. In his speech at the August 2018 Jackson Hole Symposium, the General Manager of the Bank of International Settlements warned that *"Retreating into protectionism also risks unravelling the financial interdependencies that enable and encourage trade and investment links. This threatens to unsettle financial markets and put a drag on firms' capital spending, as investors take fright and financial conditions tighten. Finally, these real and financial risks could amplify each other, creating a perfect storm and exacting an even higher price."*

PRIORITIES FOR APEC LEADERS' DISCUSSIONS

As shown in Figure 1.11, regional stakeholders identified the following issues as the top 5 priorities for APEC leaders' discussions:

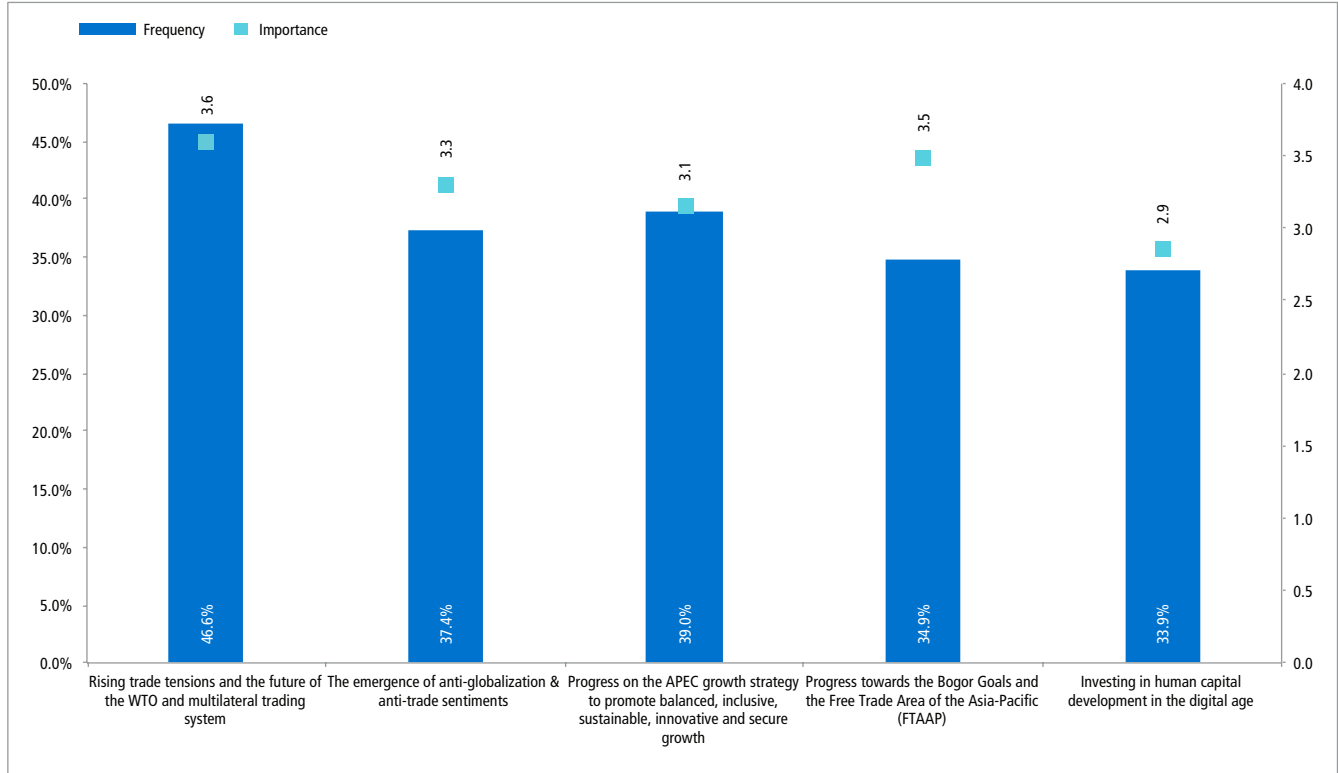
- Rising trade tensions and the future of the WTO and multilateral trading system
- The emergence of anti-globalization & anti-trade sentiments
- Progress on the APEC growth strategy to promote balanced, inclusive, sustainable, innovative and secure growth
- Progress towards the Bogor Goals and the Free Trade Area of the Asia-Pacific (FTAAP)
- Investing in human capital development in the digital age

⁷ <http://www.pbc.gov.cn/english/130721/3610729/index.html>

⁸ IMF Survey: Assessing the Need for Foreign Currency Reserves: <https://www.imf.org/en/News/Articles/2015/09/28/04/53/sopol040711b>

⁹ <https://www.reuters.com/article/global-debt-iif/global-debt-load-at-a-record-247-trillion-in-q1-iif-idUSL1N1U51A2>

Figure 1.11: Priorities for APEC Leaders

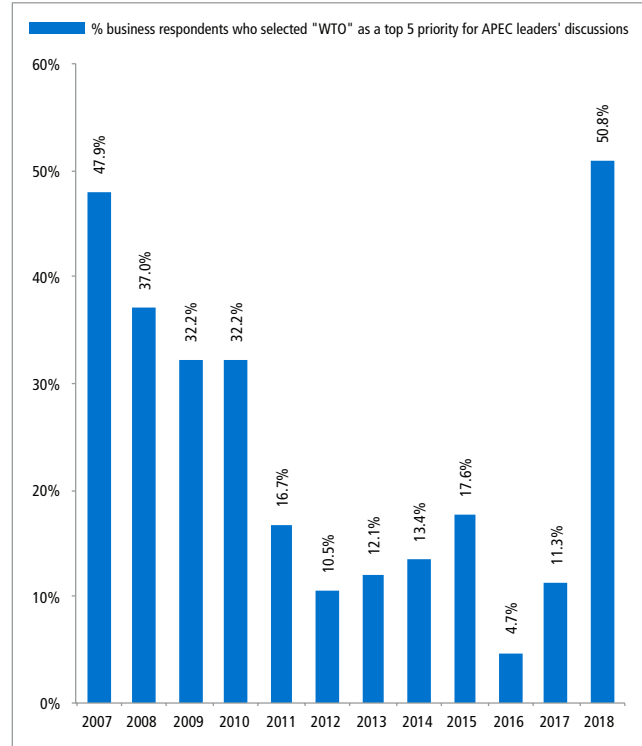


Source: PECC State of the Region Survey 2018

This represents a remarkable turnaround of views regarding attitudes toward the WTO and the multilateral trading system. Figure 1.12 shows the percentage of business respondents who selected a WTO issue as a priority for APEC leaders' discussions since 2007.¹⁰ When PECC began its survey of regional stakeholders in 2007, 48 percent selected *"The WTO Doha Development Round"* as a top 5 priority for Leaders, but over time, any option that mentioned the WTO declined in importance. In last year's survey, only 11 percent thought that *"Building political support on key issues for the WTO Ministerial"* should be a priority. As the survey results demonstrate, over time the Asia-Pacific policy community had become much more focused on regional trade deals and the growth strategy. However, recent events have clearly had an impact on views. Moreover, it is more than likely that stakeholders, at least those surveyed by PECC, equated the value of the WTO with its negotiating function and took for granted the existence of the rules, disciplines, and dispute resolution mechanisms associated with the institution.

The future of the WTO and the multilateral trading system is discussed in more detail below. A critical part of the regional narrative in recent years has been how to best address the emergence of anti-globalization and anti-trade sentiments. A core element of this had been efforts to promote growth that is more equitable or inclusive.

Figure 1.12: WTO and Multilateral Trading System as a priority for APEC leaders' discussions



Source: PECC State of the Region Surveys 2007-2018

¹⁰ The specific language has varied from year to year, The WTO Doha Round in 2007, 2008, 2010, 2011, 2012, 2013, 2014, 2015, Restarting the Doha Process in 2009, The WTO Bali Package in 2016, Building political support on key issues for the WTO Ministerial in 2017, and Rising trade tensions and the future of the WTO and multilateral trading system in 2018

PROGRESS TOWARDS THE BOGOR GOALS AND THE FREE TRADE AREA OF THE ASIA-PACIFIC (FTAAP)

The Bogor Goals have helped to drive APEC work since they were first adopted in 1994. With the deadline for the achievement of ‘free and open trade in the Asia-Pacific by 2020’ fast approaching, efforts are underway to consider what the future vision for APEC should be. The survey results reveal strong support for APEC focusing its trade policy work on achieving an FTAAP with 77 percent agreeing and only 4 percent disagreeing. This is in spite of an overall negative assessment of the political environment for freer trade in the Asia-Pacific. This underscores the importance of seeing the FTAAP as a long-term goal that will require substantial activities, preferably led by APEC, to ensure that all regional economies can effectively participate in and benefit from deeper regional economic integration.

Another dimension to this discussion is whether APEC’s work is overly focused on trade policy. Over 56 percent of respondents to PECC’s annual survey agreed with the proposition that ‘APEC should put less emphasis on free trade and more on broad economic growth, infrastructure, and jobs.’ (See discussion below on the *Need for a Broader Approach to Economic Integration?*) While that is less than the total percentage of respondents who thought that APEC should focus its trade work on FTAAP, the two statements are not mutually exclusive. Indeed, many argue that the idea of the Bogor Goals and the FTAAP is not that they are ends in themselves but simply the best, most effective means to the broader aim of a more prosperous and equitable region.

RISING TRADE TENSIONS AND THE FUTURE OF THE WTO AND MULTILATERAL TRADING SYSTEM

While stakeholders may now be sufficiently concerned to put the WTO as a priority, the critical question is what role can regional institutions play? In its report to APEC leaders in 2017, business stakeholders as represented by the APEC Business Advisory Council (ABAC) made two recommendations on the multilateral trading system:

- Work constructively, creatively and with determination towards securing robust and meaningful outcomes at the 11th WTO Ministerial Meeting.
- Support plurilateral efforts to liberalize trade in a way that complements and supports efforts towards global liberalization under the WTO.

After the 11th WTO Ministerial in December, while welcoming the ministerial decisions and informal work programs on ecommerce and micro and small and medium enterprises, ABAC’s letter to APEC Trade Ministers expressed disappointment that more ambitious outcomes were not able to be agreed in those areas, and that agreement could not be reached on fisheries and agriculture negotiations. Furthermore, ABAC emphasized that “the integrity of the global rules-based WTO trading system, including its dispute settlement mechanism and economies’ concessions and obligations, must be fully respected.” The B20, a similar business grouping that formulates recommendations to G20 leaders has stated that it is more “imperative than ever to strengthen the WTO, its rules, its monitoring instruments, and its dispute settlement mechanism.”

WHY THE NEED TO STRENGTHEN TRADE RULES?

As shown in Figure 1.8, regional economies (and indeed all economies) have been implementing a variety of measures that restrict trade. Whether they are within the WTO rules or not is immaterial to the broader economic argument that trade restrictions are bad for growth. Some (subsidies in one economy, for example) generate others (tariffs, quotas, or countervailing duties in others). Even 7 years ago there were calls for updating trade rules considering the changes that had taken place in global commerce, with former WTO Director General, Michael Moore saying “it’s not much of a stretch to say that in the modern economy, many products are no longer made in a single economy but rather, are made in the world. Our trading system needs to reflect that reality.”¹¹ The failure to make any progress on the Doha Round led, among

other factors, to economies seeking ways to update trade rules through bilateral and regional agreements – such as the ASEAN Plus agreements, and the TransPacific Partnership to name just two. While the WTO has begun some substantial work through its work program on ecommerce, much more needs to be done. Given the enormous technological changes that are changing business models, trade rules are badly out of synch with commercial reality. This could be addressed through more flexible approaches to rule making. One way forward could be to make better use of dialogues that promote greater understanding of the rules developed outside of the WTO framework. Such dialogues take place within APEC on the WTO plus elements of regional trade agreements.

¹¹ Michael Moore, former Director General of the WTO, 20th PECC General Meeting: https://www.eastwestcenter.org/sites/default/files/filemanager/PECC_20_GM/pecc20.session2.final.pdf

Dispute Settlement at Risk

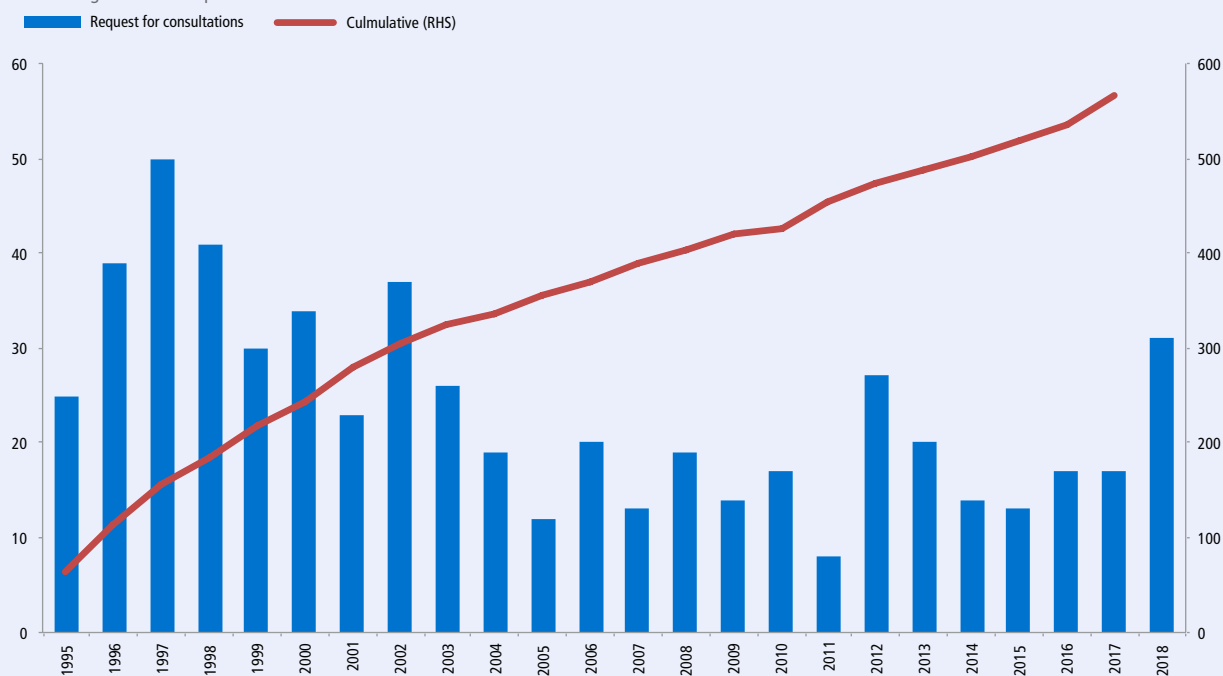
While there are tentative signs of progress on a limited set of issues, a more urgent and pressing concern is what will happen to the dispute settlement mechanism. Since 1995, over 500 disputes have been brought to the WTO, initiated by 50 members, in relation to 20 WTO agreements. Some of them have been resolved by mutual agreement by the parties involved, others required formal rulings. This indicates a widespread appreciation of the ability of the system to deal with disputes.

In practice the Dispute Settlement Body is composed of all members of the WTO which then establishes panels of experts

to consider the case, and to accept or reject the panel's findings or the results of an appeal. Panel members are usually selected in consultation with the parties to the dispute and if they cannot agree, the WTO director-general appoints them.

The process of a dispute settlement at the WTO takes around 1.25 years to complete and has not been without its critics. At the initiative of former WTO Director-General Pascal Lamy, former Deputy Director-General Alejandro Jara initiated in 2010 a process of informal consultations to find ways to make the process more efficient in line with existing rules. This process has been continued to "engage with Delegations to gather views ... on improving the functioning of the system further."

Cases Brought the WTO Dispute Settlement Mechanism



Source: https://www.wto.org/english/tratop_e/dispu_e/dispustats_e.htm#more_numbers

A Year Left to Save the System

In recent years there has been an impasse on agreement to new members, there are currently only 3 members of the Appellate Body and agreement on new appointments has been blocked by the United States. This is the very minimum for any decisions to be made as the Appellate Body establishes small group of 3 members to hear an appeal. By the end of 2019 the terms of 2 of the 3 remaining Appellate Body members will have completed their terms. This leaves the system vulnerable to collapse especially as more and more panel decisions are being appealed. Some suggestions for reform include:¹²

- Making the Appellate Body a full-time assignment
- Expanding the Appellate Body Secretariat to provide law clerks for individual Appellate Body Members
- Requiring the Appellate Body Members to undertake some form of continuing education while in office.
- Increase the number of appellate body members from seven to nine
- Single but longer terms for members of the Appellate bodies
- Enforcement of the 90-day rule on appeals
- Stricter interpretation of the transition rule which allows a member to complete an appeal

¹² See USTR 2018 Trade Policy Agenda at: <https://ustr.gov/about-us/policy-offices/press-office/reports-and-publications/2018/2018-trade-policy-agenda-and-2017> and <https://www.bloomberg.com/news/articles/2018-07-13/eu-mulls-changes-to-wto-rules-to-appease-u-s-as-trade-war-looms>

There are other larger systemic concerns that have been expressed on judicial over-reach and infringements of domestic jurisdiction that cannot be simply resolved with changes such as those suggested above,¹³ but the avoidance of a total collapse of the dispute settlement system should be considered an imperative for any economy engaged in trade. So far participation in discussions has been limited to those who understand the intricacies of the WTO process, and it is critical for a dialogue on the importance of the WTO Dispute Settlement Mechanism to engage stakeholders from business, labor and beyond.¹⁴

As far as the Asia-Pacific is concerned, support for the multilateral trading system has been a core objective for APEC

since its foundation. Indeed, in trying to forge a consensus on language in support of the WTO, APEC leaders in Danang in 2017 committed “to work together to improve the functioning of the WTO, including its negotiating, monitoring, and dispute settlement functions, to adequately address challenges facing the system, bringing benefits to all of our people and businesses. We will work to ensure the effective and timely enforcement of the WTO rules.” APEC’s non-binding dialogue nature as well as its strong tradition of stakeholder engagement makes it an ideal forum for constructive engagement on this issue. Critical to any forward momentum and successful outcome will be the active engagement of the stakeholders who ultimately are impacted by any decisions emanating from the WTO.

IMPACT OF THE TRADE WAR ON ECONOMIC GROWTH

In January 2018, the US government announced that it would apply a 30 percent tariff on solar panels. This was followed by the imposition of tariffs on steel and aluminum products in February and then 25 percent tariffs on approximately \$50 billion imports to the US from China in June. In turn several economies announced retaliatory measures in response, for example, April 2, 2018 China increased by 15-25 per cent its tariffs on 128 import products from the US, including fruit, wine, pork products and stainless steel.

While warning that these measures could derail the recovery, the IMF notes that *‘the direct contractionary effects of recently announced and anticipated trade measures are expected to be small, as these measures affect only a very small share of global trade so far. The baseline forecast also assumes limited spillovers to market sentiment, even if escalating trade tensions are an important downside risk.’* In the IMF’s worst-case scenario, global output would be reduced by 0.5 percent in the first year and then 0.4 percent in the second year. That scenario assumes a ratcheting up of tariffs from the US and symmetrical responses from trading partners as well as a shock to global confidence. Other estimates range from a 0.3 percentage point loss by the World Bank to a 2.9 percent loss estimated by the Australian Productivity Commission, while work by Dr Ken Kawasaki at the National Graduate Institute for Policy Studies in Japan shows a drop in baseline global GDP

of 2.3 percent. Work by the Bank of England estimates a loss to baseline GDP of 1 percent through the trade channel alone and an additional loss through tighter financial conditions and increased uncertainty.¹⁵ Earlier work by the Economist Intelligence Unit in 2006 suggest that a reversal of globalization would reduce annual global growth rates from 3.3 percent to just 1.3 percent.

All of these estimates use different modeling techniques but they all tend to reach the same conclusion – that an escalating trade war would have a negative overall impact on the global economy, with some economies significantly more exposed than others.¹⁶ Figure 1.13 sets out a baseline as well as scenarios based on other research on the possible impact of a trade war.

As shown in Figure 1.13, the impact of a trade war would reduce global economic growth rates to between 1 to 2.5 percent. That those growth levels would barely lift global per capita incomes is bad enough, but it is the distributive impact of such a slowdown in growth that is of central concern. Perhaps most importantly no economy comes out of a trade war unscathed – a ‘lose-lose’ situation.

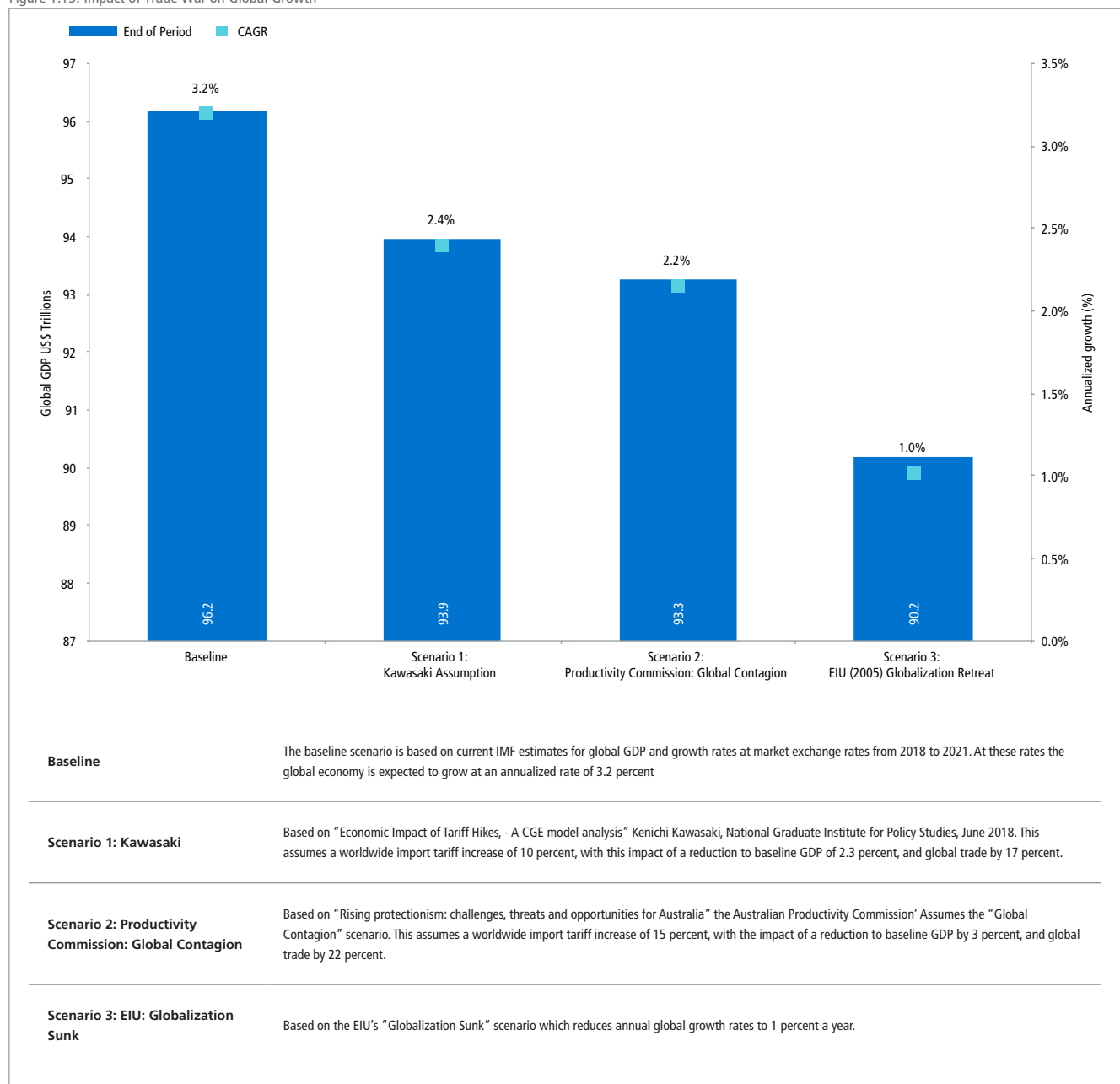
¹³ See Merit Janow Reflections on Serving on the Appellate Body, 6 Loy. U. Chi. Int’l L. Rev.249 (2008). Available at: <https://lawcommons.luc.edu/lucilr/vol6/iss1/6> for a discussion on the Appellate Body

¹⁴ At the time of writing, Trade Ministers are scheduled to meet in Ottawa to discuss proposals for WTO reform, see: <https://www.bloomberg.com/news/articles/2018-09-11/canada-proposes-new-alliance-to-reform-world-trade-organization>

¹⁵ From Protectionism to Prosperity, Mark Carney, Governor of the Bank of England, 5 July 2018 <https://www.bankofengland.co.uk/-/media/boe/files/speech/2018/from-protectionism-to-prosperity-speech-by-mark-carney.pdf?la=en&hash=49A74832C30C95D5284088BA0D0DB7EA0B2E91F2>

¹⁶ “Economic Impact of Tariff Hikes - A CGE model analysis”, Kenichi Kawasaki, June 2018, National Graduate Institute for Policy Studies (GRIPS), https://grips.repo.nii.ac.jp/?action=pages_view_main&active_action=repository_view_main_item_detail&item_id=1628&item_no=1&page_id=13&block_id=24

Figure 1.13: Impact of Trade War on Global Growth



Source: Data from the IMF WEO April 2018 database. Based on current IMF estimates for global GDP and growth rates at market exchange rates from 2018 to 2021. Scenarios based on the following: "Economic Impact of Tariff Hikes - A CGE model analysis", Kenichi Kawasaki, June 2018, National Graduate Institute for Policy Studies (GRIPS) "Rising protectionism: challenges, threats and opportunities for Australia", Productivity Commission, July 2017: <https://www.pc.gov.au/research/completed/rising-protectionism/rising-protectionism.pdf> "Foresight 2020 Economic, industry and corporate trends", Economist Intelligence Unit, 2006, http://graphics.eiu.com/files/ad_pdfs/eiuForesight2020_WP.pdf

IMPACT OF TRADE WARS WITHIN ECONOMIES

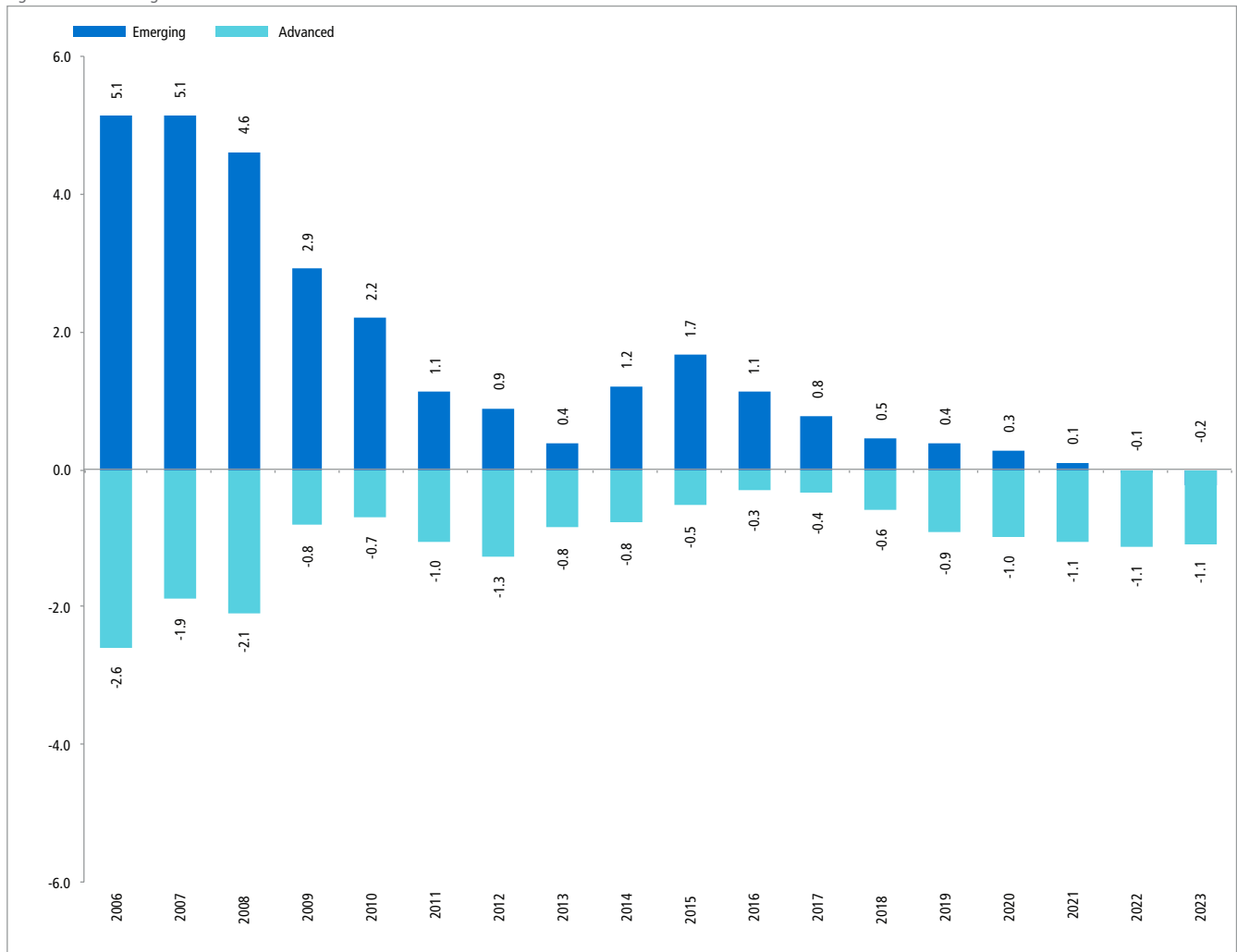
The more detailed breakdowns of the distributive impacts of a trade war make for an even more somber reading. The Australian Productivity Commission's study shows that both workers and capital owners would be worse off, with wages estimated to fall by 2.5 per cent. Nearly 80 per cent of households would face lower living standards, a household that spends A\$2500 a fortnight on goods and services would be worse off by A\$100 a fortnight.

At the sectoral level, analysis suggests that the anticipated impact of tariff increases also vary by sector. They would decrease trade in machinery and equipment including motor vehicles and parts by about 3.5 per cent and about 1.2 percent on agriculture, forestry and fisheries.¹⁷

PROGRESS ON THE APEC GROWTH STRATEGY

The APEC Growth Strategy was part of APEC's response to the changes brought about by the Global Financial Crisis. The strategy, adopted in 2010, seeks to promote growth that is more balanced, inclusive, sustainable, innovative and secure in the region. Since its adoption it has continually featured as a top priority for APEC leaders' discussions in PECC's annual survey. This survey finding underlines the importance of a broader approach to regional economic policy beyond traditional trade and market access issues.

Figure 1.14: Narrowing Current Account Balances



Source: IMF World Economic Outlook

¹⁷ Ibid

NEED FOR A BROADER APPROACH TO ECONOMIC INTEGRATION

Underlying the tensions in trade are deeper structural issues within economies. While much attention is focused on trade policy, significantly less has been paid to structural reforms. These reforms have significantly changed the internal structure of growth within regional economies, reducing the current account surpluses and deficits in the region. This should have reduced trade tensions.

While trade growth remains positive, current account imbalances remain largely in check and some considerable distance from the peaks they reached in 2006. For example, in 2006 the US current account deficit reached a high of 6 percent of GDP while China's surplus reached a high of 10 percent the following year. Since then, the US current account deficit has stabilized at between 2.5 to 3.5 percent of GDP while China's surplus has shrunk to between 1.5 to 2.5 percent of GDP. While other economies in the region run relatively large current account surpluses as a percentage of GDP, in relative terms their impact on the overall structure of the regional economy is limited. As shown in Figure 1.14, while advanced economy current account deficits are expected to remain stable for the foreseeable future, emerging economy surpluses are likely to be much reduced, indicative of the important internal structural changes taking place.

In 2005, the predecessor to this report, the Pacific Economic Outlook, commenting on the imbalances warned that *"the region continues to be characterized by an acute imbalance in trade and financial flows"* and that *"there is a growing risk of conflict between Washington and Asian trading partners."*¹⁸ Given the general lack of attention to the domestic dimensions, it needs to be reiterated

that *"current account imbalances reflect private economic decisions to save and invest and are no economic problem in themselves... however, from past experience, risk generating negative political reactions in deficit economies."*¹⁹ This was an issue that the PECC discussed at great lengths especially in the lead up to the Global Financial Crisis. At its General Meeting in 2006, in considering whether the imbalances were *'a disaster in the making'* several important points arose:

- The problem is in the structural policy fields, competitiveness market field, openness market field, regional market field, and labor market field;
- Focusing only on one dimension will prejudice our recommendations;
- What is needed is simultaneous and coordinated policy adjustments;
- It should be policy cooperation instead of policy coordination because you cannot deliver coordination. Policy cooperation means that there is a dialogue in the right fora, and that there is greater understanding of each other; and
- The root of the problem lies in the international financial architecture.²⁰

While re-emphasizing that imbalances are far from the levels they had been in 2006, those earlier warnings had not been heeded and the world went through a devastating crisis. These recommendations are essential as part of a grand bargain to avoid further escalation in the trade war.

¹⁸ Yuen Pau Woo, Pacific Economic Outlook, Pacific Economic Cooperation Council, 2005

¹⁹ Ross Garnaut, Pacific Economic Outlook, Pacific Economic Cooperation Council, 2001

²⁰ PECC General Meeting 2005, Plenary Session IV: The Trans-Pacific Imbalance: a Disaster in the Making?, Wendy Dobson, Professor, University of Toronto; Fred Bergsten, Director, Institute for International Economics; Park Yung Chul, Professor, Graduate School of International Studies, Seoul National University; Edward K.Y. Chen, President, Lingnan University; Jacob Frenkel, Vice Chairman, American International Group, Inc.

STRUCTURAL REFORM

APEC has a long tradition of promoting structural reforms. In 2004, APEC Leaders adopted the Leaders' Agenda to Implement Structural Reform, in 2010 they endorsed the APEC New Strategy for Structural Reform and in 2015 APEC Ministers endorsed a Renewed APEC Agenda for Structural Reform (RAASR) to guide APEC's work on structural reform until 2020. The aim of RAASR is two-fold:

- to reduce inequality and stimulate growth in APEC economies, and
- to contribute to APEC's overarching goal to promote balanced, inclusive, sustainable, innovative and secure growth, through measures in line with the following three pillars:
 - o Pillar One: more open, well-functioning, transparent and competitive markets;
 - o Pillar Two: deeper participation in those markets by all segments of society, including MSMEs, women, youth, older workers and people with disabilities;
 - o Pillar Three: sustainable social policies that promote the above-mentioned objectives, enhance economic resiliency, and are well-targeted, effective and non discriminatory.

Figure 1.15 shows the priorities that APEC economies submitted in their individual action plans under the RAASR. Collectively, the 21 economies gave updates on 80 priorities and 172 related actions. Categorizing these priorities into the three pillars of RAASR showed

that 66 percent pertain to pillar #1 – more open, well- functioning, transparent and competitive markets. 46 percent pertain to pillar #2 – deeper participation in those markets by all segments of society, including MSMEs, women, youth, older workers, and people with disabilities, while 34 percent pertain to pillar #3 – sustainable social policies that promote the above-mentioned objectives, enhance economic resilience, and are well-targeted, effective, and nondiscriminatory.

While APEC's current structural reform work covers critical areas, according to the Mid-Term Review of Progress on RAASR conducted by the APEC Policy Support Unit:

- APEC economies need to redouble their efforts towards improving business regulations and facilitating business conduct.
- APEC performed well in enhancing innovation and productivity, and should continue to strengthen these areas.
- APEC could increase efforts towards boosting the competitiveness of its labor and financial markets, paying attention to certain gaps in specific areas.
- APEC could step up measures aimed at strengthening access to basic services & infrastructure and enhancing fiscal & social policies.
- APEC could do more to deepen the participation of wider segments of society in its markets, particularly on youth employment.

Figure 1.15: Priorities for APEC Economies Under RASSR (Mid-Term Review)

	Pillar One: More open, well-functioning, transparent and competitive markets	Pillar Two: Deeper participation in those markets by all segments of society	Pillar Three: Sustainable social policies that promote the above-mentioned objectives, enhance economic resiliency, and are well-targeted, effective and non discriminatory
Australia	3	3	3
Brunei Darussalam	2	1	1
Canada	3	2	2
Chile	0	1	2
China	2	1	1
Hong Kong, China	4	3	1
Indonesia	1	1	1
Japan	5	3	5
Korea	1	2	1
Malaysia	1	2	0
Mexico	1	0	0
New Zealand	4	3	1
Papua New Guinea	2	2	1
Peru	2	0	0
The Philippines	4	1	1
Russia	3	3	2
Singapore	2	0	0
Chinese Taipei	2	3	0
Thailand	1	1	0
United States	5	4	4
Viet Nam	5	1	1
Share of Total (%)	66.3	46.3	33.8

Source: APEC PSU (2018). Renewed APEC Agenda for Structural Reform (RAASR) - Mid-Term Review Report.
Retrieved from: <https://www.apec.org/Publications/2018/08/RAASR-Mid-Term-Review-Report>.

1. ASIA-PACIFIC ECONOMIC OUTLOOK

Figure 1.16 to Figure 1.19 show that there have been significant shifts in the pattern of demand within regional economies since the Global Financial Crisis. Consumption and investment as a share of GDP have been on the rise in most regional emerging economies, while net exports have decreased in importance. This has largely been in line with the thinking that drove post-crisis recovery strategies and the desire to avoid a re-emergence of the imbalanced growth that characterized the pre-crisis period. These changes have differed depending on the structure of the economy. These charts only take two specific points in time – 2007 the year before the crisis struck and 2017 (or the 2016 depending on data availability).

The headline numbers mask some important underlying factors that potentially distort broader trends, for example the impact of changes in commodity prices on government expenditures and programs dependent on them as well as the impact this has on net exports. Generally, domestic demand expansion has been driving growth in recent years. This is especially true for the region's emerging economies. For example, consumption among Asia-Pacific emerging economies has been growing at annualized rates of 6.3 percent compared to just 1.5 percent for more advanced economies.

Figure 1.16: Estimated change in Consumption Expenditure as a Share of GDP since 2007

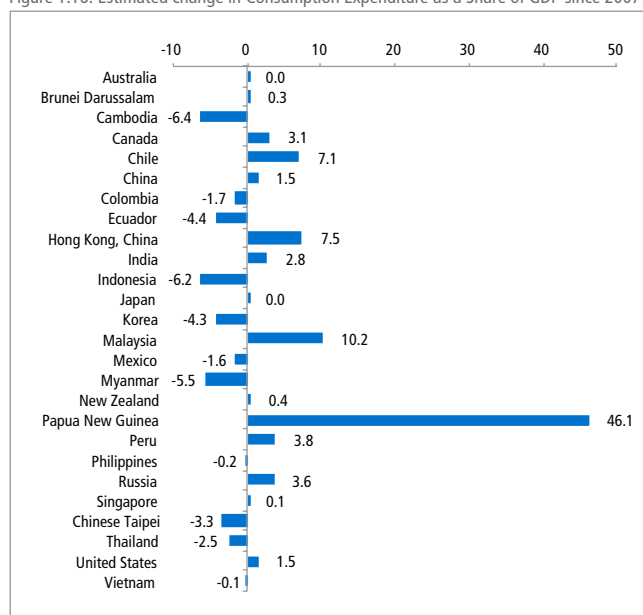


Figure 1.17: Estimated change in Investment Expenditure as a Share of GDP since 2007

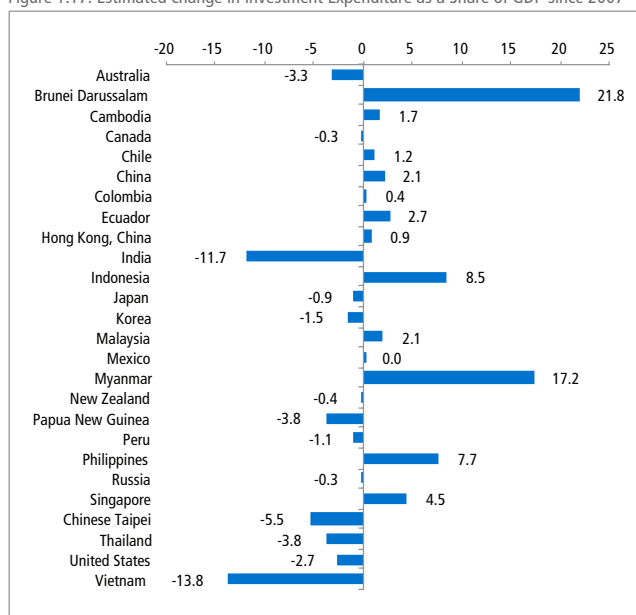


Figure 1.18: Estimated change in Government Expenditure as a Share of GDP since 2007

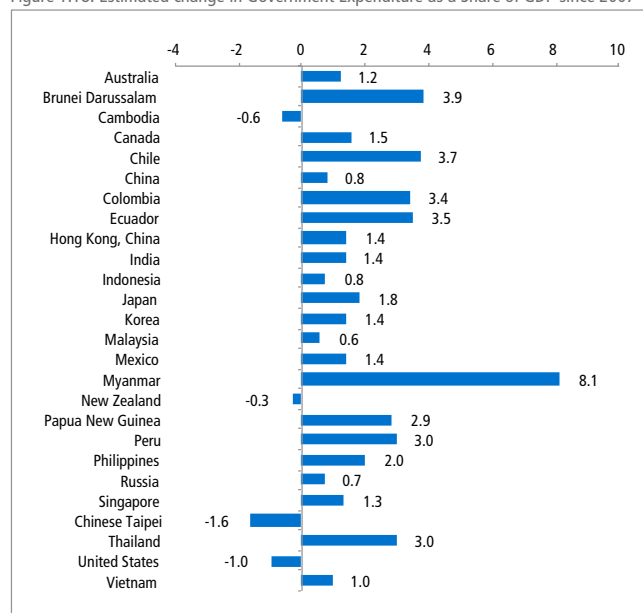
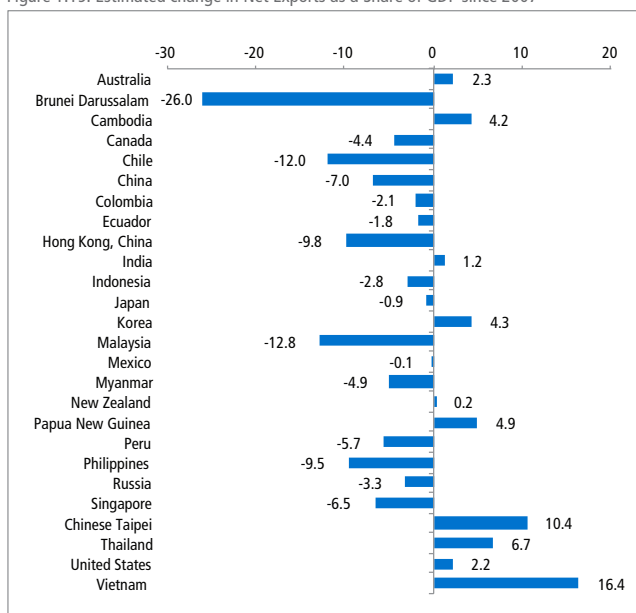


Figure 1.19: Estimated change in Net Exports as a Share of GDP since 2007



Source: <https://unstats.un.org/> and <https://eng.stat.gov.tw/>; World Bank World Development Indicators

Put in US\$ terms, household consumption in the region's emerging markets has increased by around US\$3.7 trillion since 2007. For the region's advanced economies it has increased by US\$2.2 trillion. As incomes grow in the emerging Asia-Pacific this trend is likely to continue and middle-class consumption become more prevalent. There is a long way to go in this trend. Among the region's advanced economies, per capita consumption is about US\$30,000 (measured at 2010 US dollars). Among the region's emerging economies it is less than a tenth at about US\$2,400. If cost of living were taken into account the picture would look slightly more even but the fundamental point that middle class consumption is likely to be a strong driver of growth for the region's emerging economies remains.

That change in consumption patterns is deeply related to one of the underlying structural features of the region - high savings rates among Asian economies. While both Japan and the United States are considered as high-income advanced economies, Japan's gross national savings averaged 29 percent of GDP over the past quarter of a century while the United States has been at 18 percent. At the same time, Japan's investment to GDP ratio has been around 27 percent while the US has been at 21 percent. Further work done by PECC in the aftermath of the Global Financial Crisis looked at consumption and savings trends across the world and their likely trajectory into the future.²¹ It argued that private consumption growth is determined by trends in GDP growth, household income growth, household saving rates, and household wealth but that the

relative importance of these factors differs greatly from economy to economy. However, as far as savings rates are concerned, the main determinants of the domestic saving rate in developing Asia are the age structure of the population (especially the aged dependency ratio), income levels, and the level of financial development.

CHANGING DEMOGRAPHIC STRUCTURES

By 2030, the population of the Asia-Pacific (broadly defined as the membership of APEC, the East Asia Summit and PECC) is expected to grow to 4.7 billion people. This is a total increase of close to 420 million people. However, this headline number masks some important trends underlying the demographics of the region.

The first big population trend is ageing, the number of persons over the age of 65 is expected to increase by 266 million people, of these, 220 million will be in the region's emerging economies and 45 million in advanced economies.

The second is that the labor force (those aged between 15-65 years' old) is expected to increase by 201 million. Put another way, the region will need to create an additional 201 million new jobs between 2015 to 2030 to prevent mass unemployment.

The third trend is a big decline in school-aged children (those under 15). This cohort is expected to decrease by 48 million.

Figure 1.20: Asia-Pacific Population: 1990

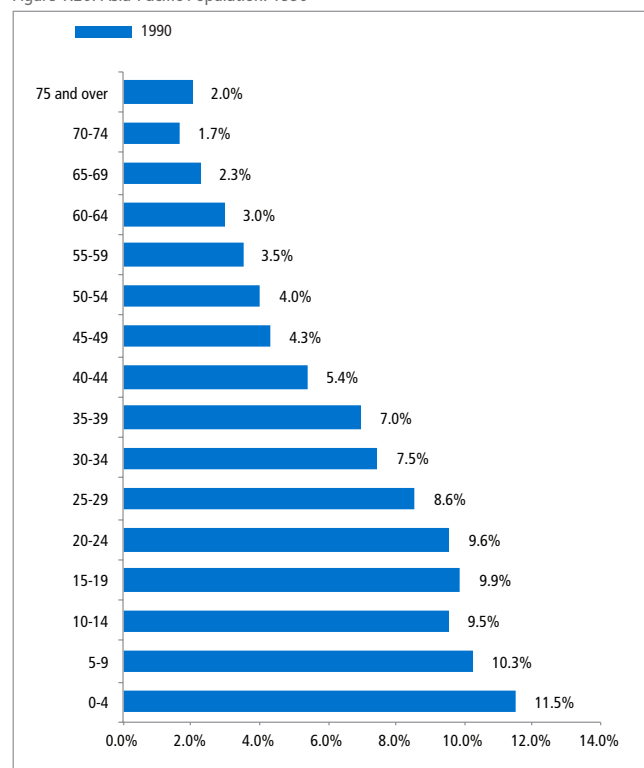
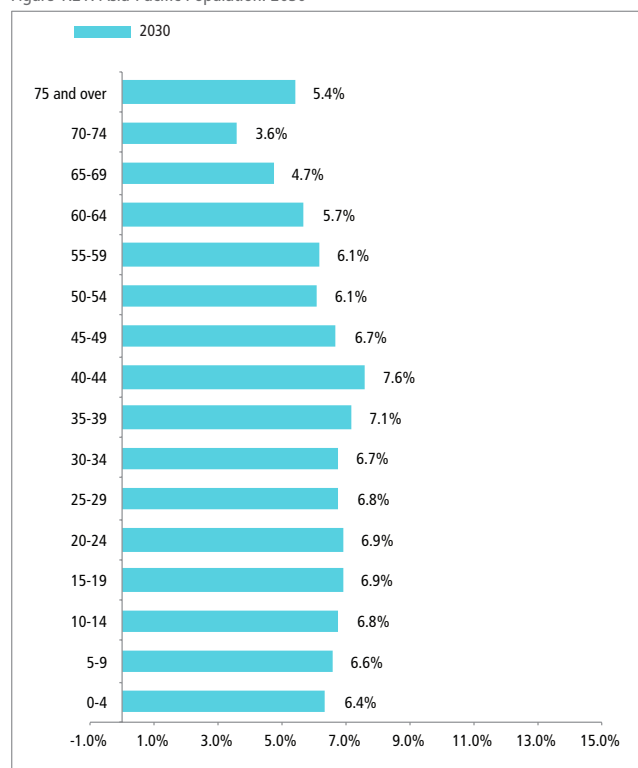


Figure 1.21: Asia-Pacific Population: 2030



Source: United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision, DVD

²¹ Charles Yuji Horioka, 'The Determinants of Saving Rates in the Developed and Developing Economies: The Impact of Social Safety Nets' http://www2.jiia.or.jp/en/pecc/2010/SRpdf/101021_4.pdf and 'Recent Trends in Consumption in Japan and the Other G7 Countries' http://www2.jiia.or.jp/pecc/2011/SRpdf/SR_Report_2011.pdf

INVESTING IN HUMAN CAPITAL IN THE DIGITAL AGE

The challenge that the digital economy brings to human capital development was a major priority for APEC last year resulting in the endorsement of the APEC Framework on Human Resources Development in the Digital Age. The impact of new technology is the focus of the next chapter.

FUTURE SKILLS CRITICAL TO GROWTH

Figure 1.22 shows estimates of where growth in the region has come from since the turn of the millennium. Growth has largely come from increases in total factor productivity; investment in non-ICT capital, and labor quantity. The results vary significantly by individual economy and income levels. Of particular concern given the demographics of the region as well as rapid technological change is the relatively small percentage of growth that has come from the quality of the labor force. This is especially true for the region's emerging economies where quality of labor has contributed significantly less to overall growth.

As populations age it is increasingly likely that labor quantity's contribution to growth for the region's emerging economies will be closer to that of the region's advanced economies. However, it is by no means assured that labor quality will contribute to emerging economies growth in the same way it has for the region's advanced economies given levels of education and rapidly changing technology without a policy intervention.

During the 1990s, as much as a fifth of the growth for the region's emerging economies came from the amount of labor entering into the labor force. That trend for emerging economies continued strongly in the 2000s but slowed this decade. That slowing trend for emerging economies is likely to continue given the rapid ageing of the population. However, a large caveat to this argument is that female participation rates in the labor force remain stubbornly low in the region. As shown in Figure 1.23, the female labor force participation rate is only 54 percent compared to 63 percent among OECD members. In absolute terms for the broad Asia-Pacific, if the female participation rate was the same as the male this would mean an additional 400 million people in the labor force.

Figure 1.22: Growth Accounting in the Asia-Pacific Since 2000

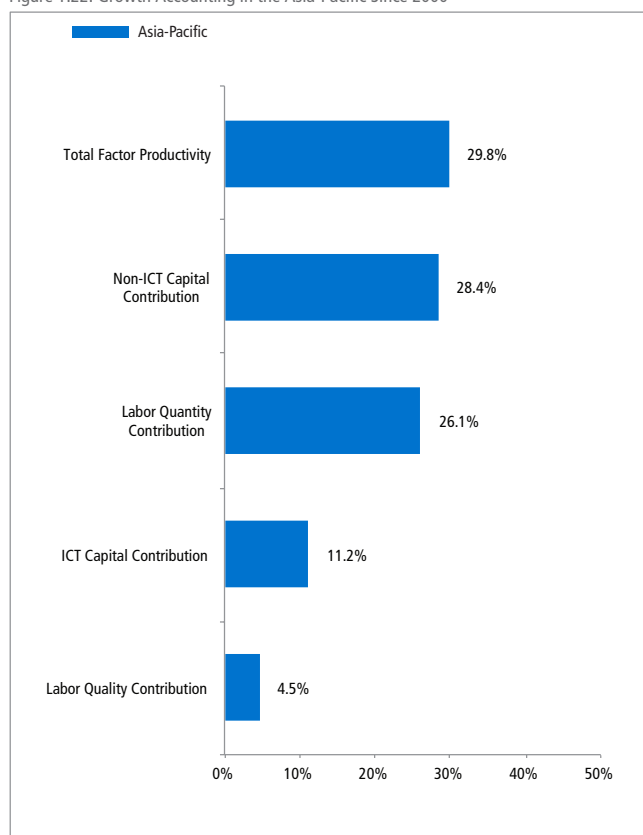
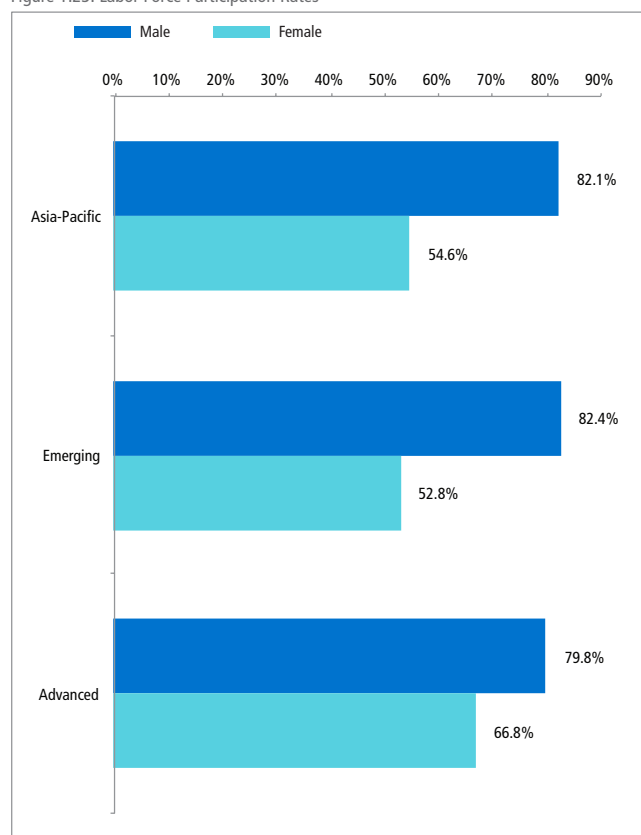


Figure 1.23: Labor Force Participation Rates



While traditional growth accounting looks at labor productivity as a single number, the Conference Board's Total Economy Database breaks down labor into quality and quantity. The quality of labor or labor composition is calculated based on educational attainment. While an imperfect proxy, this methodology provides a useful way to distinguish between the amount of labor in the economy and its quality. Since 2000, the quality of the labor force in the region's advanced economies has contributed around a fifth to growth compared to only 6 percent for emerging economies. Put another way, the region's emerging economies could improve labor productivity by focusing on education and skills.

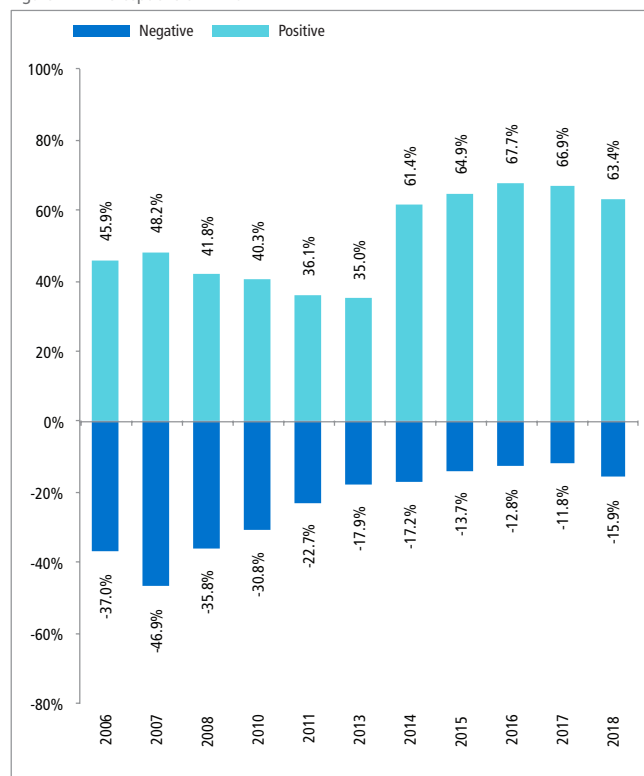
As already noted, the policy community believes human resource development in the digital age should be a top priority for APEC leaders. Much has and will continue to be written about the impact of technological change on regional economies. These changes have been brought about by the rapid changes and adoption of new technologies and their applications across societies ranging from mobile payment systems, online banking and tele-health and online education to ecommerce. The trend that started in the 1990s with the increased penetration of the internet continues. Investment expenditure on information and communication technology (ICT) accounted for about a quarter of the region's growth in the 1990s but dropped to a tenth in the 2010s. This raises the issue of how 'digital' is measured and the extent to

which it is commensurate with ICT. Perhaps of greater concern is that while ICT investments were a fifth of growth for the region's advanced economies, they appear to have been only 7 percent of the region's emerging economies.

FUTURE OF REGIONAL COOPERATION AND INTEGRATION

In spite of concerns over protectionism as a risk to growth and the backlash against trade and globalization in some economies, APEC continues to be seen as an important institution among stakeholders. Indeed, APEC's enduring value may well be its non-binding nature and as an incubator for initiatives that can be taken forward in other processes. As seen in Figure 1.24, the percentage of respondents who had a positive view of APEC over the past ten years has steadily improved from a net approval rating of 1.3 percent in 2007 to around 50 percent over the past 4 years. The positive view of APEC is broadly shared across the region with the highest positives amongst North American respondents (Figure 1.25). Tracking perceptions over time shows the most improvement in perceptions of APEC among North American and Southeast Asian respondents. Negative assessments have fallen sharply since the Global Financial Crisis, perhaps a reflection of reduced and more realistic expectations of APEC as an institution.

Figure 1.24: Perceptions of APEC



Source: PECC State of the Region Surveys (2006-2018)

Figure 1.25: Is APEC still as important as it used to be?



Source: PECC State of the Region Survey 2018

1. ASIA-PACIFIC ECONOMIC OUTLOOK

While there was broad support for the idea that APEC should expand its membership with 47 percent agreeing and 21 percent disagreeing, only 13 percent thought that this should be a priority concern at this point in time. As discussed earlier in this section, while a clear majority of respondents thought that APEC's work on trade should focus on achieving an FTAAP, the negative assessment of the political environment for freer trade and investment provides a reality check. This should not mean that regional economic integration initiatives should stop; indeed, they provide important forward momentum at a time when barriers to trade are being raised unilaterally. APEC and other regional mechanisms can

provide a platform for constructive engagement on issues where significant gaps on understanding remain.

As much as trade issues dominated concerns from stakeholders in this year's survey, it is also clear that the impact of technological change is likely to be at the forefront of concerns over the coming years. Those issues should be seen as a part of a broader set of economic policy issues that require cooperation if not coordination. Those issues form the suite of structural policies that require a much clearer focus.

CHAPTER 02 THE FUTURE OF JOBS AND SKILLS

CONTRIBUTED BY PROFESSOR KOSTAS MAVROMARAS, DIRECTOR, FUTURE OF EMPLOYMENT AND SKILLS RESEARCH CENTRE, UNIVERSITY OF ADELAIDE

Technology has been the driver of much of humankind's material development in the recent and distant past and is continuing unabated, some would say accelerated, in this driving role today, through the Fourth Industrial Revolution. As new opportunities and potential benefits continue to emerge at pace, they are intensely debated, not only for their core wealth creating content and the almost boundless horizons they appear to be opening up for humanity, but also because of the uncertainty that surrounds them and the speed and depth at which they bring change. The amazement for its potential is accompanied by a fair measure of human reticence, so much so that the word "*disruption*" is used to portray the change that technology brings. Disruption is a word that comes with synonyms such as "*disturbance, disordering, disarrangement, disarranging, interference, upset, upsetting, unsettling, confusion, confusing*" and it is usually reserved for change that is more associated with difficulties rather than with benefits. In view of the stunning innovations we are experiencing, matched by an equally stunning frequency and continuity of appearance, any reticence felt about the technological change the Fourth Industrial Revolution brings would sound unjustified and possibly misplaced.

However, there is one aspect of the Fourth Industrial Revolution where future events may show that such reticence was justified, if not under-estimated, namely, the impact of technology on work, an activity that humans have historically identified themselves with. There is already sufficient evidence showing that automation and artificial intelligence are changing fundamentally the way we work within our economies and the way our economies perceive and value our work. The anticipated loss of jobs in numbers and the anticipated changes in the nature of work is already the subject of an extensive literature, the predictions of which are almost as diverse as their initial assumptions. Whilst it is not possible to foretell what the long-term impact of technology on work will be (at least not without using the right crystal ball), it is almost certain that in the short- and medium-run we are bound to see much change which will require policy interventions of a preventive and corrective nature.

This chapter is an examination of the future of work in the Asia-Pacific region. The general context we use is based on the emerging rich but in many of its aspects still inconclusive literature on the impact of technology on work and our Asia-Pacific region focus

is made feasible by the latest 2018 PECC survey with its thematic focus on work and technology. It addresses several questions that are already asked by many people, governments and businesses, such as, (i) how is the Fourth Industrial Revolution changing the nature of work, (ii) what kinds of old jobs will disappear and what kind of and where will new jobs be created, (iii) how do economies of the region acquire the right skills for these new jobs, and (iv) what will happen to those who lose their jobs?

There is a strong view that, in order to enjoy the full benefits of new technologies, we will need capable institutions to develop appropriate new policies. These latter include first, education and training policies to build new skills, second, a labor market policy to enable the efficient utilization of these skills and third, a social care/security policy to protect those who are left behind and to preserve the social cohesion and ethical foundations of our societies as change creates many new winners and losers. These general policy objectives will need to reflect and respect the economic diversity and inter-dependence of the region's economies.

Technologies such as automation, artificial intelligence, cloud computing, 3D printing, blockchain and others, lead to better and cheaper ways to do things, but they also usually make some jobs obsolete. These technologies can be usefully differentiated by the balance between the productivity gains they achieve and the individual and social losses that worker displacement causes. It is not only the level of productivity gains and the extent of displacement that matter, but also how these are distributed, their timing and their longer term economic and social impacts.

Historically, new technologies have brought large net material gains and changed many lives and livelihoods. In the process, many workers lost their jobs, experienced lower lifetime income and in many instances completely changed the direction or even ended their working lives. Also, historically, technological change has in many instances created rather mixed outcomes with winners and losers, where losses often remained uncompensated. That is, losses suffered by displaced workers and specific communities that were not compensated by those other workers and communities that gained from the new technology. The overall impacts from past industrial revolutions (that is, both gains and losses) often took long to be realized and the benefits and losses were often unequally distributed.

BOX 1 SOCIETAL IMPACT OF ARTIFICIAL INTELLIGENCE: OPPORTUNITIES AND CHALLENGES OF A TECH-CENTRIC FUTURE OF WORK

Contributed by Professor Jiro Kokuryo, Keio University and Professor Kar Yan Tam, Hong Kong University of Science and Technology on behalf of the Association of Pacific Rim Universities¹

Amid the on-going debate over how artificial intelligence (AI) and the broader technological changes taking place – often referred to as the 4th Industrial Revolution - will affect society and impact the future of work in the Asia Pacific region, the Association of Pacific Rim Universities (APRU) has been bringing together scholars and industry experts across two research projects to analyze and address the affiliated economic risks and reservations.

If governed adequately, AI has the potential to benefit humankind enormously. However, if mismanaged, it also has the potential to harm society. The project *“AI for Everyone: Benefitting from and building trust in the technology”*, led by Professor Jiro Kokuryo from Keio University and Professor Toby Walsh from UNSW Sydney, explores the possible implication of societal challenges such as;

- Fear of *“black box”* machines manipulating human society
- Recognition that AI may be put to unethical use and that some restraining arrangements are necessary
- Risk of inference attack on privacy
- Fear that AI may deepen the gap between the rich and the poor.

The project title reflects the belief that *“access to the benefits of AI, awareness about the nature of the technology, governance of the technology and its development process with a focus on responsible development, should be transparent, open, understood by and accessible to all people regardless of their geographic, generational, economic, cultural and/or other social background.”* The project features 12 papers and policy insights from leading researchers from the Asia Pacific offering analysis and solutions to a range of topics:

- How development of Artificial intelligence technology will cause changes in crime and criminal law
- Flesh-and-Blood, Corporate, Robotic? Moral Agents of Restraint and the Problem of Misplaced Responsibility in War
- Best Bot Friend (BBF): The Emotional and Social Implications of Socializing with an AI
- The Dialectics of Individuality: Modernity, Panopticon, and Dataism
- Designing Theory-Driven Use-Centric Explainable AI: A Medical Diagnostics Example
- Political Bot Detection on Social Networks

- Explaining Decisions of Black-box AI Models
- AI Education for Everyone: How to Integrate Future Labor Force into Digital Frontier?
- Analyzing Privacy of Deep Learning in Adversarial Settings
- How weak has been weak Artificial Intelligence? The unseen societal consequences of machine learning
- Federated Transfer Learning: Privacy-preserving AI for Everyone
- Toward a Certification Framework for Trustworthy AI Systems

The project, hosted by the Hong Kong University of Science and Technology (HKUST) and led by Professor Kar Yan Tam, Dean of HKUST Business School analyzes the impact of AI and automation on the ‘Transformation of Work in Asia-Pacific in the 21st Century’. Leading experts across the region have collaborated on a study exploring background, opportunities and challenges of technological development on the future of work that are feeding into a set of policy recommendations. According to Professor Kar Yan Tam *“AI and automation will transform the future of work. This project has offered a unique forum for open discussions offering the opportunity to share insights with regional governments, business and non-profit organizations in relation to AI and its impact on the future of work”*.

Loss of jobs has been one of the primary concerns voiced at artificial intelligence. While fear of job loss is nothing new in the interaction between technology and society, AI’s flexibility in performing highly contextual work adds a whole new dimension to the problem.

IBM’s introduction of System/360, the first mainframe computer, in 1964 initiated the modern age of computing, ushering in rapid advances in digital communication and transforming the way we interact with information. Now, we are on the cusp of the Fourth Industrial Revolution, which will revolutionize the very fabric of modern life at an unprecedented scale and speed. With the development of the *“Internet of Things,”* a network of Internet-connected objects able to collect and exchange data using embedded sensors, there is more personal data in the hands of corporations than ever before. Combined with intelligent machinery, advanced robotics, and global interconnectivity via personal electronic devices, the controllers of this data are able to predict and influence every segment of our society, from economics and politics to our private lives.

Driverless cars, remote work arrangements, fully automated factories, and managerless companies are no longer ludicrous ideas of the far future.

Occupations and industries have grown and contracted over time. The third industrial revolution has encouraged the rapid expansion of more complex jobs for which there is demand for higher education skills, but many routine jobs remain. Routine jobs attract less earnings over time, so that pay inequality has become a feature of contemporary economies. However, the growth of high-skilled, non-routine jobs plateaued in the fourth industrial revolution leading to anxiety about the future. Much future-oriented analysis has been based on the experience of Western economies, however, that analysis often downplays significant variations in those experiences.

Economist John Maynard Keynes in 1930, writing in 1930, warned that *“the increase of technical efficiency has been taking place faster than we can deal with the problem of labor absorption; the improvement in the standard of life has been a little too quick”*. This quote underlines the extent to which technological change always shaped the distribution of employment in various occupations and industries over time.

During the 1st and 2nd IR, the most notable job losses were in agriculture. During the 3rd IR, most job losses occurred among routine jobs, both manual and low-skilled service jobs. In the 4th IR, relatively high-skilled blue collar (e.g. machine operators) and white-collar (bookkeepers and product testers) jobs are being reduced by new technology in advanced and developing economies. However, technological unemployment has been counter-balanced by the creation of new jobs and emergence of new industries.

While previous industrial revolutions have impacted jobs at different skills levels, particularly noteworthy in the 4th IR is the higher demand of interpersonal non-routine jobs compared with analytical non-routine jobs. This demand disparity in jobs is reflected in the returns to education. Prior to the consolidation of the digital economy in the 1980s, college degrees did not yield significantly greater returns compared to high school degrees. In other words, the pay of high school graduates was not much different to that of university degree holders. However, that pay gap increased during the 1970s through to the 1990s.

Since 2000 with the onset of IR 4.0, technological change no longer correlates with the real wage growth of highly educated people. Research suggests that the demand for higher education skills increased only up to the year 2000, and then began to decline. In the context of a continuing increase in the supply of highly educated people, many high-skilled workers have been hired into jobs previously undertaken by low-skilled

workers. Under-utilization of skills therefore becomes a policy issue.

These considerations suggest two further important questions: does technological change lead to net unemployment and what effect does technological change have on economic inequality and the quality of jobs more generally?

For instance, the emergence of video games negatively affected the toy industry leading to the closure of toy retailers such as Toys ‘R’ US. However, the video game industry has been expanding rapidly and now has more than 65,000 direct employees in the US. Evidence from France indicates that over the past 15 years the internet destroyed 0.5 million jobs but created 1.2 million, thereby being a substantial net job generator.

A feature of IR 4.0 is that routine workers have been affected by a deterioration in job quality regardless of technological change. This is the consequence of employers’ seeking labor market flexibility by favoring non-standard forms of employment, including temporary, part-time, and self-employed work and short-term agency work. These flexible forms of employment give rise to insecurity and feelings of precariousness.

As highlighted above, governments in Asia-Pacific region have made efforts to facilitate technology-based economic growth while minimizing its negative impact on employment. Their experiences provide several valuable lessons.

First, Asian experiences of technological development highlight the importance of public policy in the development of technology and promotion of economic competitiveness. The rapid economic transformation of key Asian economies including Japan, Korea, Singapore, and China demonstrate that successful transformation from agricultural societies has been facilitated by distinctive governmental innovation systems.

Second, the Asian experience of technological change differs depending on context. Within the Asia-Pacific region, no two experiences of technological change are the same. The success of a policy in one economy is unlikely to guarantee the success in other economies. Government policy needs to be tailored to those aspects of the material, cultural and institutional context that are most likely to provide comparative advantage.

Third, Asia-Pacific policy-makers need to address the negative impact of technological change on jobs. Despite avoiding higher levels of unemployment experienced, the rapid growth of information technology has increased the returns to investment in IT-embedded, capital goods and facilitated outsourcing and offshoring of work, which together have contributed to rising income inequality and little concern with the overall quality of jobs.

The type of work at which humans still outperform machines can be broadly categorized as judgment work: tasks that involve synthesizing experience, discretion, empathy, improvisation, and an understanding of organizational history and culture to make decisions that reach beyond simply interpreting data. AI can analyze data at a speed and efficiency unsurpassable by humans, but with the reports written and solutions suggested by AI, human workers will extract the insights behind numbers and facts and devise creative solutions.

Higher-level managers are relatively safe from elimination, since the increasing complexity of business situations require skills even the most advanced of bots will not master for the time being, such as being creative, providing emotional support, and building relationships. However, as previously mentioned, many of the administrative, less cognitively demanding duties usually held by mid-level managers are already being automated.

Some of the relevant skill sets required to ensure the adaptability of human capital to remain gainfully employed in the future economy could include “hard skills” such as in the scientific and technical realms as well as the soft skills to communicate and collaborate effectively with clients / customers and various stakeholders in various projects.

In addition, future employment needs would also mean the need for effective adult learning throughout one’s working life. This would entail the provision of professional conversion programs and retraining or upgrading of skillsets for displaced workers or mid-career switches.

With increasing demand on time from an evolving economy, the educational system has to keep up with rapid changes in technology and work place. Course or modular offerings could include a formal context in classroom settings, on-line learning, virtual reality elements, gaming sensibilities and a lot of real time learning. In this context, several key stake holders will have to be involved such as the relevant educational institutions, employers through the Trade Association and Chambers (TACs), private educational providers and educational VWOs (not for profit).

Another emerging trend could be the boundaries between schooling and work will become increasingly blurred as new systems develop a seamless model of learning, exposure, and practical experience into students’ lives. For displaced or

employed individuals, more learning systems should migrate online as modular on-line learning systems and just in time courses to keep up with the changing skills sets required of the future work place.

Educational institutions will likely need to teach students to be lifelong learners through more online content, in situ learning and other employer engagement scenarios to increase employable skills in an increasingly information driven digitized economy.

There also exists a need for more collaboration with employers to deliver on-demand or on-the-job training programs especially with the need to retrain a large number of the work force to manage increasing automation.

The above article is drawing on insights developed by the following academic experts as part of two APRU projects exploring the impact of AI.

Transformation of Work in Asia-Pacific in the 21st Century
Stephen Frenkel, UNSW Sydney; Jikyeong Kang, Asian Institute of Management; Sunghoon Kim, UNSW Sydney, Jungwoo Lee, Yonsei University; Myung Jae Moon, Yonsei University; Namgyoo K. Park, Seoul National University; Hideaki Shiroyama, University of Tokyo; Faizal Bin Yahya, National University of Singapore. Lead academic; Kar Yan Tam, Hong Kong University of Science and Technology. Project supported by Google.org

‘AI for Everyone: Benefitting from and Building Trust in the Technology’,
Roman Dremluiga, Far Eastern Federal University; Toni Erskine, The Australian National University; Danit Gal, Peking University/ Keio University; Chong-Fuk Lau, The Chinese University of Hong Kong; Brian Y. Lim, National University of Singapore; Raúl Monroy, Tecnológico de Monterrey; Sameer Singh, UC Irvine; Yifan Shen, Fudan University; Reza Shokri, National University of Singapore; Felipe Tobar, Universidad de Chile; Qiang Yang, Hong Kong University Science and Technology, Roland Yap, National University of Singapore. Lead academics, Jiro Kokuryo, Keio University; Tony Walsh, UNSW Sydney. Project supported by Google.org

Contact apru@apru.org to request copy of final project outputs.

The question we will ask here is whether we could expect history to repeat itself in the way today’s Fourth Industrial Revolution creates and distributes its benefits. It is often argued that the economic and social mechanisms of change are not new, so we can rely on historical evidence to guide us through change (the “we have been here before” argument).

It is counter-argued that several pertinent factors appear to be different this time, perhaps not necessarily in nature, but certainly in intensity. Such factors include the speed at which innovation happens, arguably historically unprecedented: fast change may be harder to adjust to. Also, there is the continued unbundling of production and the presence of global value chains, with the

new possibilities for economic connectivity and interdependence they create: distribution would clearly be impacted. Moreover, with the co-existence of several new and powerful general-purpose technologies, it is argued that this time around technological change and its impacts will be much deeper. So much deeper, that what we observe today is just the beginning of a very long road of deep technological change. Deeper change would require stronger economic adaptation and social assimilation and distribution efforts that would also be expected to create a larger redistribution of wealth gains.

It should come as no surprise, therefore, that there is much uncertainty about the economic, social and ethical implications of current technological change, often expressed in either overly optimistic or overly pessimistic forecasts, the differences between them based more on different assumptions than different evidence from the labor and technology markets.

HOW DO WE EXPECT THE NATURE OF WORK TO CHANGE?

Asking how technology will influence the nature of work must start with the appreciation that the nature of work has been evolving continuously throughout the industrial era. Technological change has been the main driver of the evolution of work today's advanced economies. Work has become much more productive, increasingly more skilled, requiring higher levels of training and education, and is better paid. Work is also more widely shared within the population, especially with the rise in female participation, but an average

lifetime today contains a smaller proportion of work and a larger proportion in education, leisure, retirement or other types of labour force stratus. Workers in advanced economies also have tended to work fewer hours per week than was the case some decades back, but in some cases this trend appears to be reversing. In the course of the evolution of work in the last century, many tasks became standardized and cheaper through new technologies, which made them easier to mechanize and, in many cases, fully automate.

A critical distinction for understanding the Asia-Pacific region is that its advanced economies face the Fourth Industrial Revolution from a different starting point than that of the emerging economies in the region. The differences will manifest themselves in the capabilities of relevant institutions and infrastructure, the domestic human capital endowment (e.g. education and training, health), the proportion of the population employed in the formal sector and other factors which will influence the capacity of an economy to absorb and utilize technology for development. Several of these differences could give rise to potential complementarities and therefore encourage cooperation within the region, making for different optimal workforce development pathways and differences in the evolution of work within the region.

From the 2018 PECC survey we find that the expectations in the region are that the size of workforces will decline due to the introduction of new technologies, the level of skills required will rise and that the occupational and skills structure of the workforces will change, all in ways related to the expectations in the particular part of the region the survey respondents are located.

Table 2.1: Workforce size: Expectations of change in overall economy by regional grouping (%)

Workforce change by 2030	All	North America	Northeast Asia	Oceania	Pacific South America	Southeast Asia
Decrease (greatly or slightly)	47	36	54	32	43	55
Stay the same	17	22	14	31	12	12
Increase (greatly or slightly)	33	38	30	31	41	32

Source: PECC Survey on the State of the Region 2018

Table 2.1 above offers a very broad picture on employment expectations showing that in Southeast Asia and Northeast Asia more respondents expect employment losses than gains, while in Oceania and the Americas the opinions are split, a bit less polarized in Oceania where survey respondents expect the least change.² Figure 2.1 below looks at the expected size of the workforce through a more detailed lens, presenting the net difference in the

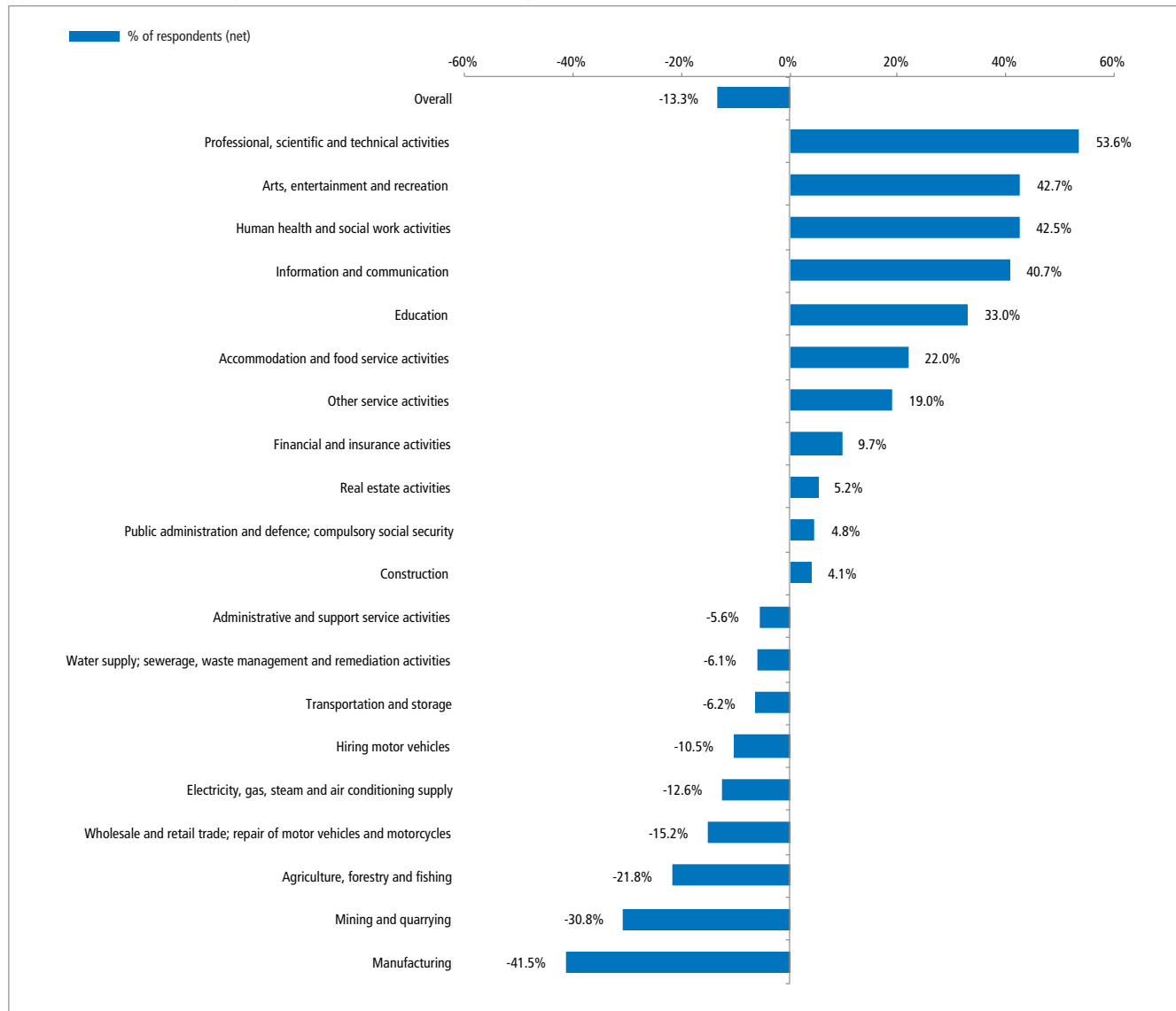
proportion of expectation of gains and losses by sector following the question "By 2030, how do you think new technologies (for example but not limited to artificial intelligence, cloud-computing, 3D printing, blockchain, and advanced robotics) will impact the number of jobs in your economy overall and for the list of sectors below?"³

² See Annex B for details on survey results.

³ Comparisons by sector can be quantified as we do know the sizes of each sector, but the reader should note that the statement of "slightly" and "strongly" cannot be taken to mean the same. Later, we present the differences for the "strongly" increase and decrease responses as they contain the most information.

2. THE FUTURE OF JOBS AND SKILLS

Figure 2.1: Impact of New Technologies on Jobs in Different Sectors of the Economy



Net = % of those who thought that the number of jobs would increase in the sector minus % of those who thought it would decrease
Source: PECC Survey on the State of the Region 2018

Respondents from both emerging and advanced economies appear to agree on the direction of change at the sectoral level. The strongest expectations that the number of jobs will increase were expressed in the following sectors: education; arts, entertainment and recreation; professional, scientific and technical activities, human health and social work activities; and information and communication.

The strongest sectors for a decline in jobs were: manufacturing; mining; and wholesale and retail trade. There was only one sector in which there was a difference in views on the direction of change – real estate. More respondents from emerging economies expect that there will be more jobs in this sector, while more from the

advanced economies expect that there will be fewer jobs in that sector by 2030.

Anticipating the impact of technology on employment by sector will only describe part of the overall impact of the Fourth Industrial Revolution on work. There will be other aspects of employment that will matter, such as occupation or location. It is worth noting that as each sector utilizes several different occupations in different proportions, and that each occupation will be impacted by technology in an individual and specific way, the unique mix of occupations within each sector will play its own role in the overall impact of technology on the sector's employment.⁴

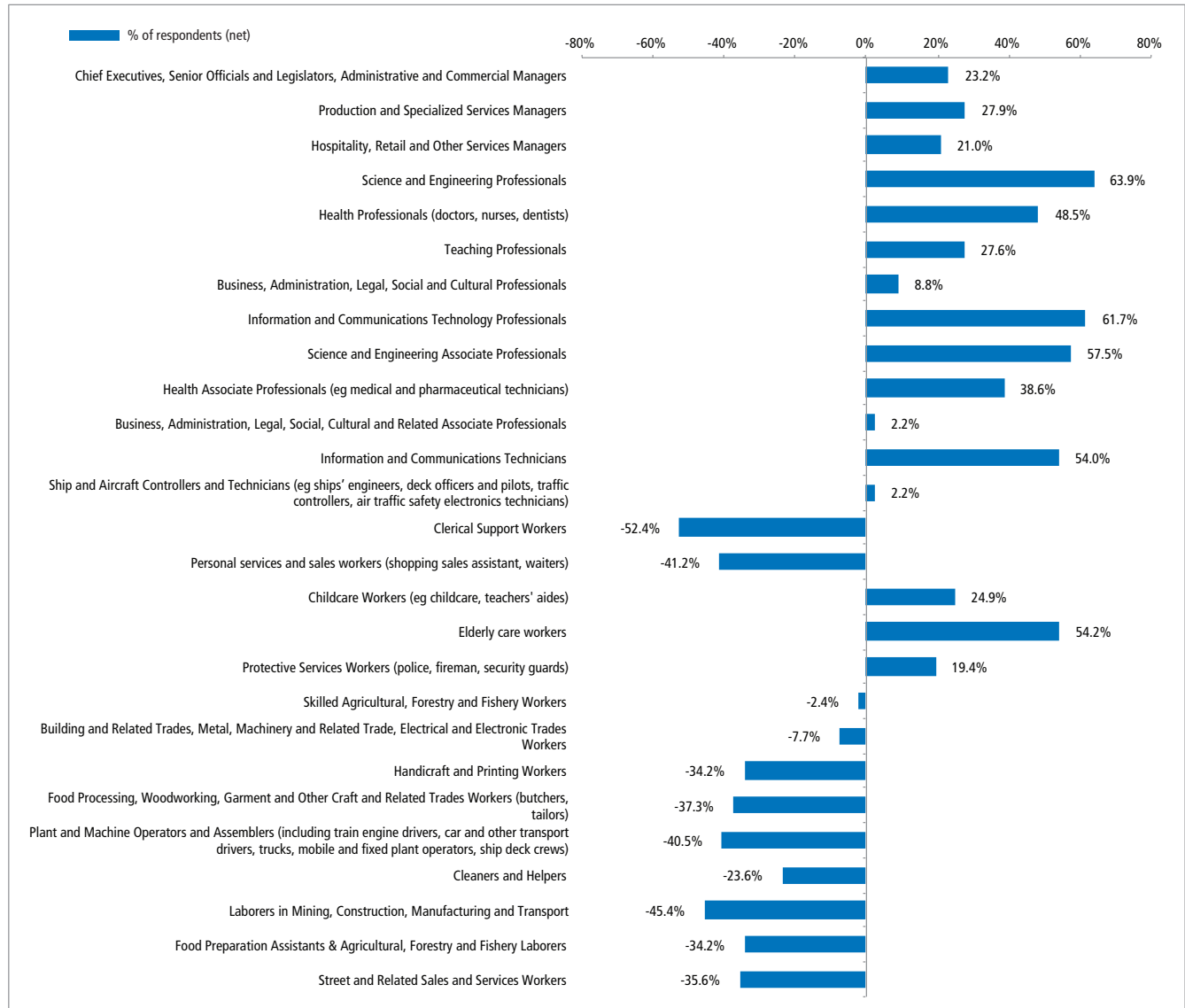
⁴ However, as technology helps production processes to unbundle and global value chains are created, the definition of sectors is becoming less and less precise and useful for our purposes. There is an increasing number of industrial producers who do not own their own factories anymore and whose main activity has ceased to be the manufacturing of their own products. They design, distribute and maintain their products the manufacturing of which is outsourced. Thus, although their core activity has already turned into the provision of a service they will often still be classified as manufacturers. This kind of measurement problem will intensify in the near future and will necessitate the birth of new statistical series and a gradual shift of research to those new measures.

WHAT KINDS OF OLD JOBS WILL DISAPPEAR AND WHAT NEW JOBS WILL BE CREATED?

Figure 2.2 shows us the net difference in the expectations for an increase or decrease in the number of workers by occupation. The question asked is “how do you think new technologies will impact

the number of jobs in the following occupational categories in your economy by 2030?”

Figure 2.2: Impact of Technological Change on Occupations



Net = % of respondents that thought there would be an increase in the number of jobs minus % of those who thought that there would be a decrease
 Source: PECC Survey on the State of the Region 2018

2. THE FUTURE OF JOBS AND SKILLS

In a similar way that a sector employs several occupations, and each of these occupations may be impacted by technology differently, an occupation uses several generic tasks and each task is subject to automation differently. The net percentage in Figure 2.2 above provides a very clear picture with science and engineering,

information and communication technologies, health and care being the occupations that are expected to create the most jobs. Table 2.2 shows the geographic distribution of the strongest job creation by showing the occupations with the highest expectation that they will “increase greatly”.

Table 2.2: Where will the new jobs be? Growth occupations (% of respondents expecting them to increase greatly) by sub-region

Occupations with strongest job creation	Average	North America	Northeast Asia	Oceania	Pacific South America	Southeast Asia
Science and Engineering Professionals	30	<u>31</u>	25	17	<u>40</u>	<u>35</u>
Science and Engineering Associate Professionals	25	<u>32</u>	20	13	<u>38</u>	<u>27</u>
Information and Communications Technology Professionals	39	<u>41</u>	35	29	<u>48</u>	<u>42</u>
Information and Communications Technicians	33	<u>37</u>	30	26	<u>35</u>	<u>37</u>
Health Professionals (doctors, nurses, dentists)	18	<u>25</u>	13	14	15	<u>26</u>
Health Associate Professionals (e.g. med & pharm technicians)	16	<u>23</u>	<u>18</u>	8	14	16
Elderly care workers	26	<u>36</u>	26	22	25	26

Source: PECC Survey on the State of the Region 2018
 Note: in **bold** and **underlined** occupations expected to grow faster than the region's average

The strongest job creation is anticipated to be in ICT professionals and ICT technicians, and the strongest overall job creation is expected in North America. Table 2.3 below shows the geographic

distribution of the occupations with the strongest expectations for employment decline by 2030.

Table 2.3: What jobs are most likely to be lost? Shrinking occupations (% of respondents expecting them to decrease greatly) by sub-region

Occupations with strongest job creation	Average	North America	Northeast Asia	Oceania	Pacific South America	Southeast Asia
Clerical Support Workers	20	18	15	14	19	<u>32</u>
Personal services and sales workers (shopping sales assistant, waiters)	14	4	<u>19</u>	2	14	<u>21</u>
Handicraft and Printing Workers	12	9	<u>13</u>	8	<u>16</u>	<u>13</u>
Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers (butchers, tailors)	13	7	<u>16</u>	8	<u>15</u>	<u>14</u>
Plant and Machine Operators and Assemblers (incl. train engine drivers, car and other transport drivers, trucks, mobile & fixed plant operators, ship deck crews)	18	16	<u>19</u>	11	<u>21</u>	<u>20</u>
Cleaners and Helpers	12	5	<u>15</u>	2	<u>13</u>	<u>16</u>
Laborers in Mining, Construction, Manufacturing and Transport	15	16	14	12	11	<u>21</u>
Food Preparation Assistants & Agricultural, Forestry and Fishery Laborers	9	4	<u>13</u>	5	6	<u>14</u>
Street and Related Sales and Services Workers	12	4	<u>20</u>	3	11	12

Source: PECC Survey on the State of the Region 2018

Note: in **bold** and **underlined** occupations expected to shrink faster than the region's average

These are all occupations with a high proportion of repetitive tasks in them that make each one of them in their own way susceptible to automation. The process through which their product is created, and their services are provided will be transformed in a way that will retain human labor to provide the human element in tasks that cannot be automated, while the remainder will be provided through advanced new technologies, thus increasing labour productivity.

The speed of this transformation will be product- and service-specific and will be greatly influenced by the institutions within which the transformation takes place. For example, one estimate suggests that the introduction of driverless cars in the United States could directly eliminate 1.3 to 2.3 million workers' jobs over the next 30 years.⁵ Table 2.3 shows the average expectations for the whole region and their geographic differences within the region. Throughout the region, there is a shared expectation for strong

displacement for (i) clerical support workers, (ii) plant and machine operators and assemblers (including train engine drivers, car and other transport drivers, trucks, mobile & fixed plant operators, ship deck crews), and (iii) laborers in mining, construction, manufacturing and transport.

For the remaining occupations listed in Table 2.3 the strongest expectations of displacement are found in Northeast Asia, Southeast Asia, and the Pacific South American economies and the weakest expectations of displacement are found in North America and Oceania. This list of occupations can be used to provide useful sociodemographic and economic profiling of the workers most likely to lose their jobs along with critical information on the skills, knowledge and experience that they will bring with them to support a drive to re-train and up-skill them in preparation for the new jobs that emerge.

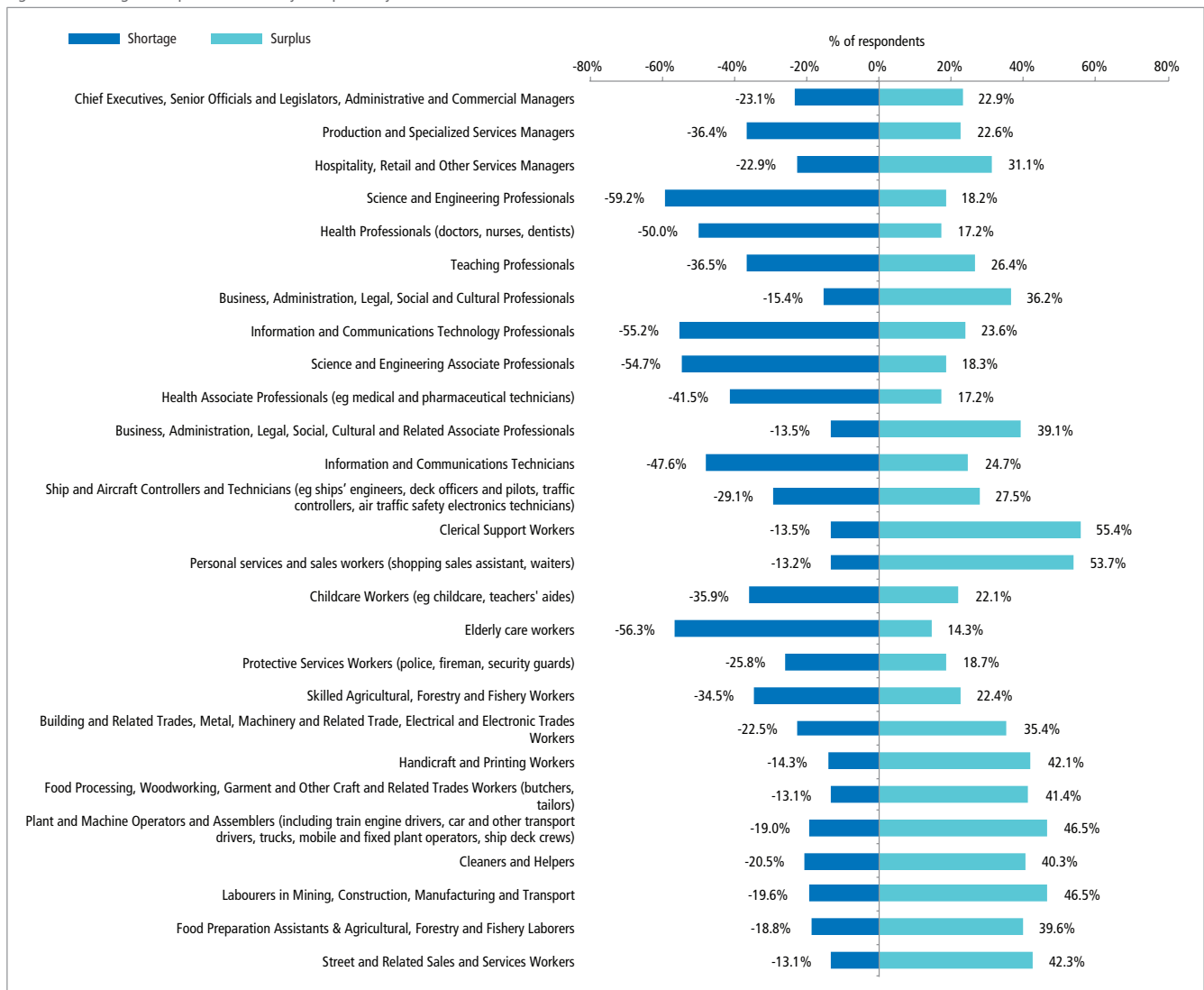
⁵ Preparing U.S. Workers and Employers for an Autonomous Vehicle Future, Erica L. Groshen et al, Securing America's Future Energy (SAFE), 2018 : <https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Groshen-et-al-Report-June-2018-1.pdf>.

DO WE HAVE THE RIGHT SKILLS IN THE REGION FOR THESE NEW JOBS?

Worker displacement will create surpluses of workers and skills in some occupations while there will be shortages of workers and skills in growth occupations. How well the economy adjusts to technological change will depend on its capacity to match the skills on offer by all available workers (employed or looking for work) with the skills required by all jobs (vacant or filled). Given the anticipated magnitude of the change we are expecting, one should expect extensive skills mismatch (that is, simultaneously extensive skill shortages in some areas and extensive skill surpluses in other areas), increased labor market turnover, including job-to-job transitions, and that all types and forms of education and training, labor market reform, and social care/security reform, will play a critical role in helping economic and social life recalibrate and re-balance itself. Figure 2.3 shows the extent of anticipated skills mismatch due to technological change.

The question that was asked for Figure 2.3 was “Which occupations do you anticipate will develop shortages or surpluses of workers in your economy due to new technologies by 2030 (tick one box in each category)”. The bars to the left (right) show expectations for a shortage (surplus) in the occupation and the percentage needed to reach 100% when the two are added represents the expectation that the skills will be well-matched. Thus, for example, for occupation elderly care workers, 56.3 percent of respondents expect shortages, 14.3 percent expect surpluses, and (100 – 56.3 – 14.3 =) 29.4 percent expect that skills will be well-matched in this occupation. (Note that the shorter the overall bar is in the figure, the more respondents expected well-matched skills in the future.) Overall, respondents tended to think that by 2030 there would be a surplus of workers in the lower skilled job categories and a shortage in higher skills.

Figure 2.3: Shortage or Surplus of Workers by Occupation by 2030



Source: PECC Survey on the State of the Region 2018

Below we show the geographic distribution of two selections of occupations, first, those expected to be in intense skills shortage (Table 2.4) and second, those expected to be in intense surplus (Table 2.5), both by 2030.

Table 2.4: Where will the intense skill shortages be? (% of respondents who thought there would be intense skills shortages for the following occupational categories by sub-region)

Occupation	Average	North America	Northeast Asia	Oceania	Pacific South America	Southeast Asia
Science and Engineering Professionals	14	13	7	10	22	18
Science and Engineering Associate Professionals	10	13	5	9	16	12
Information and Communications Technology Professionals	14	14	14	8	16	15
Information and Communications Technicians	9	13	9	8	5	12
Health Professionals (doctors, nurses, dentists)	10	9	7	6	8	17
Elderly care workers	16	19	17	15	13	17

Source: PECC Survey on the State of the Region 2018

Note: For each occupation, **bold** and underlined are the areas expected to experience intense shortages larger than the region's average

Intense shortages above the region's average are found predominantly in Southeast Asia and below the region's average in Northeast Asian and Oceania.

Table 2.5: Where will the intense skill surpluses be? (% of respondents who thought there would be intense skill surpluses for the following occupational categories by sub-region)

Occupation	Average	North America	Northeast Asia	Oceania	Pacific South America	Southeast Asia
Clerical Support Workers	22	15	20	15	17	37
Personal services and sales workers (shopping sales assistant, waiters)	17	13	18	8	17	25
Handicraft and Printing Workers	9	15	10	8	5	9
Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers (butchers, tailors)	7	7	9	3	1	11
Plant and Machine Operators and Assemblers (incl. train engine drivers, car and other transport drivers, trucks, mobile & fixed plant operators, ship deck crews)	12	15	11	8	14	13
Cleaners and Helpers	10	9	10	5	7	15
Laborers in Mining, Construction, Manufacturing and Transport	12	15	11	10	11	15
Food Preparation Assistants & Agricultural, Forestry and Fishery Laborers	9	7	17	2	4	10
Street and Related Sales and Services Workers	14	13	16	6	15	17

Source: PECC Survey on the State of the Region 2018

Note: For each occupation, **bold** and underlined are the areas expected to experience intense surpluses larger than the region's average

A similarly diverse picture emerges for the geography of those occupations expected to be in intense surplus by 2030, with Southeast Asian respondents expecting intense surpluses, but also North America and Northeast Asia showing above average percentages for several of the shrinking occupations.

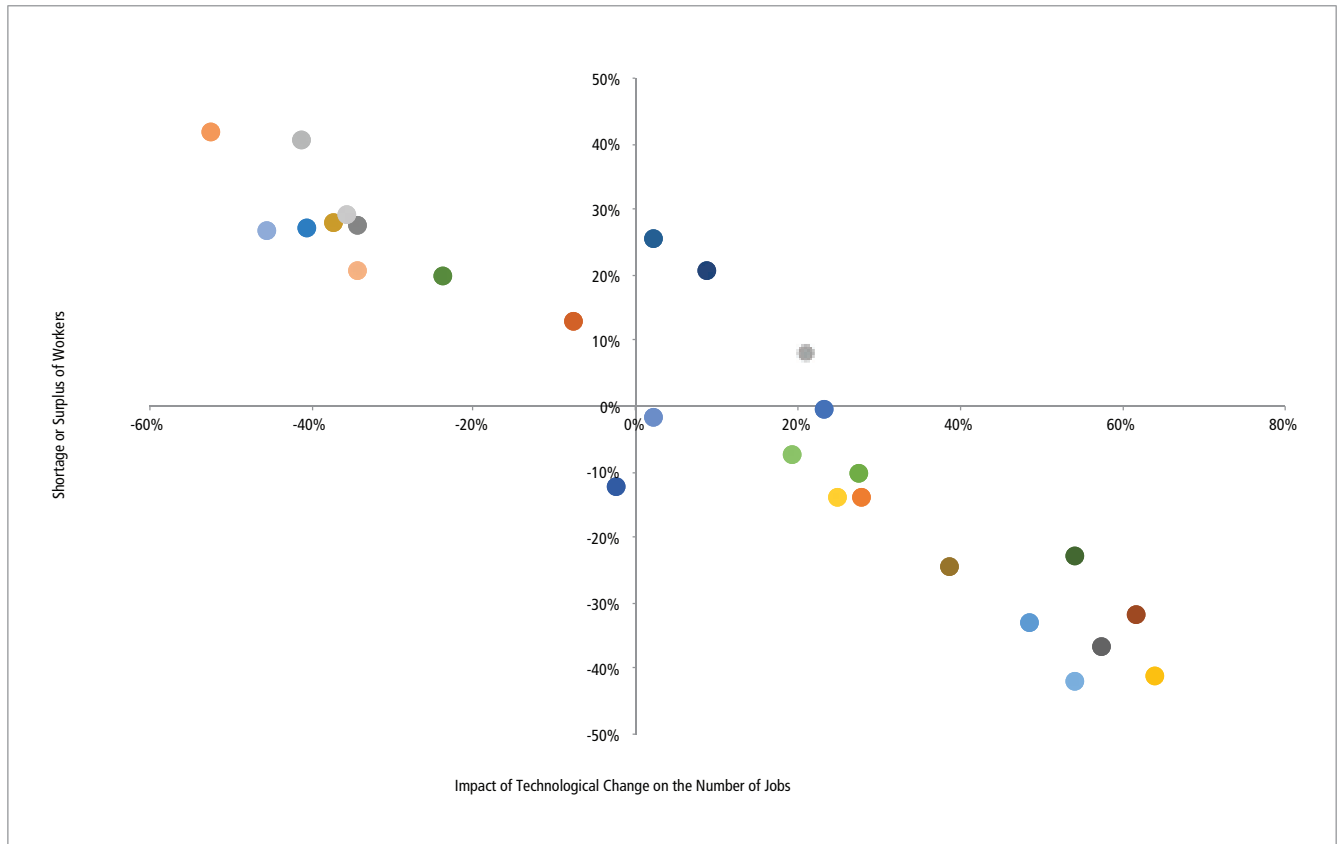
It is important to note the difference in the geographic patterns of occupations expected to strongly increase or decrease in size presented in Tables 2.2 and 2.3, and the patterns of occupations that are expected to be in intense shortage or surplus in Table 2.4 and 2.5.

THE IMPACT OF TECHNOLOGICAL CHANGE BY OCCUPATION

Figure 2.4 below puts together the information on occupation size and shortages/surpluses for all occupations. We use the net growth information in Figure 2.2 and we derive a similar net shortage or surplus percentage from Figure 2.3 (where a negative indicates a net shortage and a positive a net surplus) and combine them in Figure 2.4. The figure clearly shows a positive association between growth and job creation. Starting from the top left with clerical and

support workers (with a job shrinking expectation at 52% and a skills surplus at 42%), going through the center of the figure with ship and aircraft controllers and technicians (+2%, -2%: expected to be one of the most stable occupations) all the way to the bottom right where high growth and high skill shortages occupations are bunched up, such as science and engineering professionals and their associates, ICT professionals and their technicians.

Figure 2.4: Impact of Technological Change on Employment Size and Skills Mismatch



Source: PECC Survey on the State of the Region 2018

Figure 2.4 suggests several ways in which the occupations could be bunched up in separate categories. Broadly speaking, we could have occupations split into the four quadrants in Figure 2.4:

More Jobs and Surplus of Workers (North-East quadrant)

- Hospitality, Retail and Other Services Managers
- Business, Administration, Legal, Social, Cultural and Related Associate Professionals
- Business, Administration, Legal, Social and Cultural Professionals

More Jobs and Shortage of Workers (South-East quadrant)

- Chief Executives, Senior Officials and Legislators, Administrative and Commercial Managers

- Production and Specialized Services Managers
- Science and Engineering Professionals
- Health Professionals (doctors, nurses, dentists)
- Teaching Professionals
- Information and Communications Technology Professionals
- Science and Engineering Associate Professionals
- Health Associate Professionals (e.g., medical and pharmaceutical technicians)
- Information and Communications Technicians
- Ship and Aircraft Controllers and Technicians (e.g., ships' engineers, deck officers and pilots, traffic controllers, air traffic safety electronics technicians)
- Childcare Workers (e.g., childcare, teachers' aides)
- Elderly care workers
- Protective Services Workers (police, fireman, security guards)

Fewer Jobs and Shortage of Workers (South-West quadrant)

- Skilled Agricultural, Forestry and Fishery Workers

Few Jobs and Surplus of Workers (North-West quadrant)

- Clerical Support Workers
- Personal services and sales workers (shopping sales assistant, waiters)
- Building and Related Trades, Metal, Machinery and Related Trade, Electrical and Electronic Trades Workers
- Handicraft and Printing Workers
- Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers (butchers, tailors)
- Plant and Machine Operators and Assemblers (including train engine drivers, car and other transport drivers, trucks, mobile and fixed plant operators, ship deck crews)
- Cleaners and Helpers
- Laborers in Mining, Construction, Manufacturing and Transport
- Food Preparation Assistants & Agricultural, Forestry and Fishery Laborers
- Street and Related Sales and Services Workers

Of the four quadrants it is the South-East and the North-West that make the most intuitive sense. The former (SE) contains the growing occupations where shortages in the skills required by the occupation are strongly expected, and the latter (NW) contains the shrinking occupations where surpluses of the skills required are also strongly expected.⁶

Another way to cut this data would be by splitting it into the high decline occupations (at the top of the NW quadrant), the stable occupations (in the middle of the diagram belonging to all quadrants), and the high growth occupations (at the bottom of the SE quadrant). This way would probably find a clearer relationship with the underlying concepts of automation and worker displacement.

Declining

- Clerical Support Workers
- Personal services and sales workers (shopping sales assistant, waiters)
- Handicraft and Printing Workers
- Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers (butchers, tailors)
- Plant and Machine Operators and Assemblers (including train engine drivers, car and other transport drivers, trucks, mobile and fixed plant operators, ship deck crews)
- Cleaners and Helpers
- Laborers in Mining, Construction, Manufacturing and Transport
- Food Preparation Assistants & Agricultural, Forestry and Fishery Laborers
- Street and Related Sales and Services Workers

Stable

- Ship and Aircraft Controllers and Technicians (e.g., ships' engineers, deck officers and pilots, traffic controllers, air traffic safety electronics technicians)
- Childcare Workers (e.g., childcare, teachers' aides)
- Teaching Professionals
- Chief Executives, Senior Officials and Legislators, Administrative and Commercial Managers
- Production and Specialized Services Managers
- Building and Related Trades, Metal, Machinery and Related Trade, Electrical and Electronic Trades Workers
- Hospitality, Retail and Other Services Managers
- Business, Administration, Legal, Social, Cultural and Related Associate Professionals
- Business, Administration, Legal, Social and Cultural Professionals

Growing

- Science and Engineering Professionals
- Health Professionals (doctors, nurses, dentists)
- Information and Communications Technology Professionals
- Science and Engineering Associate Professionals
- Health Associate Professionals (e.g., medical and pharmaceutical technicians)
- Information and Communications Technicians
- Elderly care workers
- Protective Services Workers (police, fireman, security guards)

It is worth noting how close these categories are to those introduced earlier in Tables 2.4 and 2.5.

THE IMPACT OF TECHNOLOGICAL CHANGE BY OCCUPATION: DO EMERGING AND ADVANCED ECONOMIES EXPECT TO TRANSFORM DIFFERENTLY?

There are many reasons why emerging and advanced economies may respond differently in the way technology may impact jobs numbers and how skills are matched as their labor markets transform. As already mentioned, the starting point for this transformation will differ in its economic and institutional fundamentals between emerging and advanced economies, in ways that may influence how the region gets together to create cooperative and/or competitive solutions in its efforts to adapt to new technologies. This is a discussion that needs to be developed in the region as the transformation begins, namely, to what degree will the Fourth Industrial Revolution bring the different economies in the region closer to cooperation and/or competition and how could APEC best serve the joint interests of the region. This discussion has gained added urgency in the last two years and has been clearly stated in the 2018 PECC survey where the top risk for growth in the region in the next 2-3 years has been *"increased protectionism and trade wars"* (see Chapter 1 for more details).

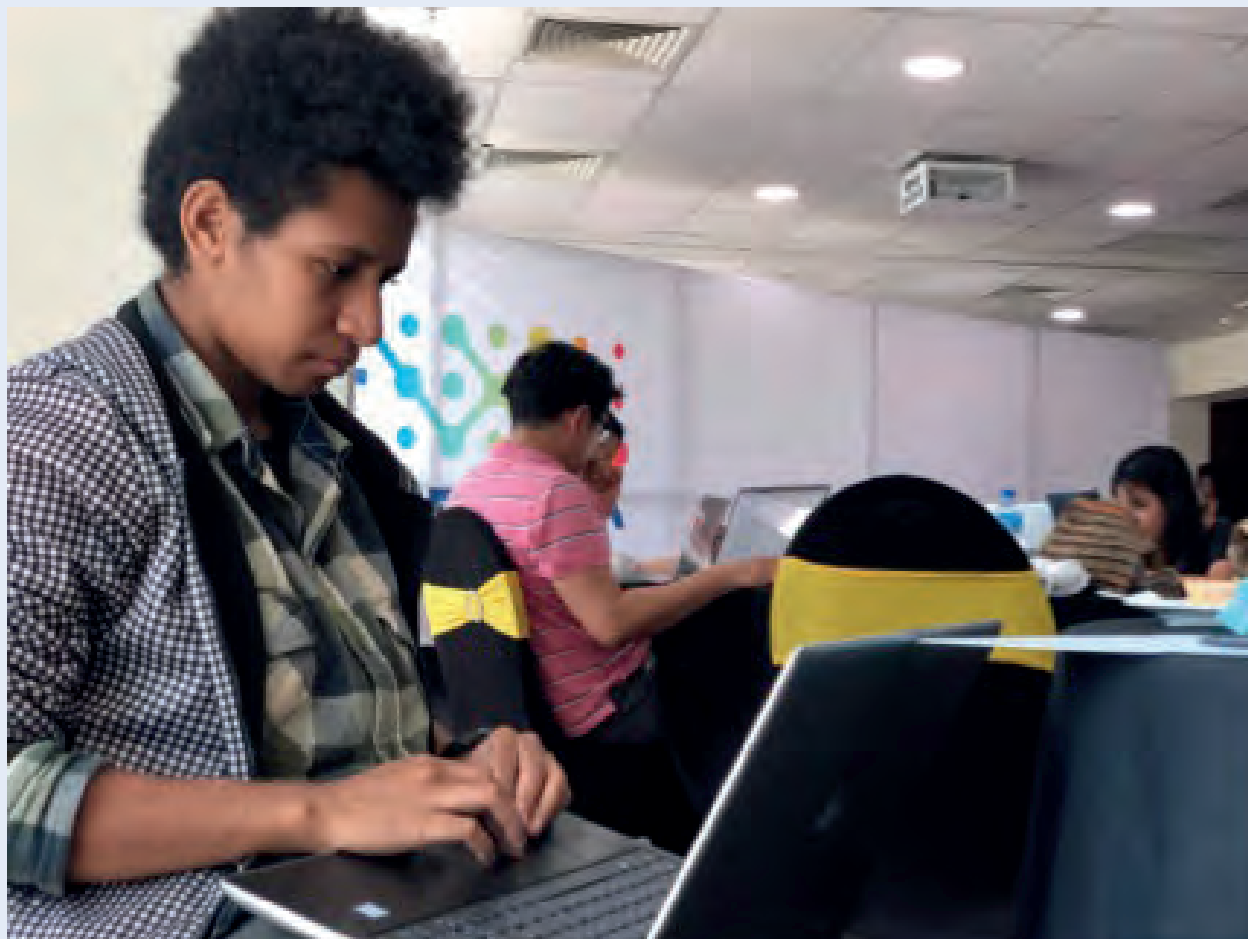
⁶ The four occupations that are located in the remaining two quadrants (North-East and South-West) send a mixed message that may well be accurate, but do not lend themselves to a clear intuitive explanation about their positioning. We would probably be able to find an intuitive appealing explanation by examining occupation-specific reasons that may be setting these occupations apart in what may on first sight appear as a counterintuitive position. However, we must note that such data sets can be best understood through the use of multivariate regression, which the authors of the report are currently pursuing.

BOX 2 THE APEC APP CHALLENGE: SKILLS FOR A NEW GENERATION

Contributed by: John Karr, Senior Director, Technology Programs, the Asia Foundation

Papua New Guinea's Crystal Kewe may be advancing more than just her family's financial prospects through her work in the IT sector, she's also inspiring a generation of young women in PNG to consider their own potential as digital entrepreneurs.

A self-taught software developer who learned how to code from the Internet and from watching YouTube videos, Crystal launched her first IT business when she was 15.



This year she took her skills and creative energy to the 2018 APEC App Challenge – a competition for software developers from APEC economies – and won first prize. Now 19-years old, Crystal leveraged skills she acquired in non-traditional ways to build a mobile e-commerce platform designed to help low income women weavers in PNG access new markets for their products. Given Crystal's dedication to the ideas she has developed, the future of inclusive growth in the Asia-Pacific may well be led by local innovators, designers, and developers who have honed their skills and built their own human capital in new and unique ways.

This is an important message for the region's policy makers. In Asia, where manufacturing-led job growth over the last half-century has been a key driver of prosperity, the need to find new ways to deliver training and essential skills to workers is critical to the continued development of the region. Workers with access to a diverse set of education and training options are likely to have a greater chance of remaining competitive in a rapidly modernizing marketplace. This is particularly the case with digital skills and advanced technical knowledge such as software development and design. Demand for these and other skills are expected to grow significantly over the next ten years and will be critical to expanding economic growth in a more inclusive and innovation-led fashion.

Crystal's story is indicative of an increasing trend among technology professionals in the region. Many are gathering new skills from online resources and among communities they meet and interact with on the Internet. And this quality was on vivid display at the APEC App Challenge where 14 teams of software developers and designers from nine APEC economies participated in a 24-hour app development competition centered on one essential question: how can technology bring trade opportunities to entrepreneurs in the informal sectors of APEC economies?

While rich in culture, craftsmanship and entrepreneurial spirit, the informal sectors of APEC economies have yet to fully capture the benefit of technology-driven trade which would help them integrate into the broader economy. In PNG, promoting the development of micro-entrepreneurship in the informal economy is considered by many to be a necessary step towards the emergence of a class of more formal entrepreneurs in the SME sector.

Ignored by larger e-commerce solutions, the challenge of drawing informal actors into trade is well suited for local entrepreneurs who know their domestic context and the unique challenges these economies present. This was the message of the App Challenge - long-standing bottlenecks that hinder economic growth in certain markets do not require international interventions or complex development plans. They can be addressed by local entrepreneurs and developers many of whom were self-taught or developed their most marketable skills by accessing training and education outside of formal institutions.

The concepts generated during the 24-hour hackathon will likely have far-reaching effects for micro-entrepreneurs in Papua New Guinea and other informal economies.

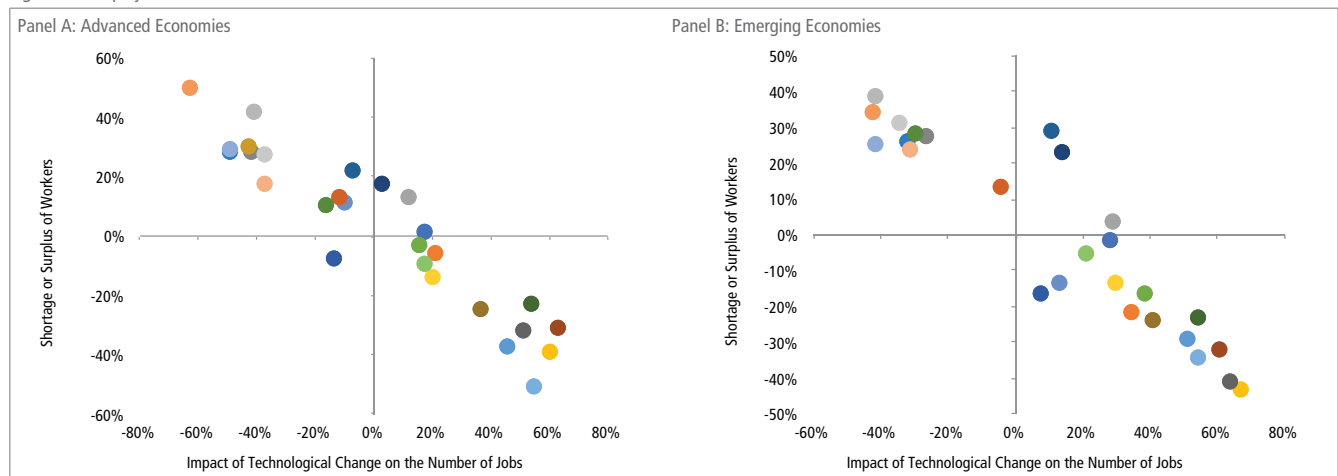
The concepts generated during the 24-hour hackathon will likely have far-reaching effects for micro-entrepreneurs in Papua New Guinea and other informal economies. Crystal Kewe leveraged her programming acumen to develop *Biluminous*, an app designed to help local artisanal weavers of PNG's culturally significant bilum bags connect with more customers and grow their businesses. But these ideas can also scale to other economies and connect a variety of MSMEs to new business opportunities. The APEC App Challenge helps us understand the creative potential of the region and the new ways that motivated individuals can build their own human capital.

An initiative of The Asia Foundation, the APEC Secretariat, and Google, the APEC App Challenge highlights the importance of a range of digital skills that empower the region's next generation who, in turn, will build the platforms and services which will help micro- and small businesses showcase their craft to the world. Crystal Kewe is a great example of this local capacity. She represents a generation of highly skilled and creative young people that are just now beginning to build the infrastructure that will help connect APEC entrepreneurs at every level of society to new opportunities to prosper and thrive in a global economy.

To shed some preliminary light on possible employment-related differences between advanced and emerging economies in the region, we examine the expected impact of technological transformation on the number of jobs and the matching of skills

and how these may differ between emerging and advanced economies. To this purpose we re-calculate Figure 2.4 separately for the emerging and for the advanced economies and compare the results in Figure 2.5 below.

Figure 2.5: Employment Size and Skills Mismatch



Source: PECC Survey on the State of the Region 2018

2. THE FUTURE OF JOBS AND SKILLS

Expectations about growing occupations differ between advanced and emerging economies. For most of the growing occupations, advanced economies have lower expectations for growth in jobs and, also lower expectations for shortages in the necessary skills. For example, jobs growth expectations for science and engineering professionals (and their associates in brackets) are 67% (63%) for emerging and 60% (51%) for advanced economies. At the same time expectations for skill shortages are -43% (-41%) for emerging and -39% (-32%) for advanced economies. This same difference is similarly prominent among slower growing occupations such as teaching professionals with emerging/advanced jobs growth at 38%/15% and skills shortages at -17%/-3% and production and specialized services managers at 34%/21% and -21%/-5% respectively. Moving to occupations with more modest expectations of growth a similar picture emerges, namely that growth expectations are higher among emerging economies, and so are expectations of shortages.

The comparison shows an ambition on the part of emerging economies in the Asia-Pacific region to catch up with their advanced partners, but also an appreciation that this will bring even more intense skills shortages for these occupations, with all the demands that these will bring to education, training, and related labor market infrastructure and institutions. It may also reflect the current paucity of such skills in emerging economies as well as the out-migration of professionals who have those skills. The degree to which the necessary infrastructure for this transformation is in place will be looked at in the next section.

Before we move to the examination of declining jobs occupations, we must note an exception found in the data. The only high growth occupation where advanced economies have similarly strong expectations for jobs growth as emerging economies (both at around 54%) but stronger expectations for skills shortages (-34% for emerging and -50% for advanced economies) is elderly care, which could be explained by demographic and social differences in that ageing is more advanced in advanced economies and the delivery of aged care is socially and financially different.

Expectations about declining occupations are far more variable than those for growing ones. This is probably because the reason,

the timing and the intensity of declining can be very occupation and possibly sector specific. There are the severely declining occupations such as clerical support workers and laborers in mining, construction, manufacturing and transport where emerging economies expect to shed jobs much more slowly and to suffer much less from skills surpluses than the advanced economies. For clerical support workers, the net expectation for jobs decline is 43% for respondents from emerging economies and 63% for those from advanced, with the respective skills surpluses being at 35% and 50%. Clearly respondents from advanced economies are expecting a much stronger negative employment impact than the emerging ones, presumably because they also expect that they will be transforming deeper than the emerging economies.

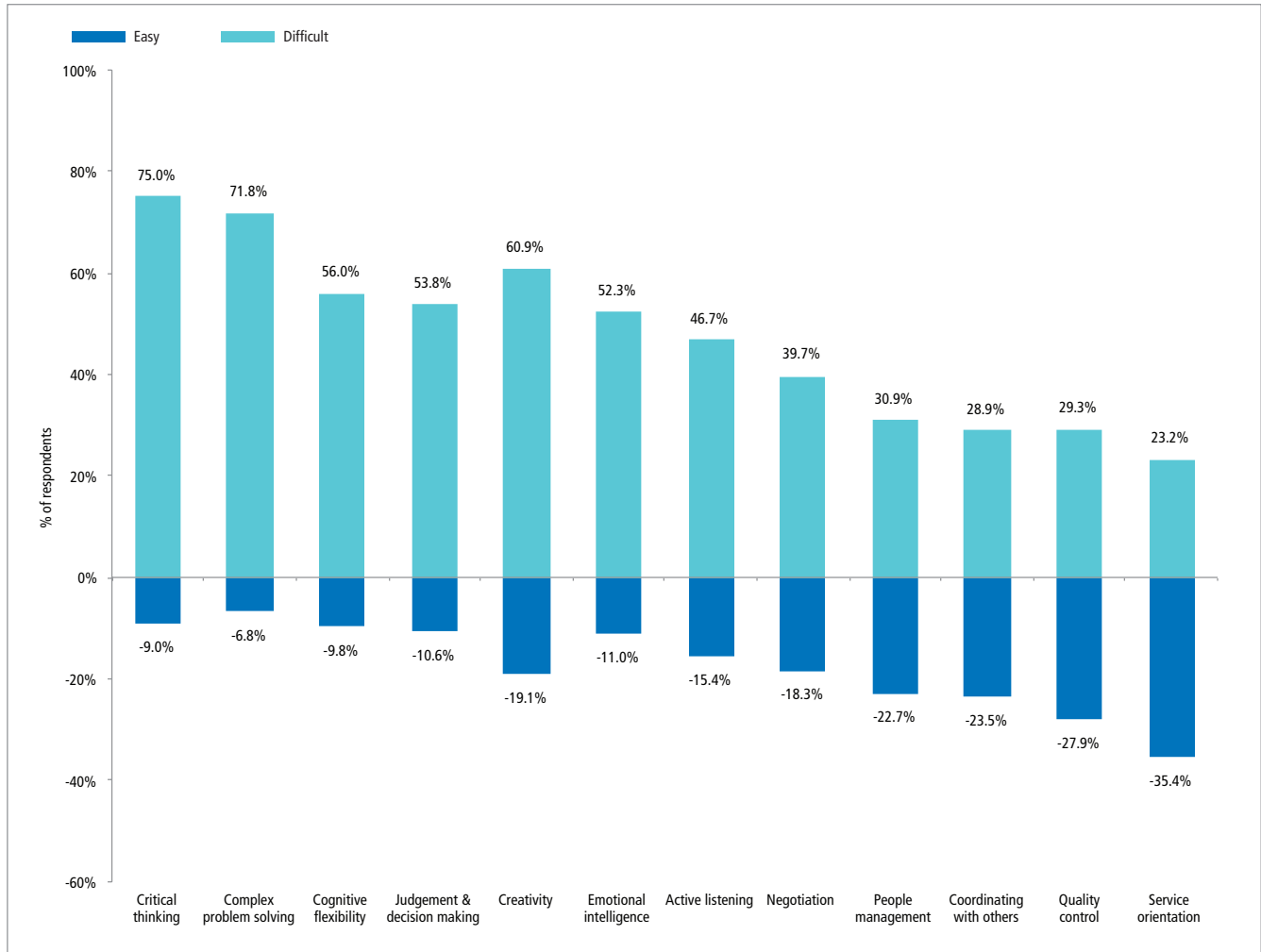
However, this pattern does not extend to many more of the declining occupations. For example, *personal services*, *food preparation*, and *street sales* all show expectations that are very similar between emerging and advanced economies for both jobs and skills mismatch. The lack of clear patterns continues with *cleaners and helpers*, *building and related trades*, and *business administration* all showing a very diverse picture that does not lend itself to a straightforward generalizable explanation.

Our best guess here is that without the use of multivariate regression this part of the data will remain difficult to interpret usefully. The comparison of the declining occupations between advanced and emerging economies suggests that decline will not be an orderly process and that it will be very occupation specific. The implication is that it will be hard to obtain the information needed to assess the negative social aspects of the decline and to interpret it usefully to construct social policy to help will manage this transition.

Having established some aspects of how the Fourth Industrial Revolution may impact on the number and type of jobs and occupations that will be lost and fewer aspects of the new jobs that will be created, we presented the survey respondents with a list of 12 skills that have been cited in World Economic Forum's Future of Jobs Reports ⁷ and asked them if they think that such skills will be easy or difficult to find and hire in the region by 2030. This is clearly a highly speculative question and its answer should be considered accordingly.

⁷World Economic Forum, The Future of Jobs Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution: http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf. In turn the WEF categories are based on a streamlined version of the O*NET labor market information system adopted by the US Department of Labor.

Figure 2.6: Critical Skills Shortages and Surpluses



Source: PECC Survey on the State of the Region 2018

Figure 2.6 stresses the challenges the region faces in adapting to the Fourth Industrial Revolution with respondents highlighting the educational and hiring difficulties they anticipate within their economies. Critical thinking and problem solving, closely followed by cognitive flexibility and judgement and decision making at the shortages end of the spectrum, and the increasing mechanization expected in areas that have to do with customer service, quality

control and coordinating and managing people at the surpluses (or perhaps lower shortages) end of the spectrum. Many of these skills are not taught explicitly as part of a skills-set but are facilitated to develop from the earliest education stages, starting according to educational and economic research from the early childhood pre-school stage of education, the value of which often remains underestimated by policy.

WHAT WILL HAPPEN TO THOSE WHO ARE LEFT BEHIND?

This is a very hard question to answer for two main reasons. First, because the extent of automation that will become technically feasible as the Fourth Industrial Revolution comes to its full strength is very hard to predict. Innovation is not happening in a linear fashion in time or in depth, scale, or scope. Second, even if we were able to make some reasonable predictions about the technical possibilities and their subsequent impact on automation, worker displacement, and new jobs creation, we would still need to account for human responses in the form of individual, social and political choices regarding the desirable speed and depth of the change. We would also need to account for the capacity of institutions and infrastructure that are required to support these choices. To top this uncertainty, as many of these parameters differ by economy, trade possibilities would always be a factor to consider about how groups of economies may respond to the making of individual and joint choices. For these reasons we will not venture to make any solid predictions. We will instead put the evidence we presented above in a broader context, using scenarios that have been offered in the literature and highlighting the question of how prepared the region is for the Fourth Industrial Revolution.

The evidence we have presented on jobs and employment outcomes suggests that there will be a lot of displacement in the form of occupations that are automated and many workers who will lose their jobs. At the same time, whatever forecast we can muster in this period of intense uncertainty suggests that the Fourth Industrial Revolution will also bring intense new job creation. There is too much uncertainty surrounding these two processes for us to offer an estimate of the net number of jobs lost minus jobs created in the transformed economies. It is critical to build into our thinking that there will be no guarantee that those who lose their jobs due to automation will also be the same people who will be employed in the newly created jobs. Several scenarios have been put forward, one of the most prominent ones being by McKinsey (2017) who state that the quantitative economy specific charts presented in their analysis “should not be taken as forecasts or predictions” and that they “Rather, they illustrate a range of possible outcomes”.⁸ In these scenarios they explain convincingly that the range of expected displacement is very broad, depending on how rapid adoption is and what the economy-specific reactions are. They also suggest that the likely outcomes will differ very much between emerging and advanced economies. These are points we have argued in our analysis, especially that economy-specific starting points will be very influential about the way the fourth industrial revolution will impact the different parts of our region.

McKinsey (2017) suggest that measured as a proportion of current work activity hours, automation will have displaced by 2030 in China between 15 and 31 percent of the total work hours, in the US between 23 and 44 percent, with Japan topping the range with displacement between 27 and 50 percent by 2030. In contrast, Mexico’s range is 13 to 26 percent and India’s 10 to 19 percent. To put this in some human perspective, these scenarios are talking about worker displacement of approximately between a quarter and half a billion people by 2030. Given the enormity of such numbers, the last question we will address in this chapter is whether the regional policy community believes that existing education, labor and education institutions and infrastructure are prepared for the Fourth Industrial Revolution and what aspects are those of more, or less concern in each sub-region.

How well developed are the relevant areas of policy in the region? How well-prepared are the institutions and how aware and ready to act are the core stakeholders when the impacts of the Fourth Industrial Revolution require economic, political and social solutions? As the current political turmoil experienced in several regions of the world indicates, core institutions are challenged and some of the benefits deriving from past progress are endangered, including the benefits from freer trade, international cooperation, and globalization. Well-prepared institutions are critical in this context.

The strong expectations that many jobs will be lost, and that new jobs will be created, alongside with the anticipated high levels of mismatch due to new technologies underscore the widely held view that education, labor and social policy will need to play a critical and active role in managing the impending technological transformation safeguarding economic development whilst also protecting the weakest and most vulnerable. Our overall assessment of the region’s preparedness to deal with the training, upskilling and possible disruption coming from new technologies is sobering and should constitute a call for action in policy circles. Social policy, education systems and labor markets are all deemed by stakeholders as starkly unprepared for dealing with the disruptions that are likely to come. Responses between advanced and emerging economies differed only minimally.

⁸ Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation (2017) McKinsey Global Institute.

Figure 2.7: How prepared are system for change? (Emerging Economies)

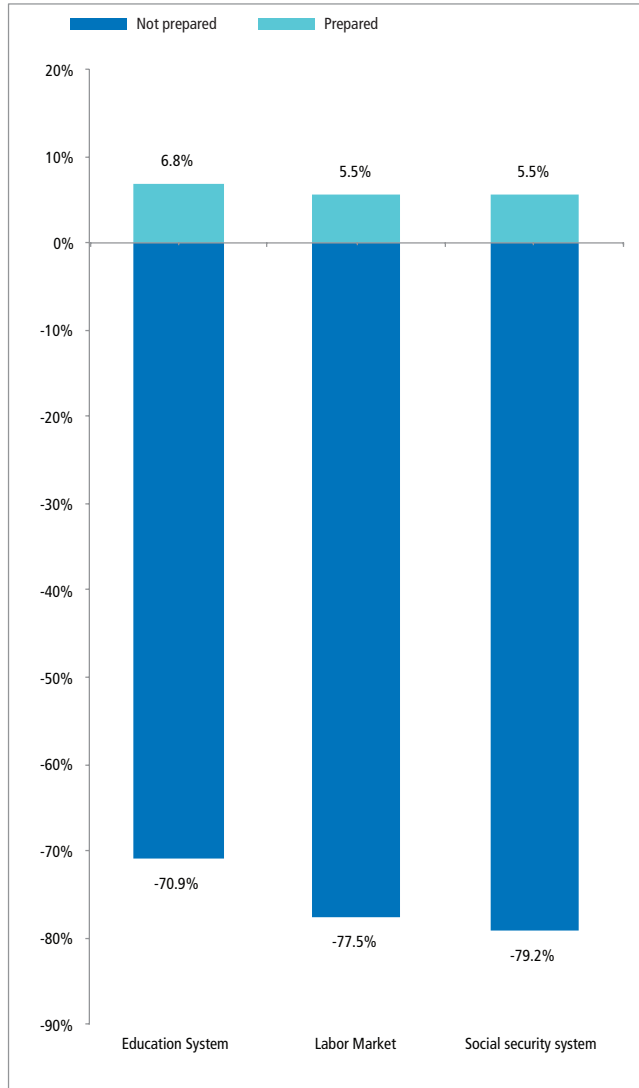
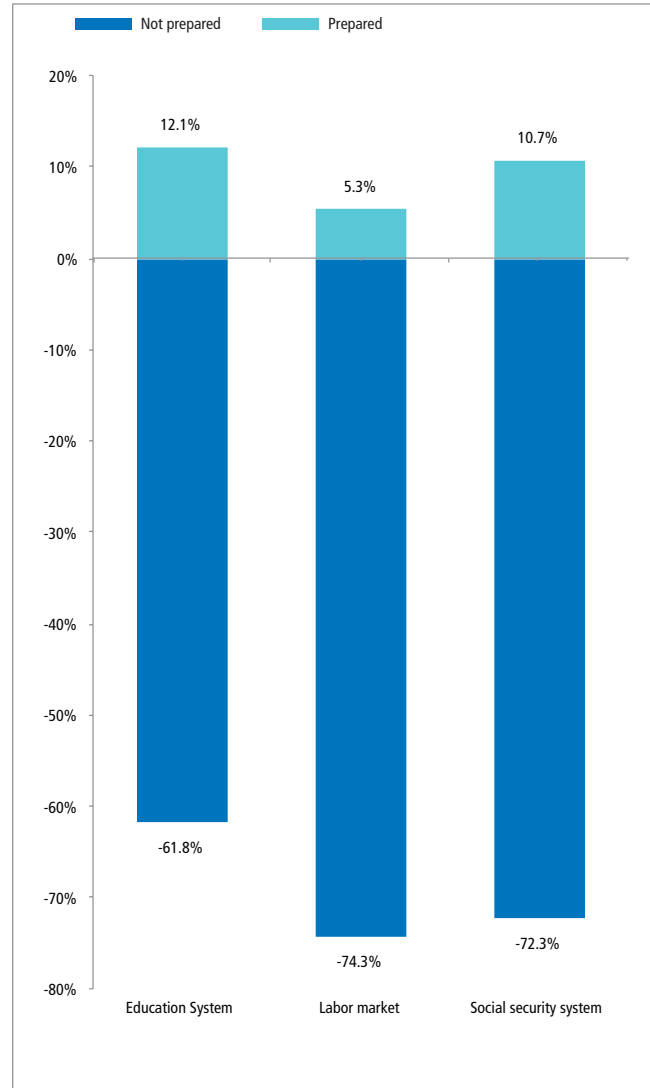


Figure 2.8: How prepared are system for change? (Advanced Economies)



Source: PECC Survey on the State of the Region 2018
 Question: Please rank the following in terms of their preparedness to deal with the training, upskilling and possible disruption coming from new technologies in your economy.

The survey asked further detail on specific aspects of education, labor and social policy in the respective economies, shown in Tables 2.6 and 2.7 below. As Figures 2.7 and 2.8 above have already forewarned us, there were very low levels of satisfaction across the region on the match between educational training and the needs

of the economy as well as on the levels of cooperation between education providers and employers. These are issues that are hotly debated (see Box 3: Perspective on the Role of the Education System by Gary Hawke).

BOX 3 PERSPECTIVE ON THE ROLE OF THE EDUCATION SYSTEM

Contributed by Professor Gary Hawke, Member, NZPECC, former Head of the School of Government and Professor of Economic History, Victoria University of Wellington, Fellow of the Royal Society of New Zealand

Like other PECC economies, New Zealand faces the challenge to its education system posed by the changing needs of employers. The focus is often tertiary education but more attention should be paid to what is done in schools.

Employer complaints should not be taken at face value. Masters complained about apprentices in the Middle Ages (and probably had more reason when apprentices were lodged in the family homes of their employers). Each education level has an incentive to complain about the outcome from earlier stages - secondary schools about primary, universities about secondary schools. Skepticism is again the appropriate response.

Teaching is a skilled art. It is a mistake to see learning as like pouring knowledge into empty vessels. It is equally a mistake to think that undirected student activity is usually an effective vehicle for learning. The skill of teaching falls between these extremes - it is a mixture of directing and facilitating.

What is its objective? Employers when looking beyond the immediate need of their businesses generally produce demands like that generated by the PECC survey: i.e. they seek initiatives that help to build labor force skills in the following areas:

- Critical thinking
- Complex problem solving
- Creativity
- Cognitive flexibility
- Judgement & decision making

These are essentially the same as the OECD was reporting in the 1980s. They are “*soft skills*” rather than direct subject knowledge, or ability to complete immediate tasks such as hammer nails in, run a spreadsheet, or operate a complex piece of engineering equipment.

The New Zealand curriculum responded by defining core competencies:

- Thinking
- Relating to others
- Using language, symbols, and texts
- Managing self
- Participating and contributing

There is no gap between business demands and the aims of the education system.

There can be questions about achievements. The essence of schooling is to engender the core competencies using what has been learned over centuries. Disciplines have been developed and found useful as vehicles for learning. Some are longstanding such as Literary Studies, History, or Mathematics. Others have been developed more recently such as Design, and the traditional subjects themselves change dramatically over the years. The subjects can become sources of great enjoyment although they do not always do so. But the distinctions among them, while still useful for cataloguing library books and for creating school timetables – both activities of diminishing value are not crucial for the purpose of education. The aim is learning through subjects rather than learning about subjects. The key competencies of the curriculum are not how teaching should be organized; even what are often seen as the fundamental building blocks of learning, literacy and numeracy, are not best developed by explicit courses on literacy and numeracy.

We ask teachers to report on student achievement in subjects. We also ask teachers to provide judgements about the capability of students in relation to the key competencies. The big challenge to the New Zealand school system is developing teacher abilities in respect of the latter; that is what employers want.

Much of this applies also to tertiary education. Managing the transition from the education system to employment is not a matter of learning specific skills. It is mostly a matter of developing knowledge and aptitudes as defined in the core competencies. One of our problems is that many teachers have little knowledge of any employment other than their own and it is not easy for many parents to provide it. That is a challenge for business - make employment comprehensible and attractive.

Even more the challenge is for employers to build on foundational education. The requirements of the future workforce are probably not even known now. Lifetime education is crucial. Every employing entity should be a learning environment. The tertiary sector would then be in a position to provide the new knowledge and aptitudes which business requires.

Complaints from the sidelines about relevance are useless.

When asked how satisfied they are with specific labor and education issues in their economy (on a scale of: Not at all, Slightly; Moderately, Very; Extremely) stakeholders responded with very low levels of satisfaction: the majority of their answers were in the two

lowest satisfaction categories and only rarely did the two highest satisfaction categories put together reach the 10 percent mark. Tables 2.6 and 2.7 present this rather alarming evidence in some detail.

Table 2.6: Satisfaction with labor and education issues by stakeholder (% of respondents who said that they were not at all satisfied or only slightly satisfied with the following in their economies)

Satisfaction with labor and education issues (percentage in lowest two satisfaction categories)	Average	Business	Government	Non-government
Labor Market related factors				
Freedom to hire and dismiss employees	53	55	47	55
Wage and working hour flexibility	65	62	69	65
Ability to secure skilled staff	63	69	58	61
Cooperation between education providers and employers	67	72	66	64
Match between educational training and needs in the economy	73	84	67	69
Education and Skills related factors				
Other university education including postgraduate	44	44	41	46
STEM (science, technology, engineering and maths) university education	59	60	59	57
Vocational education and training and apprenticeships	63	58	60	67
Business management education	44	50	36	46
Math, science and digital education	64	66	63	64
Secondary schooling	58	62	52	58
Child care, early childhood education and primary schooling	61	61	54	64
Number of areas of concern out of a total of 12		8	1	5

Note: Percentage of Not at all satisfied or Slightly satisfied responses, by stakeholder. In **bold** and underlined are areas of concern, defined as instances with above average low satisfaction incidence (i.e. lower satisfaction than the regional average).

Source: PECC Survey on the State of the Region 2018

Table 2.6 focuses on low satisfaction responses as indicators of areas of concern and shows the proportion of responses where the answer was either *Not at all satisfied* or *Slightly satisfied*, for the three categories of stakeholders, Business, Government and Non-government. The proportion of stakeholders who express concern is alarmingly high. The lowest concern level is about university

education (with “only” 44 percent respondents expressing concern) and the highest is about the low match between educational training and the needs in the economy (with 73 percent of respondents expressing concern). The concern about “skills for growth” come through in several ways.

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Concerns regarding skills and the labor market are expressed by high dissatisfaction about the ability to secure skilled staff (at 63 percent) and about the cooperation between education providers and employers (at 67 percent). These concerns are corroborated by the high level of concern about Maths, science and digital education as part of school education (at 64 percent compared with 58 percent for secondary and 61 percent for primary schooling) and STEM in the universities (at 59 percent, compared with 44 percent for business management education and 44 percent for other university education). As if these concerns were not enough by themselves, it is troubling to see that they are much more strongly expressed by businesses (in 8 out of 12 areas their concern was above average) with government respondents expressing an area as above average concern only once (about wage and working hours flexibility). Non-government stakeholders score a 5 out of 12. These differences suggest that information is not flowing optimally and that channels of communication and information as well as research in these areas should be considerably strengthened. The “*common sense*” question is, if satisfaction is low at this (early) stage of the Fourth Industrial Revolution’s rollout, how can we expect that our policy responses will be adequate when the change intensifies and becomes faster?

Table 2.7 below examines the geographic dimension of the dissatisfaction about labor and education issues. For reasons that need further investigation, respondents from Pacific South America express concern with all issues they are asked. With the exception of university education (other than STEM) where they are dissatisfied the least, in all other areas their expression of concern is very wide. Especially striking is their concern about Math, science and digital education at school (at 85 percent), STEM at university level (at 73 percent) and problematic match between educational training and the needs of the economy (at 80 percent). The next geographic area to show wide levels of concern is North America with 8 out of 12 areas above average, followed by Southeast Asia scoring 5 out of 12 and Northeast Asia and Oceania scoring 3 each out of 12. Notably Northeast Asia expresses the widest dissatisfaction about wage and working hours flexibility and early and primary school education, while Oceania reports low satisfaction about the cooperation between education providers and employers and the lowest dissatisfaction with labor market flexibility, in both hiring/dismissal and wages/working hours flexibility.

Table 2.7: Satisfaction with labor and education issues by geography (percentage)

Satisfaction with labor and education issues (percentage in lowest two satisfaction categories)	Average	North America	Northeast Asia	Oceania	Pacific South America	Southeast Asia
Labor Market related factors						
Freedom to hire and dismiss employees	53	53	50	45	64	54
Wage and working hour flexibility	65	64	72	44	74	64
Ability to secure skilled staff	63	64	57	63	68	64
Cooperation between education providers and employers	67	73	62	70	73	62
Match between educational training and needs in the economy	73	78	66	67	80	77
Education and Skills related factors						
Other university education including postgraduate	44	42	46	44	48	40
STEM (science, technology, engineering and maths) university education	59	62	47	59	73	61
Vocational education and training and apprenticeships	63	78	50	63	70	62
Business management education	44	44	44	49	55	35
Math, science and digital education	64	80	45	63	85	65
Secondary schooling	58	64	53	53	71	52
Child care, early childhood education and primary schooling	61	69	65	53	69	48
Number of areas of concern out of a total of 12		8	3	3	12	5

Source: PECC Survey on the State of the Region 2018

Note: Percentage of Not at all satisfied or Slightly satisfied responses, by geography. In **bold** and underlined are areas of concern, defined as instances with above average low satisfaction incidence (i.e. lower satisfaction than the regional average).

The overall picture we see from Figures 2.7 and 2.8 and Tables 2.6 and 2.7 is a widespread perception of unpreparedness and low levels of satisfaction with the way education and labor markets are handled. The high levels of dissatisfaction in North America may be the result of the Fourth Industrial Revolution having already made different progress in that part of the region (e.g. with much shifting from manufacturing to services, or with capital and technology

outflows due to industrial unbundling) than in Southeast and Northeast Asia where both manufacturing and services have progressed more strongly, but from a lower starting point. It is also important to note that, with the exception of Northeast Asia, which is clearly dominating the statistics of its geographic area, math and science education are of major concern everywhere else in the Asia Pacific region.

BOX 4 THE FUTURE WORK FORCE

Interview with Scott Price, Chief Transformation Officer, UPS

How do you see technology transforming your company's business model?

Most industries are being disrupted by technology. This creates the opportunity to develop new business models to better serve existing needs. UPS is no exception. We are using technology to enhance our performance and develop new solutions for our customers, giving them the flexibility and capabilities, they need in this age of technological advancement. In the process, we are transforming ourselves into a technology company capable of supporting the most complex supply chains and enabling the ever-changing global trade. In fact, this is not the first time we have leveraged technologies to transform ourselves and to serve our customers better. Over the course of our 111-year history, UPS has been successfully integrating advancing technologies in our operations.

The industrial revolution of our time is being driven by information technologies. At UPS, we are using a wide range of information technologies to develop our smart global logistics network. These include: data analytics, artificial intelligence (AI), machine learning, blockchain and others. UPS's smart global logistics network refers to our digitally and physically connected facilities, fleet and information systems. Information technologies help us synchronize our physical assets and activities across the world, allowing us to become more efficient and sustainable and provide better services to our customers. Here are some notable examples of the information technologies that we use:

- **Network Planning tools (NPT) for network optimization:** NPT maximizes efficiency in our transportation routes and facilities, even when volumes

spike and destinations change. By applying *advanced analytics, artificial intelligence, and operations research*, these tools optimize the flow of up to 60 million packages in our U.S. network each day. NPT is in development and will have a rolling release until it is fully deployed in 2020.

- **Enhanced Dynamic Global Execution (EDGE) for facility optimization:** EDGE uses *real-time data* to enhance real-time decision-making inside our facilities. These proprietary programs tell us where and how packages should be sorted and can locate operational assets instantly. EDGE is comprised of more than 20 separate projects that are being developed and tested now, with full deployment planned in phases through 2020.
- **On-Road Integrated Optimization and Navigation (ORION) for route optimization:** Our groundbreaking *route optimization software* determines the most efficient delivery route each day. Deployed across the U.S. and being piloted in Canada, Germany, and the U.K., ORION is essential to reducing our carbon footprint by minimizing UPS's total miles driven.
- **Delivery Information Acquisition Device (DIAD) for delivery optimization:** Drivers use this handheld tool when delivering packages. Our next generation DIAD will integrate *artificial intelligence and other technology* enhancements to enable drivers to make better decisions that help us meet our customers' unique needs and preferences.

What are the key workforce challenges from your perspective? How do they differ from market to market?

It is critical to develop a workforce with skills that meet current needs, while also hiring and maintaining talent that can learn skills for success in the future. The rapid pace of technological change means that training and upskilling programs are necessary for employees. We are planning ahead of the demand, but identifying the right skills is also a challenge. For example, the World Economic Forum predicts that by 2020 more than a third of desired skill sets of most occupations will be comprised of skills that are not yet crucial to the job today.

Furthermore, there is a need to pursue concerted efforts from various stakeholders to close the skills gap in labor. There must be an adaptable workforce that embraces technology changes and is willing to acquire new skills. There are significant incentives for partnerships between businesses, governments and education providers to design and implement a 21st century curriculum. As an example, in 2017, UPS collaborated with Georgetown University for a Master's class on new urban technologies, which encourages students to apply real data to urban environment policy issues.

The skills gap exists across markets. Studies by McKinsey find that almost 40 percent of American employers say they cannot find people with the skills they need, and in China the demand for skilled labor is likely to outnumber the supply by 24 million people by 2020. At the same time, different markets face disparate problems. For example, ageing populations, in economies such as Japan and Korea, have shrinking youth cohorts, which may necessitate wholesale reskilling among older workers.

What are you doing to adjust to the skills requirements coming from technological change? Do you provide training or work with educational institutions?

We believe professional development is a shared responsibility, so UPS invests about \$565 million annually on training programs to help employees further their careers within the company. In the U.S., we recently pledged to provide enhanced workforce opportunities to more than 50,000 employees through higher education, apprenticeships, up-skilling and retraining. Our aim is to help our employees prepare for rewarding positions that meet their short-term goals and further their development for life-long careers.

We offer both internal trainings, as well as programs with educational institutions. These are available for employees ranging from entry-level to mid-career, including management employees. For example:

- We partner with local governments and community colleges to offer “Earn & Learn” programs to UPS employees in the U.S. This allows employees to work part-time while attending school. In addition to regular employee benefits, participants receive tuition deferment and book reimbursement, as well as opportunities to become full-time employees upon graduation. In fact, most UPSers start their careers at UPS as part-time employees.
- UPS's Intergrad is a technologically advanced training center for drivers, helping them better use technologies to enhance their performance and safety. In the training centers, the learning experience is enhanced through advanced technologies such as 3-D simulation and virtual reality (VR), in addition to the traditional classroom instruction and hands-on training. This state-of-the-art training center was developed through a private-public partnership between UPS and the Department of Labor. We now have 11 facilities in the U.S. and Europe.
- UPS offers recurrent training annually in order to help our workers keep up with new vehicles and technology. This includes targeted training for technicians when new hybrid or electric vehicles arrive at their facilities. We also provide training for a wide range of services and equipment due to the increasing diversity of UPS's vehicle fleet, which requires technicians to be proficient on all types of scan and diagnostics equipment. New technicians also receive training on the emerging technology of telematics and condition-based maintenance, the latter of which offers proactive notification of impending vehicle component failure.

What role do you see for regional cooperation in addressing these challenges?

As mentioned, markets in the region share similar workforce challenges. We can address these issues through partnerships with various stakeholders, including employers, employees, labor, educators and governments. Stakeholders in many markets have joined together to solve these challenges and find ways to help business and labor better prepare for the future of work. For example, the U.S. recently expanded an apprenticeship program, in which UPS is one of the business participants. Other APEC members, such as Singapore, Korea and Japan among others, have also established national policy councils to look into the issues of job creation and the future of jobs. Therefore, it would be useful for governments and other stakeholders in the region to learn from each other's experiences. As a platform for testing new policy ideas and capacity-building, APEC is an ideal place for all our stakeholders to discuss and find solutions for the future of work.

CONCLUSION

This chapter has examined the future of work in the Asia-Pacific region in the face of the Fourth Industrial Revolution. This is a vast topic and we have just begun to scratch the surface of only few of its most important aspects. The introductory section builds the context and sets the scene. The examination of *“Artificial Intelligence for Everyone”* in Box 1 deals with the new aspects of the change that the Fourth Industrial Revolution is bringing in terms of ambition and benefits and in terms of potential economic, social and institutional risks that will have to be managed. It highlights the role of diversity within the Asia-Pacific region and explains the need of social and economic preparedness.

As demonstrated by the results of PECC’s survey of the regional policy community, there is a clear expectation that automation will lead to sizeable workforce decreases in some sectors but that there are also likely to be increases in other sectors that will be the incubators of new technologies and growth, the view being that there will be modest overall decreases in the size of the workforces by 2030 and that these would be unevenly spread within the region.

We then focused on occupations as the most relevant categorization of work, in order to identify and possibly measure the worker displacement and jobs creation impact of the Fourth Industrial Revolution. Science and engineering, ICT, health and care related are expected to be the big winners at both higher education and vocational education levels. Job creation is expected at its strongest in North America and in SE Asia. There are strong differences by sub-region in the expectations for job displacement by occupation, we presume due to the different stage of the economies concerned.

The finding that skill shortages and skill surpluses are expected to coexist is a critical aspect of the expectations regarding the impact of the Fourth Industrial Revolution on workforces. There is no reason why we should be assuming that displaced workers would be readily employable to any of the newly created technologically advanced jobs. Mismatch will play a large role in the labor markets of the future and we already see substantial differences by geography and by occupation.

Box 2: The APEC App Challenge: Skills for a New Generation offered at this stage an example of the many practical aspects of building skills and training in the context of an emerging economy and the social and economic transformation that is facilitated by the Fourth Industrial Revolution.

The analysis of mismatch continued with a focus on the differences in mismatch between emerging and advanced economies and how the patterns of skill shortages were qualitatively rather similar (presumably because, at least in part, they are motivated by the same type technologies) but the patterns of skill surpluses were not (presumably because of the very different social and economic institutions that are designed to support displacement and re-

training). We found that the more mechanical skills were predicted to be the least likely to be in shortage in the future, whilst critical thinking, complex problem solving, judgement & decision making, cognitive flexibility and creativity were predicted to be in future shortage.

Having established the degree to which we expect to see displacement and job creation and, also some of its occupational and geographic aspects we turned to the question of how prepared the region is in terms of its education, labor and social institutions and infrastructure. Even the most conservative estimates paint a very alarming picture about the extent of a global problem displacement with all its labor market mismatch, education up-skilling and re-training and social care for those who are left behind without much hope of joining in. The responses from the PECC Survey on the state of the Region 2018 were sobering and the concerns they identified will require more attention and research. A very small percentage of stakeholders reported that they believe their economies to be ready and the more detailed questions revealed diverse and intense concerns about many highly important aspects of education, labor markets and social support.

APEC has already begun to lay the groundwork for addressing these issues. In 2017 at their meeting in Danang, regional leaders endorsed the APEC Framework on Human Resources Development in the Digital Age. The Framework sets policy directions and measures to support economies to prepare workers for present and future challenges. It calls for APEC to be used as a platform for policy dialogue and cooperation on these issues. It seeks to complement existing initiatives, including the APEC Education Strategy and contribute to global efforts including the ILO’s *“future of work centenary initiative”* and the United Nations’ Sustainable Development Goals, particularly Goal 4 to ensure inclusive and equitable quality education for all and promote lifelong learning and Goal 8 to create new dynamism for growth, achieve sustainable, innovative, and inclusive growth, employment and decent work for all.

This chapter is not ending in an unequivocally optimistic note. We anticipate unprecedented change, perhaps not so much in the net numbers of jobs growth, but in the very large numbers of workers that will need to find their way out of displacement and into a different labor market, which requires very different skills and where many things are done very differently. As identified in the interview with UPS’ Chief Transformation Officer, Scott Price, businesses are undertaking efforts to prepare workers for the change but these need to be scaled up. This will not be an era for people who are afraid of or dislike change. It will be an era that will unleash massive opportunities for those who embrace change. It will also be an era which will challenge our social and ethical foundations, as we try to establish new ways to ameliorate the outcomes from skills and occupational mismatch throughout the globe. Above all, this chapter is sending the message that, ready or

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not, the Fourth Industrial Revolution is coming to the Asia-Pacific region and the region is declaring itself woefully unprepared. The urgent need for educational and labor market reforms is clearly stated, as is the need for closer collaboration between business,

government and academia. Closer cooperation by stakeholders will be required and APEC is already laying the foundations for this. A new Fourth Industrial Revolution Taskforce should be formed by APEC to produce research, advice and guidance for all stakeholders.

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CHAPTER 03

INDEX OF ECONOMIC INTEGRATION IN THE ASIA-PACIFIC*

CONTRIBUTED BY DR. BO CHEN[†]

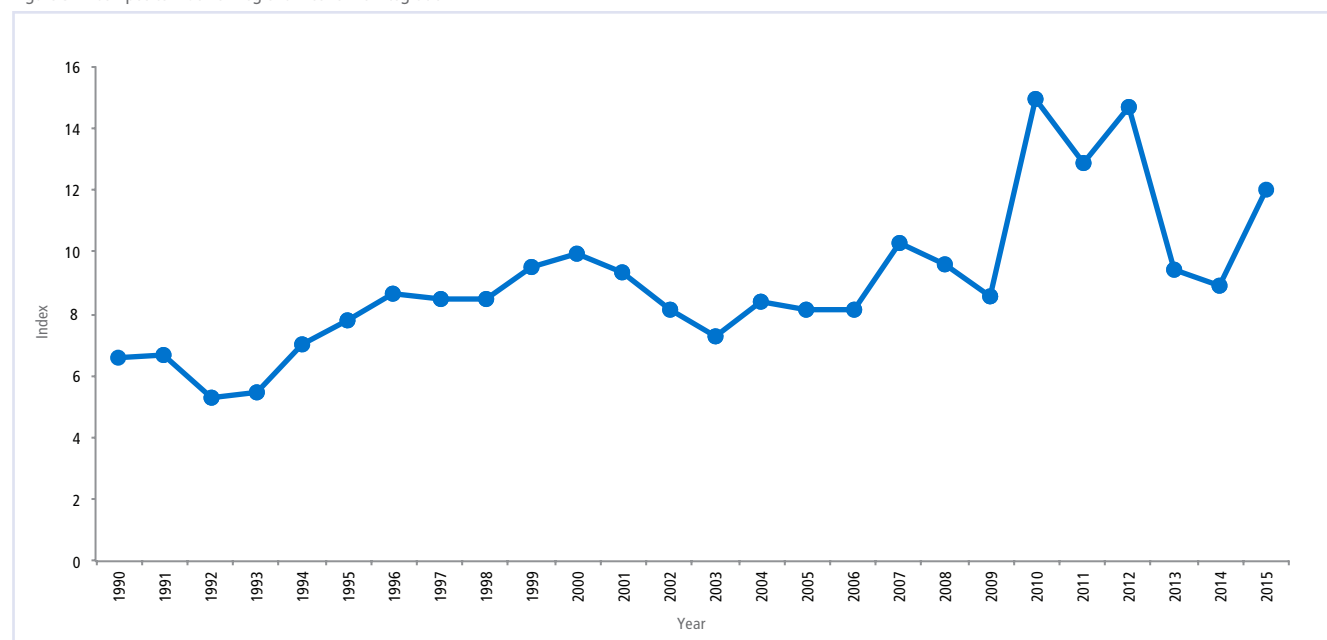
The latest update to PECC's index of economic integration in the Asia-Pacific region shows a rebound after two consecutive years of falling. The rebound comes mainly from growth in intra-regional flows of tourists as well as greater levels of convergence in educational expenditure.

The index measures the degree of integration taking place in the Asia-Pacific region based on intraregional flows of: goods; investment; tourists; and five measures of convergence: gross domestic product (GDP) per capita; share of non-agriculture to GDP; the urban resident ratio; life expectancy; and share of education expenditure in gross national income (GNI). The index was developed in 2008 as a tool to measure the degree of integration taking place in the Asia-Pacific. Regional economic integration has become a core objective of the Asia-Pacific Economic Cooperation (APEC) forum. The process of economic integration is commonly

defined as the intra-regional freer movement of goods, services, labor, and capital across borders.

The degree of economic integration can be analyzed at bilateral, regional, and global levels. Even though the Asia-Pacific region is not covered by a single trading agreement, there is much anecdotal evidence to suggest that it is becoming more integrated. It is well known that parts of the region are already highly integrated through production networks that facilitate trade of intermediate and finished goods across borders. Since 1998, many economies in the region have negotiated bilateral and sub-regional free trade agreements with partners in as well as outside the region. APEC Leaders have also endorsed a proposal to investigate the idea of a Free Trade Area of the Asia-Pacific (FTAAP), which if successful, would constitute the largest regional trading bloc in the world.

Figure 3.1: Composite Index of Regional Economic Integration



* For approach details, data sources and treatment, please refer to Bo Chen and Yuen Pau Woo (2010), "Measuring Economic Integration in the Asia-Pacific Region: A Principal Components Approach," *Asian Economic Papers*, Vol.9(2), pp. 121-143.

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3. INDEX OF ECONOMIC INTEGRATION IN THE ASIA-PACIFIC

An important feature of the index is that it excludes trade and investment flows among geographically contiguous sub-regional trading partners, namely the North American Free Trade Agreement (NAFTA), the ASEAN Free Trade Area, and Australia-New Zealand Closer Economic Relations. It also excludes flows among China, Hong Kong (China), and Chinese Taipei. This is to control for the effect that sub-regional flows may have on the index, whereby a very high degree of integration among, for example, NAFTA economies could result in a falsely high measure of integration with the Asia-Pacific region as a whole.

Furthermore, since trade, investment, and tourism measures are calculated relative to global transactions, the index will rise for a given economy only if that economy's share of intraregional trade/investment is growing relative to total trade and investment.

The weights given to each dimension are determined using principal component analysis.¹

Table 3.1: Weights Used

Composite Index

Category	Weight (%)
Convergence*	23.0%
Trade	29.0%
Foreign Direct Investment (FDI)	12.0%
Tourism	36.0%

As shown above, intra-regional trade flows account for just under a third of the total weight of the index and tourism just over a third. Flows of foreign direct investment are about a tenth of the index and the convergence sub-index just over a fifth.

* Convergence Sub-Index

Category	Weight (%)
GDP per capita	13.0%
Non-agriculture share of GDP	13.0%
Urban ratio	9.0%
Life expectancy	15.0%
Education expenditure share of GNI	50.0%

The convergence measures are premised on the notion that integration will lead to greater uniformity among the economies. Education expenditure as a share of GNI makes up half of the weight of the sub-index with per capita incomes, non-agricultural share of GDP, the urban ratio; and life expectancy around a tenth each.

These weights were derived using principal component analysis. As per the methodology, more trade and investment among regional partners may not translate into a higher score on the integration index if, at the same time, partners are diverging in terms of incomes, education expenditure, life expectancy, urbanization, and economic structure.

Caution should be exercised in the interpretation of these findings. The measures chosen for inclusion in the composite index are imperfect indicators of convergence and trade/investment integration. The rankings in turn should not be read normatively as "league tables" in the sense that a higher ranking is superior to a lower ranking. A low ranking may simply indicate that an economy is oriented more globally than regionally, as is likely the case for China and the United States.

Nevertheless, the change in index value for a given economy over time can be read as a measure of its changing economic orientation. The index value for the region as a whole can also be seen as a measure of closer economic ties among Asia-Pacific economies and as one indicator of APEC's success.

The 2018 update to the index is based on the latest data available for the selected dimensions from 2015. Missing data were approximated using standard interpolation and extrapolation techniques.

The most recent figures showed a rebound in the index. Since the Global Financial Crisis, economic integration in the Asia-Pacific has been volatile. The 2018 update (for the indices up to 2015) by economy shows that the overall convergence process continued to rebound, albeit slightly. As a result, 11 out of the 17 Asia-Pacific economies included in this study became more converged against the average mean level of the Asia-Pacific region in the year before.

¹ See Bo Chen and Yuen Pau Woo (2010), "Measuring Economic Integration in the Asia-Pacific Region: A Principal Components Approach," *Asian Economic Papers*, Vol.9 (2), pp. 121-143.

Table 3.2: Comparison of 2014 and 2015 Indices

Index	Convergence Index		Composite Index		Ranking*	
	Economy	2015	Change	2015	Change	2015
Australia	-5.5	-0.2	39.4	2.9	6	=
Canada	24.5	2.7	21.4	4.7	12	▲ 2
Chile	50.7	1.5	34.3	-1.3	9	▼ 2
China	-42.0	8.2	-9.9	2.4	16	▲ 1
Hong Kong (China)	-28.6	-3.3	241.6	12.4	2	=
Indonesia	-37.0	8.7	-1.4	0.6	15	▲ 1
Japan	0.2	-2.4	33.7	8.1	10	▼ 1
Korea	63.2	1.9	76.6	-2.4	3	=
Malaysia	-27.5	-33.3	52.7	4.3	5	=
Mexico	40.0	-1.7	21.2	0.6	13	▼ 1
New Zealand	-50.1	6.0	28.4	5.0	11	▼ 1
Philippines	-89.1	9.2	-10.0	-12.9	17	▼ 2
Singapore	-39.6	3.8	253.3	7.6	1	=
Chinese Taipei	-28.9	5.7	35.2	14.1	7	▲ 4
Thailand	29.5	0.1	72.3	-4.0	4	=
United States	13.9	-5.4	14.2	-5.0	14	▼ 1
Vietnam	-21.4	3.3	35.0	2.7	8	=
Asia-Pacific Region	-6.8	0.6	12.0	3.1		=

Source: Authors' calculations and Chen and Woo (2010).
* Rankings shown in parentheses indicate those from previous year (2014).

The overall convergence index resumes its increasing trend after dropping in recent years. Based on the most recent data available, the deviations from the regional averages of GDP per capita, non-

agricultural GDP share, urbanization, life expectancy as well as education expenditure dropped this year compared to last year.

3. INDEX OF ECONOMIC INTEGRATION IN THE ASIA-PACIFIC

Figure 3.2: Intraregional Trade Flows (% of GDP)

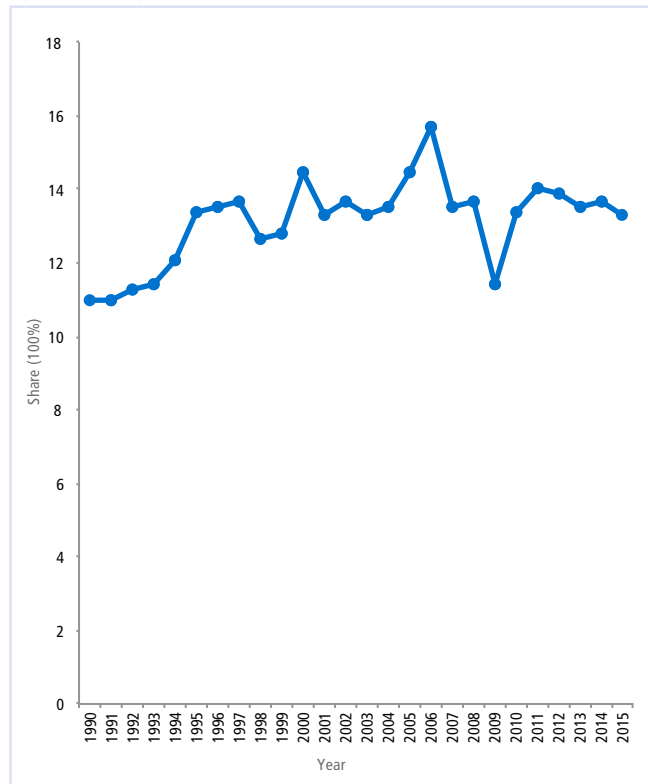
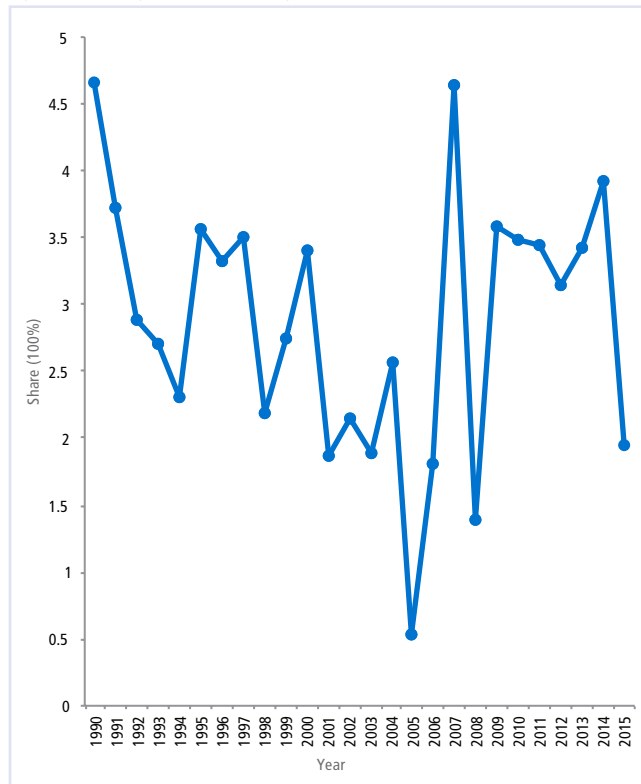


Figure 3.3: Intraregional Flows of Foreign Direct Investment (%)



ASIA-PACIFIC TRADE FLOWS

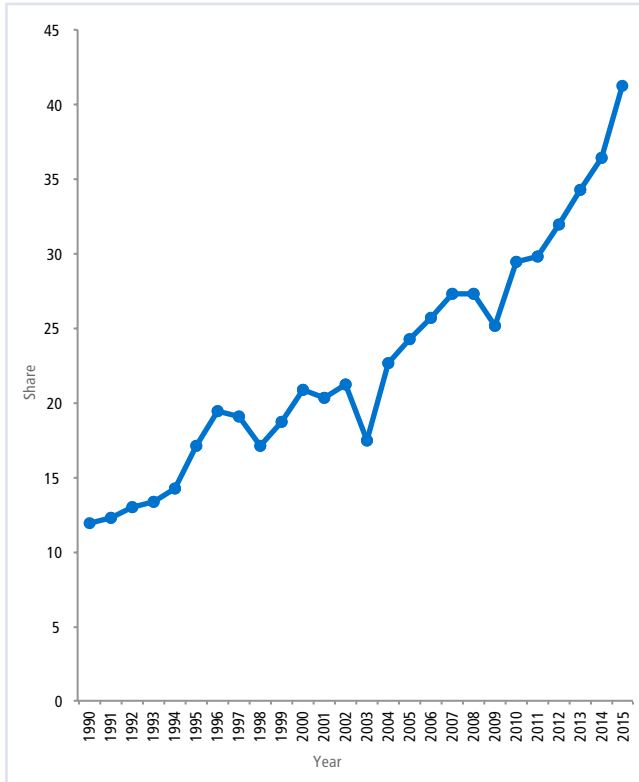
Figure 3.2 shows the share of Asia-Pacific intra-regional imports and exports to regional GDP. Though economic recovery in the region has been substantial as discussed in Chapter 1 of this report, intra-regional trade, while significant, remains below its peak reached before the Global Financial Crisis. The intra-regional trade flow share slightly declined to 13.3% in this year's update from 13.6% compared to the peak reached in 2006. The weak recovery can be mainly attributed to two reasons. First, China's has been experiencing economic structural change since 2012 and its trade growth has lost its pace since then. Second, US economic recovery, though quite robust, does not translate into a strong external demand as expected. It should be re-emphasized here that this index discounts flows among sub-regions: the economies of Southeast Asia, North America and those among China, Chinese Taipei and Hong Kong (China).

The share of Asia-Pacific intraregional merchandise trade recovered from the big hit in 2009. However, the recovery was not robust and the recovery trend has been zigzag. Indeed, only 5 out of the 17 included economies show an increase in their intra-regional trade shares: Vietnam, Mexico, Canada, Hong Kong (China), and Chinese Taipei.

FOREIGN DIRECT INVESTMENT

As shown in Figure 3.3, compared to flows of goods, intraregional flows of investment show a much more erratic pattern. It had a dramatic drop in 2009 due to the Global Financial Crisis and, while it has recovered, it has not been a substantial factor impacting overall integration. Investors still hold sensitive and conservative attitudes towards the regional economic recovery.

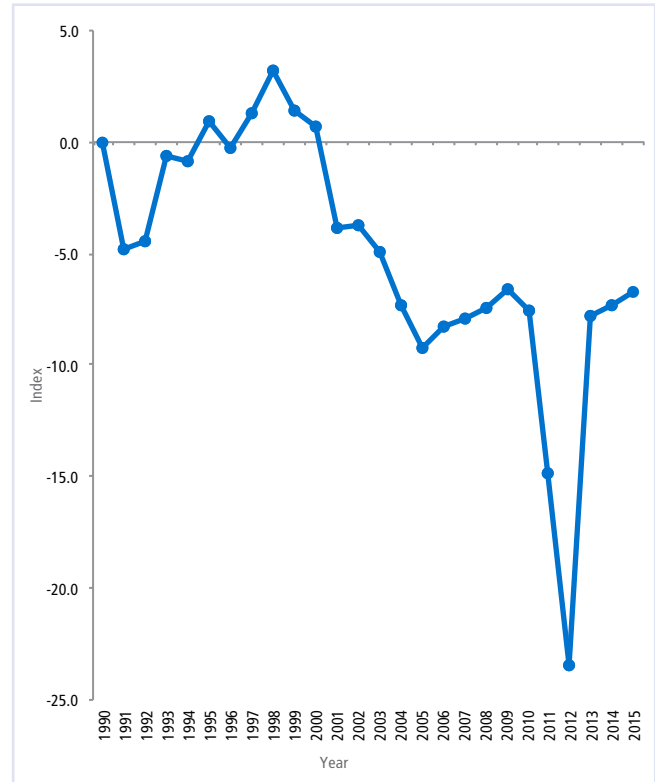
Figure 3.4: Intra-regional Tourist Inflows (% of total)



TOURISM FLOWS

Figure 3.4 shows the recovery trend of the intra-regional tourism. It indicates that the intra-regional tourist share (to every 1,000 citizens in hosting economy of the sample) increased further to reach new heights in 2015. Except for the declines seen in 2007-2009 and 2010-2011, intra-regional tourist flows have grown substantially from 17.5 tourist per 1000 citizens in 2003 to more than 41.2 in 2015, the highest level recorded in our index.

Figure 3.5: Convergence Index

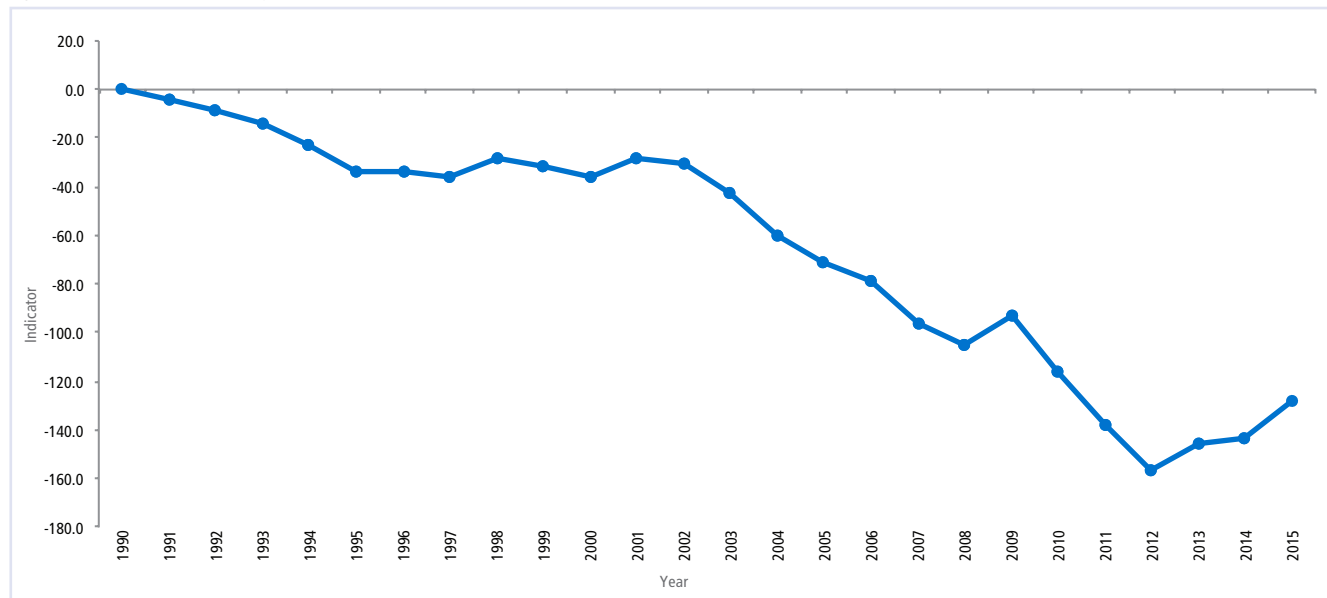


CONVERGENCE INDEX

The sub-index of convergence shows a rebound in overall convergence in the region based on the 5 dimensions of convergence included as shown in Figure 3.5.

3. INDEX OF ECONOMIC INTEGRATION IN THE ASIA-PACIFIC

Figure 3.6: Deviation of GDP Per Capita

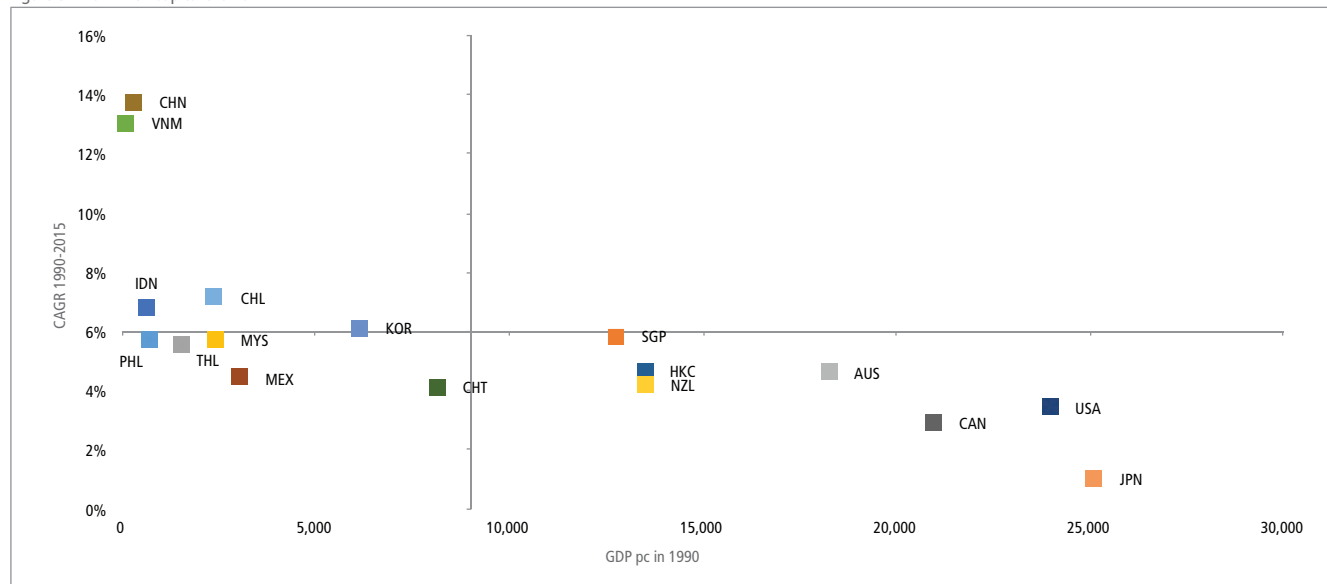


LESS DIVERGING INCOMES

While GDP per capita levels in the region had been significantly increasing from its 1990 level, deviation from the regional average also increased after 2000. Such divergence trend had been slightly mitigated after 2012. It should be noted here that GDP per capita

accounts for just 13 percent of the weight of this sub-index while education expenditure accounts for 50 percent of the weight. Shifts towards convergence in education, even minor ones, could outweigh much larger shifts in income.

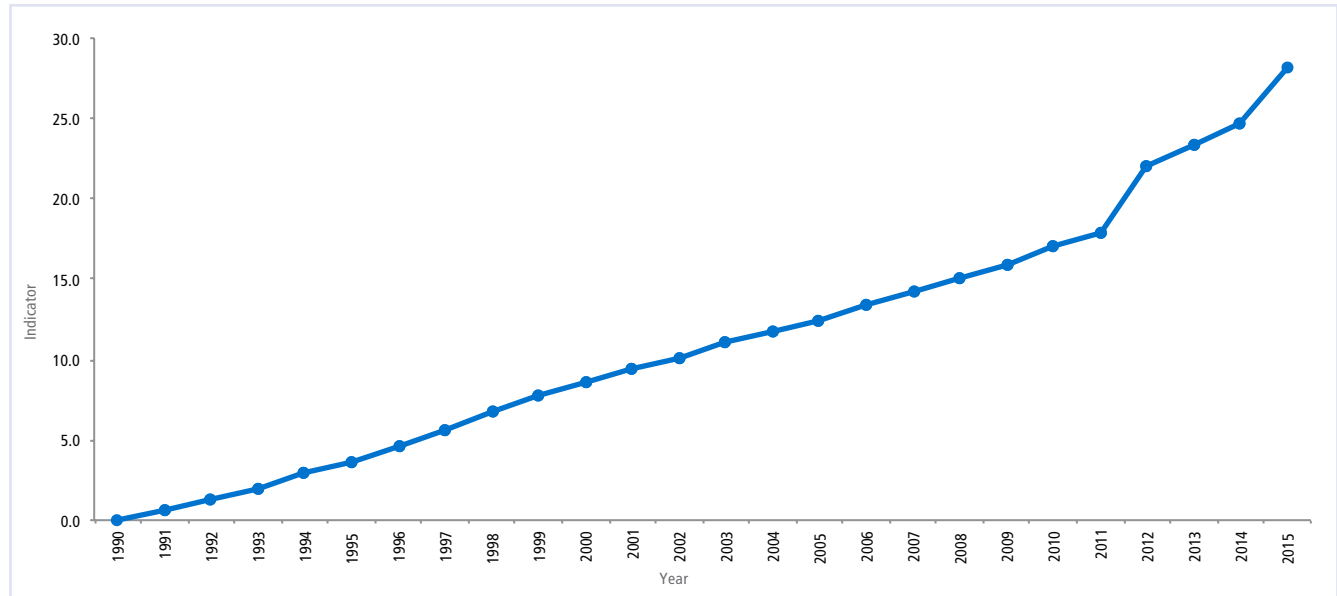
Figure 3.7: GDP Per Capita Growth



Over the entire index period, the divergence in incomes has been driven by differences in growth rates. In 1990, the average GDP per capita in the region was around US\$9000, with average growth rate of 6 percent. However, as expected, some economies that had lower incomes in 1990 have had very high growth rates over above 10 percent a year while others grew at or below the regional

average. Moreover, some with higher incomes continued to perform strongly near the regional average. For incomes to converge, economies with lower starting GDP per capita levels would need to grow at a much faster rate than those with higher starting levels. Figure 3.7 shows the GDP per capita levels of regional economies in 1990 and the average growth rate over the past 26 years.

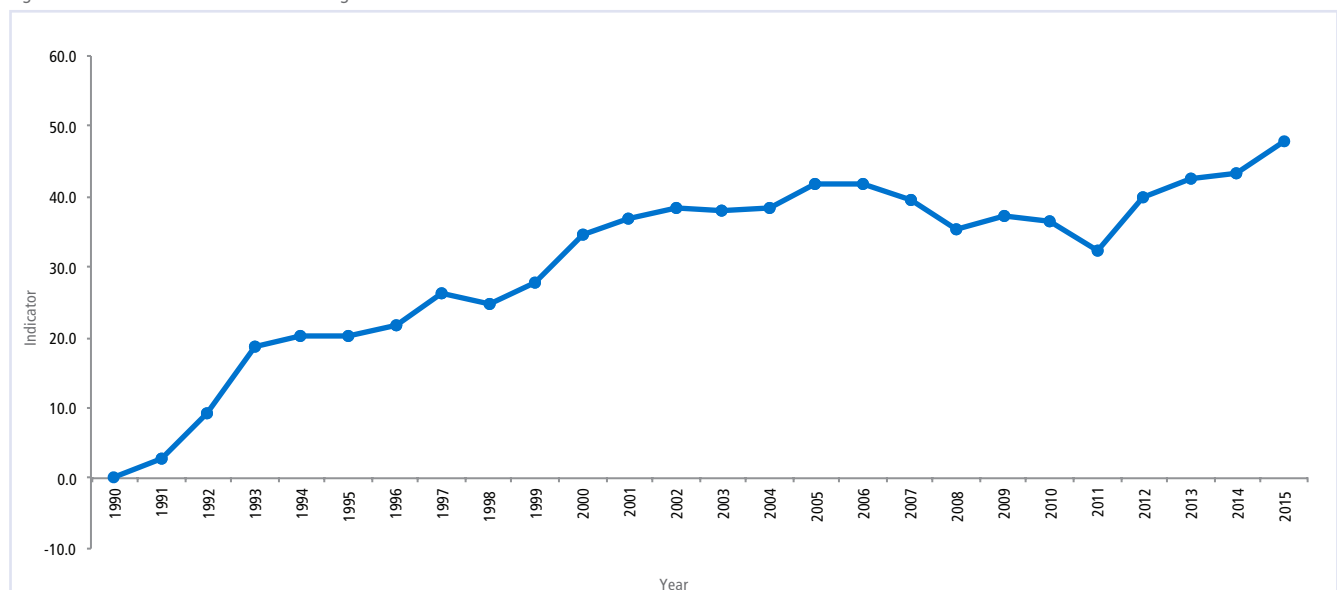
Figure 3.8: Deviation Indicator: Urban Resident Ratio



The pace of urbanization in developing economies in the region has been chasing that of the developed ones throughout the period as represented by the deviation indicator of urban population as shown in Figure 3.8. In 1990, the average urban resident ratio of these 17 included economies was 65.2 percent with a standard

deviation of 21.9. By 2015, the urban resident ratio had increased to 75.1 percent with a standard deviation of 16.2, where all economies showed increase in urbanization and the figures have been converging at a similar rate. As seen in Figure 3.8, this has been a very linear and consistent trend in the region.

Figure 3.9: Deviation Indicator: Share of Non-agriculture in GDP

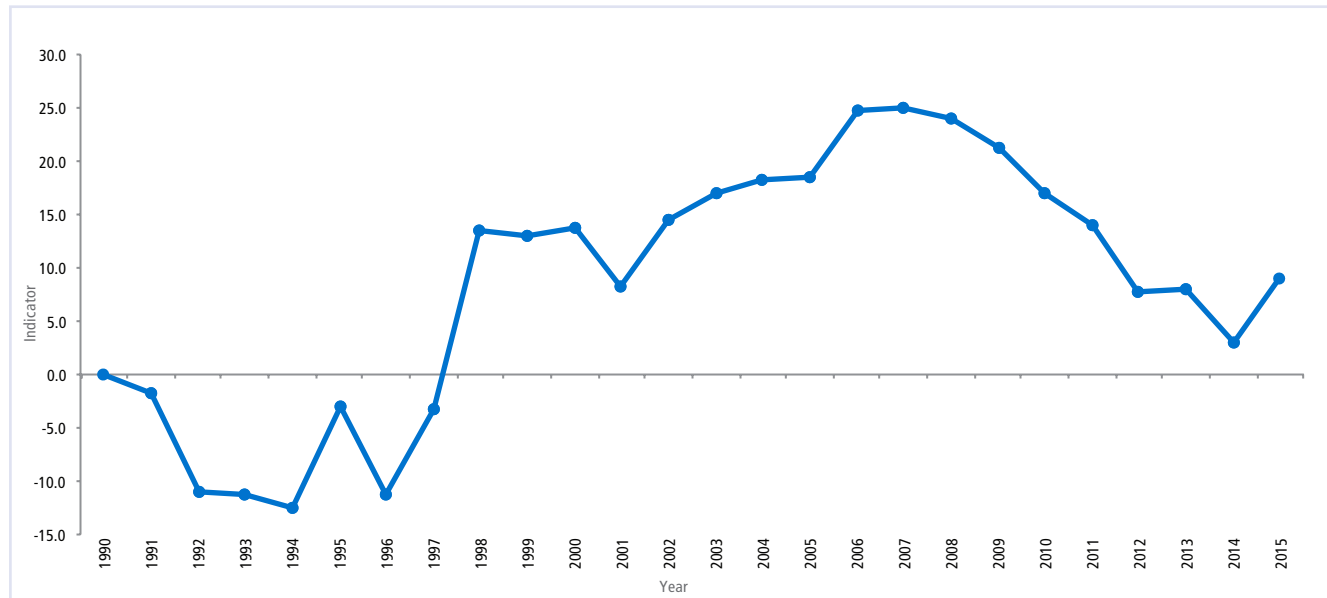


Unlike the convergence shown in the pace of urbanization, the share of non-agriculture in GDP has been much more volatile, with some significant dips taking place in 2007 and again in 2010. However, a strong rebound occurred in 2011 and the convergence level has been back on the rise since then. As shown in Figure 3.9,

the indicator exceeded the previous peak in 2006. According to the data, the average share of non-agriculture in GDP increased to 94.6 in 2015 from the previous peak of 94.0 in 2006 while the standard deviation across the economies shrunk from 4.8 to 4.3.

3. INDEX OF ECONOMIC INTEGRATION IN THE ASIA-PACIFIC

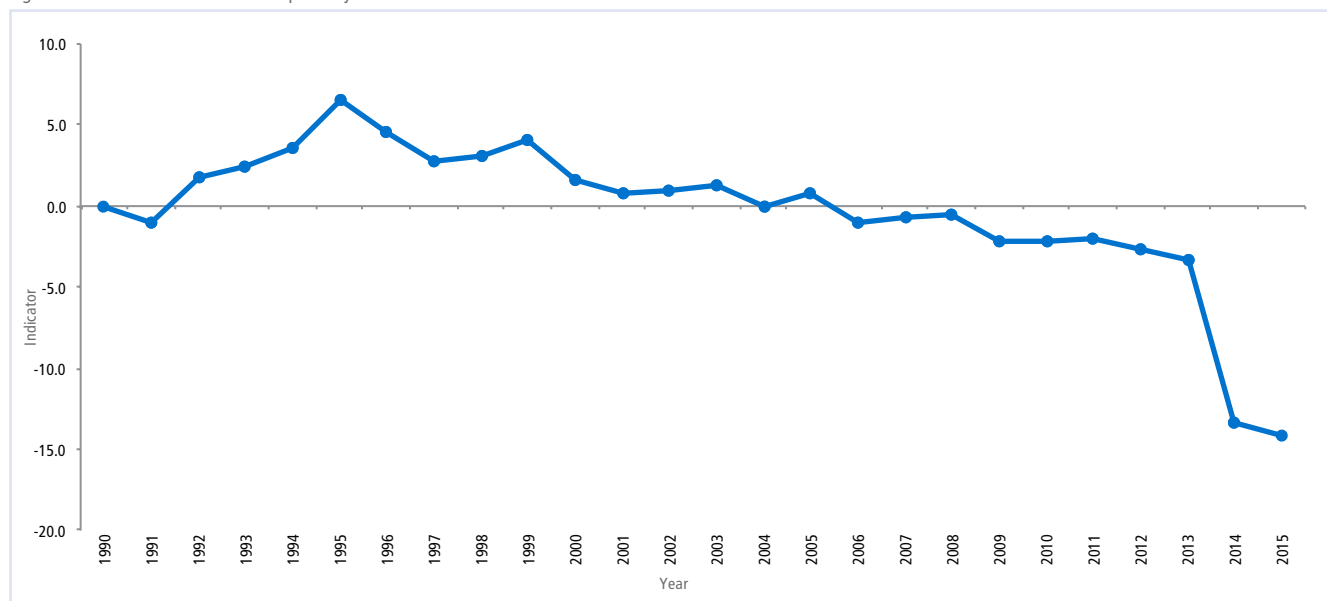
Figure 3.10: Deviation Indicator: Expenditure on Education as a Proportion of GNI



While the proportion of expenditure on education in the region has significantly risen to 4.3 percent compared to 3.42 in 1990, Figure 3.10 shows that the convergence of education expense

share declined from 2008 until 2014. Underlying this decline was significant divergence in the percentage of GDP spent on education by Asia-Pacific economies.

Figure 3.11: Deviation Indicator: Life Expectancy



In 1990, the average life expectancy in the region was 73.6 years with a standard deviation of 3.5. By 2015, it had increased by almost 5 years to 78.6, with a standard deviation of 4.0. As seen in Figure 3.11, between 1990 and 1995, life expectancies had been converging. However, the level of convergence began to decrease thereafter. The latest update to the index shows that the level of convergence in life expectancy in the region is persistently below the level in 1990 after 2006. This means life expectancy is increasing faster in certain economies than others.

When APEC Leaders set out the Bogor Goals in 1994, they set out a vision through which the region would not only maintain high growth rates but also narrow development gaps. While the region has done well in integrating and overall incomes have increased at a dramatic pace, the index shows that there is a long way to go in terms of closing development gaps. Integration is not an end in itself but a means to ensuring that all citizens can achieve their potentials. A broader and deeper economic cooperation in Asia-Pacific region such as the FTAAP is desired to maintain and accelerate to integration process.

ANNEX

A

Table 1: GDP Growth (year-on-year %)

	2016	2017	2018	2019	2020	2021	2022	2023
Australia	2.6	2.2	3.2	2.8	2.7	2.6	2.6	2.6
Brunei Darussalam	-2.5	1.3	2.3	5.1	4.3	7.5	5.9	3.9
Cambodia	7.0	6.9	7.0	6.8	6.5	6.3	6.0	6.0
Canada	1.4	3.0	2.1	2.0	1.8	1.8	1.6	1.6
Chile	1.3	1.5	4.0	3.4	3.2	3.0	3.0	3.0
China	6.7	6.9	6.6	6.2	6.2	6.0	5.8	5.6
Colombia	2.0	1.8	2.8	3.6	3.7	3.7	3.6	3.6
Ecuador	-1.2	2.4	1.1	0.7	1.3	1.7	1.8	1.8
Hong Kong, China	2.2	3.8	3.8	2.9	3.0	3.0	3.1	3.1
India	7.1	6.7	7.3	7.4	7.7	7.7	7.7	7.7
Indonesia	5.0	5.1	5.1	5.1	5.2	5.3	5.3	5.4
Japan	1.0	1.7	1.1	0.9	0.3	0.7	0.5	0.5
Korea	2.9	3.1	2.8	2.6	2.8	2.8	2.7	2.6
Laos	7.0	6.9	6.8	7.0	7.0	6.9	6.8	6.8
Malaysia	4.2	5.9	4.7	4.6	4.8	4.8	4.8	4.8
Mexico	2.9	2.0	2.2	2.5	2.7	2.9	3.0	3.0
Myanmar	5.9	6.8	6.4	6.8	7.0	7.0	7.1	7.2
New Zealand	4.1	3.0	3.1	3.0	3.1	3.1	2.6	2.5
Papua New Guinea	1.6	2.5	-1.1	3.8	3.2	3.4	3.5	3.8
Peru	4.0	2.5	4.1	4.1	4.1	4.1	4.0	4.0
Philippines	6.9	6.7	6.5	6.6	6.6	6.8	6.8	6.9
Russia	-0.2	1.5	1.7	1.8	1.8	1.6	1.3	1.2
Singapore	2.4	3.6	2.9	2.5	2.7	2.7	2.7	2.6
Chinese Taipei	1.4	2.9	2.7	2.4	2.3	1.9	1.9	1.9
Thailand	3.3	3.9	4.6	3.9	3.7	3.5	3.5	3.6
United States	1.6	2.2	2.9	2.5	1.8	1.7	1.5	1.4
Vietnam	6.2	6.8	6.6	6.5	6.5	6.5	6.5	6.5

	2016	2017	2018	2019	2020	2021	2022	2023
Asia-Pacific	3.2	3.7	3.9	3.7	3.5	3.5	3.3	3.3
Emerging	5.7	5.8	5.8	5.6	5.7	5.6	5.5	5.4
Advanced	1.6	2.3	2.6	2.3	1.7	1.7	1.5	1.4

Table 2: CPI Inflation (year-on-year %)

	2016	2017	2018	2019	2020	2021	2022	2023
Australia	1.4	2.0	2.2	2.4	2.6	2.5	2.5	2.5
Brunei Darussalam	-1.6	0.0	0.5	0.5	0.5	0.5	0.5	0.5
Cambodia	3.9	2.2	3.5	3.2	3.1	3.0	3.0	3.0
Canada	1.4	1.8	2.7	2.1	2.1	2.1	2.1	2.0
Chile	2.8	2.3	2.9	3.0	3.0	3.0	3.0	3.0
China	2.1	1.8	2.6	2.3	2.7	2.8	2.9	3.0
Colombia	5.8	4.1	3.1	3.0	3.0	3.0	3.0	3.0
Ecuador	1.1	-0.2	0.7	0.1	0.8	0.9	1.1	1.2
Hong Kong, China	2.4	1.5	2.3	2.1	2.2	2.4	2.5	2.5
India	3.6	4.6	5.1	3.9	4.6	4.3	4.1	4.0
Indonesia	3.0	3.6	3.6	4.0	3.7	3.0	3.0	3.0
Japan	0.3	0.6	1.4	1.7	0.9	1.2	1.2	1.4
Korea	1.3	1.5	1.6	1.9	2.0	2.0	2.0	2.0
Laos	2.5	0.1	2.6	2.9	3.1	3.1	3.1	3.1
Malaysia	1.7	3.5	3.0	2.5	2.6	2.5	2.4	2.3
Mexico	3.4	6.8	4.3	3.1	3.0	3.0	3.0	3.0
Myanmar	7.0	5.4	6.3	5.9	5.8	5.7	5.6	5.5
New Zealand	1.3	1.6	1.6	1.9	2.0	2.0	2.0	0.5
Papua New Guinea	6.6	4.7	4.2	3.8	3.8	3.8	3.8	3.8
Peru	3.2	1.4	2.4	2.0	2.0	2.0	2.0	2.0
Philippines	2.2	2.9	5.2	3.7	3.2	3.0	3.0	3.0
Russia	5.4	2.5	3.6	5.7	4.8	4.8	4.8	4.6
Singapore	0.2	0.4	2.0	1.3	1.4	1.3	1.3	1.3
Chinese Taipei	1.7	1.2	1.5	1.3	1.5	1.8	1.9	2.0
Thailand	1.1	0.8	0.5	1.1	0.4	0.6	0.9	1.1
United States	2.2	2.2	2.1	2.3	2.2	2.2	2.2	2.1
Vietnam	4.7	2.6	4.0	4.0	4.0	4.0	4.0	4.0

	2016	2017	2018	2019	2020	2021	2022	2023
Asia-Pacific	2.1	2.1	2.5	2.5	2.5	2.5	2.5	2.6
Emerging	2.7	2.6	3.1	2.9	3.1	3.1	3.1	3.2
Advanced	1.7	1.8	2.0	2.2	2.0	2.0	2.0	2.0

Table 3: Growth of Exports of Goods and Services (year-on-year %)

	2016	2017	2018	2019	2020	2021	2022	2023
Australia	6.8	3.5	4.1	2.7	5.6	6.8	6.5	6.5
Brunei Darussalam	-1.9	-2.7	3.2	34.0	32.8	0.3	0.1	0.5
Cambodia	15.3	10.5	12.9	10.6	9.4	8.9	8.9	8.6
Canada	1.0	1.1	2.5	4.0	3.1	2.3	1.8	1.6
Chile	-0.1	-0.9	6.1	4.4	4.2	4.3	4.6	3.8
China	1.1	9.3	5.5	4.5	4.2	3.1	2.7	2.6
Colombia	-1.4	-0.7	3.5	4.8	7.1	3.4	6.1	6.4
Ecuador	3.0	0.1	-2.5	5.4	5.0	3.7	1.6	1.9
Hong Kong, China	0.7	5.5	4.1	2.8	3.2	3.5	3.5	3.4
India	6.8	9.6	7.4	8.0	8.0	8.1	8.2	8.2
Indonesia	1.2	12.6	2.3	5.0	7.6	7.9	9.1	7.8
Japan	1.7	6.7	3.9	2.1	3.0	1.8	1.5	1.4
Korea	2.6	1.9	4.1	3.0	3.7	3.5	3.4	3.3
Laos	4.1	7.3	4.5	6.4	3.1	3.5	-1.8	6.0
Malaysia	3.9	7.8	3.7	3.9	4.9	4.1	4.0	3.8
Mexico	3.5	3.8	4.7	4.7	4.9	5.0	4.9	4.8
Myanmar	3.1	6.5	8.1	5.8	7.7	8.9	9.5	8.6
New Zealand	1.6	2.4	2.4	3.3	3.6	4.5	4.3	4.1
Papua New Guinea	32.8	11.5	-18.8	13.7	0.4	-0.4	2.1	1.7
Peru	11.5	8.1	3.4	3.8	3.4	3.4	3.4	3.4
Philippines	10.8	19.6	12.1	9.6	6.6	8.0	6.3	7.0
Russia	1.6	8.8	4.8	1.9	1.9	2.1	2.3	2.6
Singapore	1.1	4.1	2.9	3.8	3.9	3.9	4.0	3.8
Chinese Taipei	-3.9	7.9	-1.7	2.0	2.4	2.3	2.3	2.3
Thailand	2.8	7.0	4.9	4.6	3.8	3.9	4.0	3.8
United States	-0.1	3.0	3.3	0.9	2.9	2.5	2.5	2.4
Vietnam	10.7	16.4	11.8	13.2	15.1	14.6	14.6	15.0

	2016	2017	2018	2019	2020	2021	2022	2023
Asia-Pacific	1.7	6.1	4.3	3.5	4.2	3.8	3.8	3.8
Emerging	2.9	8.9	5.7	5.3	5.4	4.9	4.8	4.9
Advanced	0.8	3.9	3.2	2.1	3.2	2.9	2.8	2.8

Table 4: Growth of Imports of Goods and Services (year-on-year %)

	2016	2017	2018	2019	2020	2021	2022	2023
Australia	0.2	7.8	5.3	3.7	4.8	5.4	5.6	5.6
Brunei Darussalam	2.7	1.3	6.4	6.8	1.9	8.6	6.0	3.5
Cambodia	12.8	10.3	8.3	8.8	7.9	6.5	6.6	6.3
Canada	-1.0	3.6	3.6	1.7	1.4	1.0	1.0	1.1
Chile	0.2	4.7	6.8	2.7	3.8	4.1	4.0	3.9
China	4.7	7.1	8.2	5.1	5.0	4.5	4.0	3.8
Colombia	-4.0	0.3	0.1	5.5	5.3	4.3	4.8	5.2
Ecuador	-9.4	14.3	2.5	-3.3	-2.6	2.0	1.8	1.6
Hong Kong, China	0.9	6.3	4.9	3.2	3.4	3.7	3.8	3.6
India	4.1	12.9	9.2	8.1	9.1	8.7	9.0	9.3
Indonesia	2.5	8.7	4.2	5.4	7.5	7.7	9.1	7.5
Japan	-1.6	3.4	3.2	2.3	1.6	1.8	1.5	1.6
Korea	4.7	7.0	3.4	3.2	4.0	3.9	3.9	3.9
Laos	1.7	8.0	7.3	3.7	2.8	-0.5	-1.2	-1.7
Malaysia	1.6	8.8	3.7	5.0	4.9	4.1	3.8	3.6
Mexico	2.9	6.5	4.4	4.2	4.9	5.3	5.1	4.8
Myanmar	4.8	6.0	6.7	11.5	8.8	9.2	8.8	8.3
New Zealand	3.2	6.7	7.2	3.7	3.3	3.5	3.7	3.5
Papua New Guinea	-12.4	4.9	-16.6	7.8	3.1	3.2	3.0	2.8
Peru	-3.0	4.5	6.1	4.8	5.7	5.3	4.6	4.7
Philippines	20.3	18.5	11.2	11.8	7.5	7.7	6.6	6.6
Russia	-4.3	20.3	4.8	4.5	2.3	2.0	1.5	2.4
Singapore	0.1	5.2	2.5	4.0	4.5	4.5	4.6	4.4
Chinese Taipei	-4.0	4.1	-2.6	2.0	2.4	2.9	2.9	2.9
Thailand	-1.0	7.7	5.8	7.3	6.6	6.1	6.0	5.6
United States	1.9	4.6	4.5	5.7	3.4	3.1	2.4	1.0
Vietnam	12.5	17.4	11.4	14.4	16.1	15.3	15.2	15.3

	2016	2017	2018	2019	2020	2021	2022	2023
Asia-Pacific	2.1	6.9	5.3	4.9	4.5	4.3	4.1	3.9
Emerging	3.7	9.4	7.3	6.1	6.1	5.8	5.6	5.6
Advanced	0.8	5.0	3.7	4.0	3.1	3.1	2.8	2.3

Table 5: Current Account Balance (% of GDP)

	2016	2017	2018	2019	2020	2021	2022	2023
Australia	-3.1	-2.3	-1.9	-2.3	-2.5	-2.5	-2.4	-2.3
Brunei Darussalam	9.6	6.1	5.0	13.1	17.2	15.6	16.1	18.6
Cambodia	-8.8	-8.8	-10.7	-9.5	-8.7	-8.4	-8.0	-7.8
Canada	-3.2	-3.0	-3.2	-2.5	-2.0	-1.8	-1.7	-1.7
Chile	-1.4	-1.5	-1.8	-1.9	-1.9	-2.1	-2.2	-2.2
China	1.8	1.4	1.2	1.2	1.1	1.0	0.8	0.6
Colombia	-4.3	-3.4	-2.6	-2.6	-2.5	-2.5	-2.4	-2.3
Ecuador	1.5	-0.4	-0.1	0.3	0.6	0.5	0.7	0.9
Hong Kong, China	4.0	3.0	3.1	3.2	3.3	3.4	3.5	3.5
India	-0.7	-2.0	-2.3	-2.1	-2.1	-2.2	-2.4	-2.6
Indonesia	-1.8	-1.7	-1.9	-1.9	-2.0	-2.0	-2.0	-2.0
Japan	3.8	4.0	3.8	3.7	4.0	4.1	4.0	4.0
Korea	7.0	5.1	5.5	5.8	5.8	5.8	5.7	5.6
Laos	-12.0	-13.0	-14.9	-13.7	-12.7	-11.3	-10.6	-9.2
Malaysia	2.4	3.0	2.4	2.2	2.0	1.9	1.9	1.9
Mexico	-2.1	-1.6	-1.9	-2.2	-2.2	-2.2	-2.0	-2.0
Myanmar	-3.9	-5.3	-5.4	-5.6	-5.9	-6.0	-5.9	-5.8
New Zealand	-2.3	-2.7	-2.6	-3.0	-2.8	-2.6	-2.7	-2.8
Papua New Guinea	16.7	16.8	20.2	19.2	18.0	17.3	16.6	15.9
Peru	-2.7	-1.3	-0.7	-1.1	-1.5	-1.9	-2.0	-2.0
Philippines	-0.3	-0.4	-0.5	-0.6	-0.8	-1.0	-1.2	-1.2
Russia	2.0	2.6	4.5	3.8	3.4	3.4	3.4	3.4
Singapore	19.0	18.8	18.9	18.7	18.6	17.8	16.8	16.0
Chinese Taipei	13.6	13.8	13.6	13.5	13.5	13.4	13.2	13.5
Thailand	11.7	10.8	9.3	8.6	7.9	6.5	4.9	3.5
United States	-2.4	-2.4	-3.0	-3.4	-3.6	-3.4	-3.2	-3.0
Vietnam	3.1	4.1	3.0	2.4	1.9	1.4	0.9	0.5

	2016	2017	2018	2019	2020	2021	2022	2023
Asia-Pacific	0.3	0.1	-0.1	-0.4	-0.4	-0.5	-0.6	-0.7
Emerging	1.1	0.8	0.5	0.4	0.3	0.1	-0.1	-0.2
Advanced	-0.3	-0.4	-0.6	-0.9	-1.0	-1.1	-1.1	-1.1

Table 6: GDP & CPI Weights (% of total)

	2016	2017	2018	2019	2020	2021	2022	2023
Australia	2.63	2.71	2.70	2.67	2.66	2.65	2.65	2.65
Brunei Darussalam	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.03
Cambodia	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05
Canada	3.19	3.24	3.24	3.22	3.24	3.25	3.28	3.30
Chile	0.52	0.54	0.50	0.50	0.50	0.49	0.49	0.49
China	23.34	23.58	25.35	26.23	27.04	27.78	28.50	29.21
Colombia	0.58	0.61	0.59	0.59	0.59	0.59	0.59	0.59
Ecuador	0.21	0.20	0.19	0.19	0.18	0.18	0.17	0.17
Hong Kong, China	0.67	0.67	0.66	0.65	0.66	0.66	0.66	0.66
India	4.73	5.13	5.12	5.33	5.55	5.79	6.04	6.31
Indonesia	1.94	1.99	1.93	1.95	1.99	2.02	2.06	2.10
Japan	10.29	9.56	9.29	9.05	8.77	8.52	8.29	8.07
Korea	2.93	3.02	3.05	3.00	2.97	2.95	2.94	2.92
Laos	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
Malaysia	0.62	0.62	0.66	0.68	0.70	0.72	0.75	0.77
Mexico	2.24	2.26	2.18	2.17	2.16	2.15	2.15	2.15
Myanmar	0.13	0.13	0.13	0.13	0.13	0.14	0.15	0.15
New Zealand	0.39	0.40	0.40	0.40	0.40	0.40	0.41	0.41
Papua New Guinea	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Peru	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.42
Philippines	0.63	0.62	0.60	0.60	0.63	0.65	0.68	0.71
Russia	2.66	3.00	3.09	2.96	2.85	2.77	2.70	2.67
Singapore	0.64	0.64	0.63	0.62	0.61	0.61	0.60	0.59
Chinese Taipei	1.10	1.14	1.10	1.05	1.01	0.97	0.93	0.89
Thailand	0.86	0.89	0.87	0.88	0.88	0.88	0.88	0.88
United States	38.73	38.06	36.72	36.14	35.47	34.78	34.02	33.22
Vietnam	0.42	0.43	0.43	0.45	0.46	0.48	0.49	0.51

Table 7: Trade Weights (% of total)

	2016	2017	2018	2019	2020	2021	2022	2023
Australia	2.41	2.52	2.52	2.55	2.60	2.63	2.68	2.73
Brunei Darussalam	0.05	0.05	0.04	0.04	0.04	0.05	0.05	0.05
Cambodia	0.14	0.14	0.14	0.15	0.16	0.16	0.17	0.18
Canada	4.69	4.55	4.40	4.29	4.18	4.07	3.98	3.88
Chile	0.68	0.68	0.65	0.66	0.65	0.64	0.64	0.64
China	20.67	20.79	21.23	21.37	21.42	21.44	21.37	21.25
Colombia	0.46	0.45	0.42	0.40	0.40	0.41	0.41	0.42
Ecuador	0.18	0.19	0.20	0.19	0.18	0.18	0.17	0.17
Hong Kong, China	5.92	5.73	5.73	5.69	5.59	5.53	5.49	5.47
India	4.31	4.54	4.68	4.81	4.97	5.15	5.38	5.63
Indonesia	1.59	1.65	1.67	1.70	1.74	1.81	1.91	2.01
Japan	7.57	7.51	7.47	7.43	7.29	7.14	6.98	6.81
Korea	5.29	5.49	5.42	5.38	5.35	5.30	5.29	5.27
Laos	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04
Malaysia	2.06	2.13	2.18	2.16	2.16	2.16	2.15	2.15
Mexico	3.94	3.93	3.88	3.78	3.76	3.76	3.79	3.83
Myanmar	0.16	0.16	0.18	0.17	0.17	0.18	0.19	0.20
New Zealand	0.46	0.46	0.45	0.45	0.45	0.45	0.45	0.45
Papua New Guinea	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05
Peru	0.42	0.43	0.43	0.43	0.42	0.42	0.42	0.42
Philippines	0.95	0.95	0.97	1.01	1.06	1.10	1.13	1.16
Russia	2.92	3.11	3.35	3.33	3.23	3.16	3.13	3.13
Singapore	4.54	4.46	4.38	4.32	4.29	4.27	4.28	4.29
Chinese Taipei	2.87	2.92	2.70	2.64	2.59	2.55	2.53	2.50
Thailand	2.45	2.49	2.50	2.49	2.51	2.52	2.54	2.56
United States	23.38	22.58	22.12	22.15	22.15	22.06	21.79	21.43
Vietnam	1.80	1.98	2.16	2.31	2.52	2.74	2.98	3.27

ANNEX RESULTS OF ASIA-PACIFIC POLICY COMMUNITY SURVEY

This annex presents the findings of a survey of the Asia-Pacific policy community conducted by the Pacific Economic Cooperation Council from 13 August to 19 September 2018. The survey was disseminated through PECC member committees, the United Nations Network of Experts for Paperless Trade and Transport in Asia and the Pacific (UNNExT), the Asia-Pacific Research and Training Network on Trade (ARTNET); the ASEAN-EU Business Council; the Association of Pacific Rim Universities (APRU); and the Papua New Guinea Committee on APEC Policy Issues (CAPI).

This is not a survey of public opinion but rather, a survey of those whose views influence policymaking, especially at the regional level. As some of the questions tend to be technical, they require a relatively deep knowledge of developments at regional level. However, we do believe that those surveyed include those who are responsible for influencing and often making decisions on various aspects of their economy's positions within different regional groups.

The guidance for identifying panelists is as follows:

GOVERNMENT

Panelists should be either decision-makers or senior advisors to decision-makers. As a guide, the government respondents in previous years included a number of former and current Ministers, Deputy and Vice-Ministers, Central Bank Governors and their advisors for Asia-Pacific issues, current APEC Senior Officials, and a number of former APEC Senior Officials.

BUSINESS

Panelists should be from companies who have operations in a number of Asia-Pacific economies or conduct business with a number of partners from the region. This might include each economy's current ABAC members as well as past ABAC members. In last year's survey, these included CEOs, vice presidents for Asia-Pacific operations, and directors of chambers of commerce.

NON-GOVERNMENT: RESEARCH COMMUNITY/CIVIL SOCIETY/MEDIA

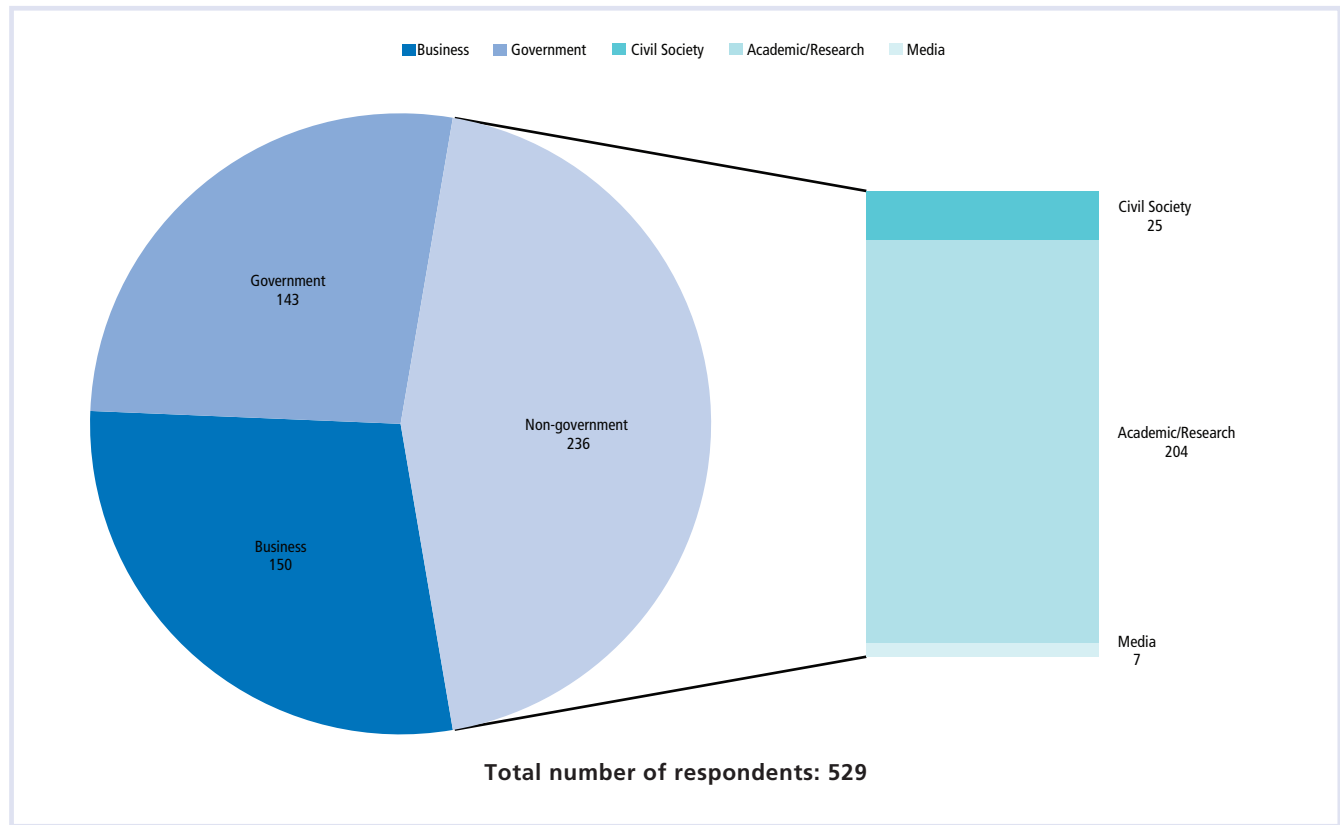
Panelists should be well-versed in Asia-Pacific affairs, being the type of people governments, businesses, and the media would tap into to provide input on issues related to Asia-Pacific cooperation. These included presidents of institutes concerned with Asia-Pacific issues, heads of departments, senior professors, and correspondents covering international affairs.

RESPONDENT BREAKDOWN

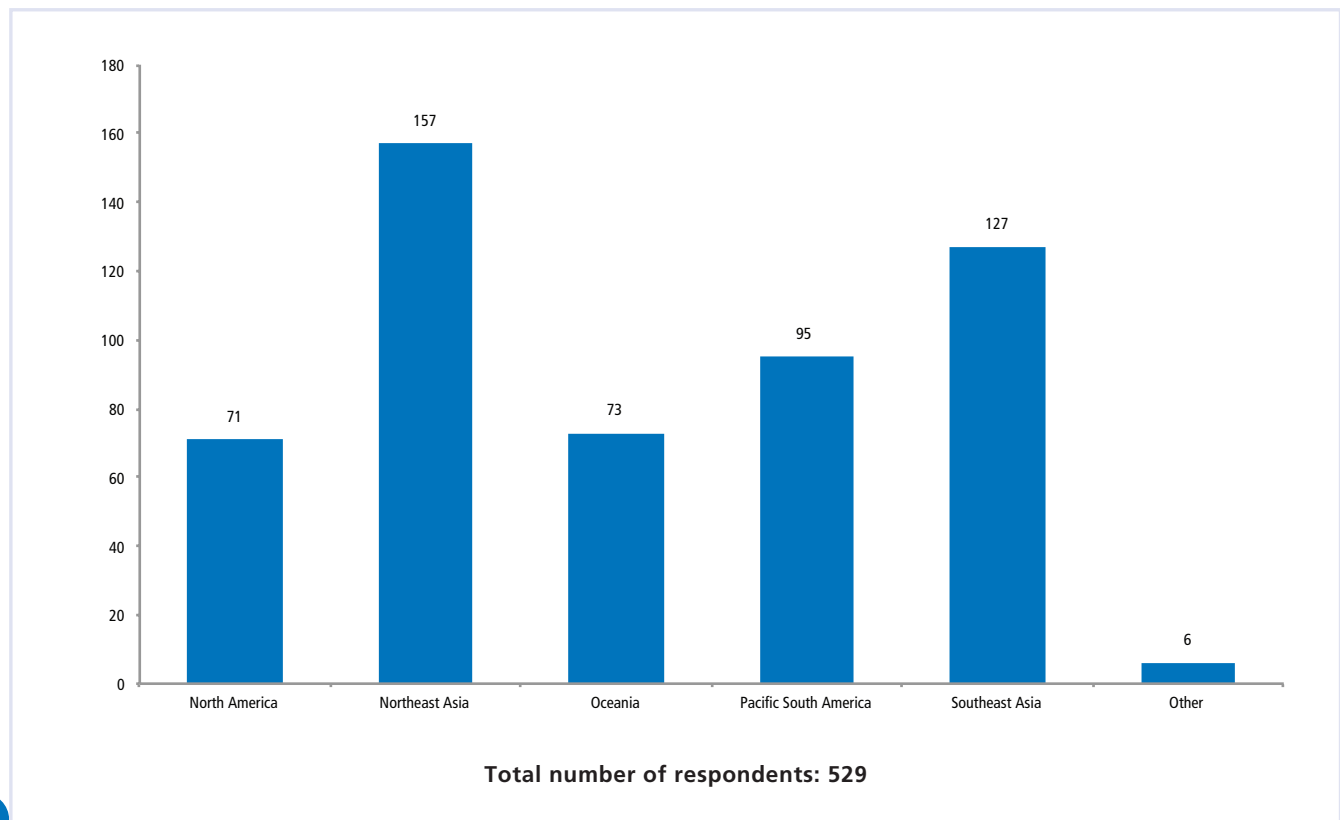
We do not disaggregate results for each economy but rather by sub-regions – Northeast Asia, North America, Oceania, Pacific South America, and Southeast Asia.

- North America: Canada, Mexico, and the United States
- Northeast Asia: China, Hong Kong (China), Japan, Korea, Mongolia, Russia, and Chinese Taipei
- Oceania: Australia, New Zealand, and Papua New Guinea
- Pacific South America: Chile, Colombia, Ecuador, and Peru
- Southeast Asia: Brunei Darussalam, India, Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam

BREAKDOWN OF RESPONDENTS BY SECTOR



BREAKDOWN OF RESPONDENTS BY SUB-REGION



1. What are your expectations for economic growth over the next 12 months compared to the last year for the following economies/regions? Please select/tick the appropriate box.

	Much weaker	Somewhat weaker	About the same	Somewhat stronger	Much stronger	Don't know	Total
China	4.3%	38.4%	27.4%	18.9%	9.8%	1.1%	100.0%
India	0.2%	14.0%	38.8%	32.6%	9.7%	4.7%	100.0%
Japan	1.1%	20.0%	51.8%	20.2%	4.4%	2.5%	100.0%
Russia	3.6%	25.9%	39.7%	21.9%	2.3%	6.7%	100.0%
Southeast Asia	1.0%	13.2%	33.4%	37.6%	11.5%	3.3%	100.0%
Oceania	1.3%	13.3%	56.1%	14.3%	3.0%	12.0%	100.0%
The United States	1.5%	24.0%	29.5%	34.2%	8.7%	2.1%	100.0%
The European Union	1.3%	28.2%	46.1%	20.4%	1.7%	2.3%	100.0%
The World economy	1.1%	28.0%	42.4%	24.1%	2.3%	2.1%	100.0%

2. Please select the top five risks to growth for your economy over the next 2-3 years. Please select ONLY five (5) risks, using a scale of 1-5. Please write 1 for the most serious risk, 2 for the next most serious risk, 3 for the next third highest risk, 4 for the fourth highest risk and 5 for the least serious risk.

	1	2	3	4	5	Total
A health pandemic	1.0%	0.4%	0.6%	2.0%	2.0%	6.0%
Natural disasters	2.4%	4.4%	3.8%	3.6%	5.8%	20.0%
Climate change	5.4%	4.6%	3.8%	5.6%	4.2%	23.6%
Energy security	2.2%	3.0%	3.0%	2.8%	2.2%	13.2%
Food security	0.4%	1.4%	2.2%	1.8%	2.2%	8.0%
Lack of political leadership	7.6%	8.2%	5.8%	6.4%	8.0%	36.1%
Disappearing jobs	3.6%	2.6%	3.2%	3.8%	4.2%	17.4%
Shortage of available talent/skills	4.0%	4.0%	5.0%	5.6%	5.6%	24.2%
Lack of adequate infrastructure	3.4%	3.8%	4.0%	5.6%	5.2%	22.0%
Failure to implement structural reforms	6.8%	5.6%	7.4%	5.4%	7.4%	32.7%
Increased protectionism and trade wars	29.5%	13.2%	9.4%	7.4%	2.6%	62.1%
Unfavorable currency realignments	2.6%	2.2%	3.8%	3.6%	4.6%	16.8%
A slowdown in the US economy	3.2%	6.2%	6.8%	9.2%	4.6%	30.1%
A slowdown in the Chinese economy	6.2%	9.0%	11.8%	8.4%	7.8%	43.3%
A slowdown in the Japanese economy	0.4%	0.2%	0.8%	1.0%	1.8%	4.2%
Sharp fall in asset prices	1.4%	2.8%	3.4%	3.0%	5.4%	16.0%
Cyber attacks	2.0%	2.8%	3.4%	3.0%	5.8%	17.0%
Possible slowdown in world trade growth	5.8%	11.4%	9.0%	9.6%	8.0%	43.9%
Corruption	8.4%	5.4%	6.8%	5.0%	3.8%	29.5%
Unsustainable debt	2.8%	4.8%	3.4%	4.2%	4.2%	19.4%
Inflation	0.8%	3.8%	2.4%	2.8%	4.4%	14.2%

3. By 2030, how do you think new technologies (for example but not limited to artificial intelligence, cloud-computing, 3D printing, blockchain, and advanced robotics) will impact the number of jobs in your economy overall and for the list of sectors below?

	Decrease greatly	Decrease slightly	Stay the same	Increase slightly	Increase greatly	Don't know	Total
Overall	11.0%	35.7%	17.1%	23.4%	10.1%	2.7%	100.0%
Agriculture, forestry and fishing	10.6%	30.7%	36.1%	15.8%	3.7%	3.2%	100.0%
Mining and quarrying	12.2%	32.3%	34.9%	10.0%	3.7%	6.8%	100.0%
Manufacturing	25.9%	39.1%	10.5%	12.0%	11.5%	1.1%	100.0%
Electricity, gas, steam and air conditioning supply	5.8%	30.5%	34.2%	16.2%	7.6%	5.6%	100.0%
Water supply; sewerage, waste management and remediation activities	3.9%	28.2%	36.7%	19.7%	6.3%	5.2%	100.0%
Construction	5.4%	23.0%	36.3%	22.4%	10.1%	2.8%	100.0%
Wholesale and retail trade; repair of motor vehicles and motorcycles	12.4%	29.9%	27.6%	19.4%	7.7%	3.0%	100.0%
Transportation and storage	10.3%	28.2%	26.7%	22.8%	9.5%	2.6%	100.0%
Accommodation and food service activities	5.4%	17.0%	30.4%	33.0%	11.3%	2.8%	100.0%
Information and communication	8.2%	14.4%	10.6%	28.7%	34.7%	3.4%	100.0%
Financial and insurance activities	9.0%	22.8%	24.3%	24.7%	16.8%	2.4%	100.0%
Real estate activities	4.1%	20.5%	42.7%	22.9%	7.0%	2.8%	100.0%
Professional, scientific and technical activities	1.9%	8.6%	21.7%	37.6%	26.6%	3.6%	100.0%
Administrative and support service activities	10.8%	28.0%	26.2%	23.4%	9.7%	1.9%	100.0%
Public administration and defence; compulsory social security	3.2%	19.7%	45.8%	21.2%	6.5%	3.7%	100.0%
Education	3.2%	14.7%	28.8%	33.5%	17.5%	2.3%	100.0%
Human health and social work activities	1.3%	9.3%	33.7%	37.1%	16.0%	2.6%	100.0%
Arts, entertainment and recreation	1.3%	8.2%	34.3%	35.6%	16.5%	4.1%	100.0%
Other service activities	2.8%	11.5%	40.3%	24.2%	9.1%	12.1%	100.0%
Hiring motor vehicles	9.2%	26.7%	30.8%	16.5%	9.0%	7.9%	100.0%

4. Now turning to specific occupations, how do you think new technologies will impact the number of jobs in the following occupational categories in your economy by 2030? (tick one box in each category)

	Decrease greatly	Decrease slightly	Stay the same	Increase slightly	Increase greatly	Don't know	Total
Chief Executives, Senior Officials and Legislators, Administrative and Commercial Managers	1.7%	10.4%	51.5%	29.7%	5.6%	1.1%	100.0%
Production and Specialized Services Managers	2.0%	19.1%	27.4%	38.2%	10.7%	2.6%	100.0%
Hospitality, Retail and Other Services Managers	2.4%	19.9%	31.9%	31.9%	11.4%	2.6%	100.0%
Science and Engineering Professionals	1.1%	7.9%	16.3%	43.4%	29.5%	1.8%	100.0%
Health Professionals (doctors, nurses, dentists)	1.3%	6.4%	34.0%	38.2%	18.0%	2.2%	100.0%
Teaching Professionals	2.2%	17.3%	31.7%	36.3%	10.7%	1.8%	100.0%
Business, Administration, Legal, Social and Cultural Professionals	3.1%	20.9%	39.6%	25.3%	7.5%	3.5%	100.0%
Information and Communications Technology Professionals	3.0%	8.3%	13.0%	33.9%	39.1%	2.6%	100.0%
Science and Engineering Associate Professionals	1.3%	9.9%	17.3%	43.2%	25.4%	2.9%	100.0%
Health Associate Professionals (eg medical and pharmaceutical technicians)	1.7%	12.4%	29.9%	37.1%	15.7%	3.1%	100.0%
Business, Administration, Legal, Social, Cultural and Related Associate Professionals	3.5%	26.1%	36.0%	24.6%	7.2%	2.6%	100.0%
Information and Communications Technicians	3.1%	11.1%	15.0%	35.3%	32.9%	2.6%	100.0%
Ship and Aircraft Controllers and Technicians (eg ships' engineers, deck officers and pilots, traffic controllers, air traffic safety electronics technicians)	3.7%	28.9%	27.6%	25.2%	9.6%	4.8%	100.0%
Clerical Support Workers	20.0%	44.1%	21.1%	9.6%	2.0%	3.3%	100.0%
Personal services and sales workers (shopping sales assistant, waiters)	14.0%	42.5%	26.1%	11.0%	4.4%	2.0%	100.0%
Childcare Workers (eg childcare, teachers' aides)	1.5%	14.8%	39.2%	30.8%	10.4%	3.3%	100.0%
Elderly care workers	0.4%	7.8%	24.7%	36.0%	26.4%	4.7%	100.0%
Protective Services Workers (police, fireman, security guards)	2.0%	13.7%	46.7%	26.9%	8.1%	2.6%	100.0%
Skilled Agricultural, Forestry and Fishery Workers	3.6%	27.8%	36.4%	23.3%	5.6%	3.3%	100.0%
Building and Related Trades, Metal, Machinery and Related Trade, Electrical and Electronic Trades Workers	4.8%	29.4%	35.7%	20.2%	6.4%	3.5%	100.0%
Handicraft and Printing Workers	12.1%	37.5%	30.7%	11.7%	3.8%	4.2%	100.0%
Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers (butchers, tailors)	12.7%	41.4%	25.7%	12.7%	4.2%	3.3%	100.0%
Plant and Machine Operators and Assemblers (including train engine drivers, car and other transport drivers, trucks, mobile and fixed plant operators, ship deck crews)	17.7%	41.4%	19.5%	13.1%	5.5%	2.8%	100.0%
Cleaners and Helpers	11.6%	30.4%	37.6%	14.9%	3.5%	2.0%	100.0%
Laborers in Mining, Construction, Manufacturing and Transport	15.0%	43.0%	26.3%	9.3%	3.3%	3.0%	100.0%
Food Preparation Assistants & Agricultural, Forestry and Fishery Laborers	9.4%	41.4%	29.4%	13.8%	2.9%	3.1%	100.0%
Street and Related Sales and Services Workers	11.8%	36.5%	34.3%	10.3%	2.4%	4.8%	100.0%

5. Which occupations do you anticipate will develop shortages or surpluses of workers in your economy due to new technologies by 2030 (tick one box in each category)

	Intense Shortages	Moderate shortages	Balanced	Moderate surpluses	Intense Surpluses	Don't know	Total
Chief Executives, Senior Officials and Legislators, Administrative and Commercial Managers	2.7%	20.4%	52.0%	19.9%	2.9%	2.0%	100.0%
Production and Specialized Services Managers	3.2%	33.2%	37.6%	21.0%	1.6%	3.5%	100.0%
Hospitality, Retail and Other Services Managers	1.9%	21.0%	42.2%	28.1%	3.1%	3.8%	100.0%
Science and Engineering Professionals	13.6%	45.6%	20.5%	15.0%	3.2%	2.1%	100.0%
Health Professionals (doctors, nurses, dentists)	9.6%	40.4%	30.7%	14.2%	3.0%	2.1%	100.0%
Teaching Professionals	5.5%	31.0%	34.2%	20.4%	6.0%	3.0%	100.0%
Business, Administration, Legal, Social and Cultural Professionals	1.4%	14.1%	44.7%	29.0%	7.1%	3.7%	100.0%
Information and Communications Technology Professionals	13.9%	41.4%	18.6%	18.2%	5.5%	2.5%	100.0%
Science and Engineering Associate Professionals	10.3%	44.4%	23.8%	14.0%	4.3%	3.2%	100.0%
Health Associate Professionals (eg medical and pharmaceutical technicians)	6.2%	35.3%	37.8%	14.7%	2.5%	3.4%	100.0%
Business, Administration, Legal, Social, Cultural and Related Associate Professionals	1.4%	12.1%	44.2%	32.5%	6.6%	3.2%	100.0%
Information and Communications Technicians	9.2%	38.4%	24.5%	20.8%	3.9%	3.2%	100.0%
Ship and Aircraft Controllers and Technicians (eg ships' engineers, deck officers and pilots, traffic controllers, air traffic safety electronics technicians)	4.1%	25.0%	36.7%	22.9%	4.6%	6.7%	100.0%
Clerical Support Workers	2.7%	10.8%	25.9%	33.4%	22.0%	5.3%	100.0%
Personal services and sales workers (shopping sales assistant, waiters)	2.8%	10.4%	29.2%	36.3%	17.4%	3.9%	100.0%
Childcare Workers (eg childcare, teachers' aides)	5.7%	30.1%	39.1%	17.9%	4.1%	3.0%	100.0%
Elderly care workers	16.0%	40.3%	26.5%	10.7%	3.6%	2.9%	100.0%
Protective Services Workers (police, fireman, security guards)	2.3%	23.5%	51.2%	16.1%	2.5%	4.4%	100.0%
Skilled Agricultural, Forestry and Fishery Workers	5.8%	28.7%	38.2%	19.6%	2.8%	4.9%	100.0%
Building and Related Trades, Metal, Machinery and Related Trade, Electrical and Electronic Trades Workers	2.5%	19.9%	36.8%	30.1%	5.3%	5.3%	100.0%
Handicraft and Printing Workers	3.2%	11.0%	36.6%	33.1%	9.0%	7.1%	100.0%
Food Processing, Woodworking, Garment and Other Craft and Related Trades Workers (butchers, tailors)	1.8%	11.3%	40.7%	34.5%	6.9%	4.8%	100.0%
Plant and Machine Operators and Assemblers (including train engine drivers, car and other transport drivers, trucks, mobile and fixed plant operators, ship deck crews)	3.9%	15.1%	30.0%	34.6%	11.9%	4.6%	100.0%
Cleaners and Helpers	4.1%	16.4%	35.7%	30.6%	9.7%	3.5%	100.0%
Laborers in Mining, Construction, Manufacturing and Transport	3.0%	16.6%	29.5%	34.3%	12.2%	4.4%	100.0%
Food Preparation Assistants & Agricultural, Forestry and Fishery Laborers	2.7%	16.0%	36.6%	30.4%	9.2%	5.0%	100.0%
Street and Related Sales and Services Workers	2.3%	10.8%	37.9%	28.3%	14.0%	6.7%	100.0%

6. Thinking ahead to 2030, which specific skills and abilities do you anticipate will be the hardest to find in your economy? (tick one box in each category)

	Very easy	Easy	Neutral	Difficult	Very difficult	Don't know	Total
Complex problem solving	1.8%	5.0%	19.9%	42.2%	29.6%	1.6%	100.0%
Critical thinking	1.1%	7.9%	14.4%	47.3%	27.7%	1.6%	100.0%
Creativity	3.9%	15.2%	18.4%	43.0%	18.0%	1.6%	100.0%
People management	2.7%	20.0%	45.3%	24.1%	6.8%	1.1%	100.0%
Coordinating with others	2.5%	21.0%	46.0%	23.5%	5.5%	1.6%	100.0%
Emotional intelligence	1.4%	9.7%	33.8%	38.1%	14.2%	2.9%	100.0%
Judgement & decision making	0.9%	9.7%	33.9%	40.0%	13.8%	1.6%	100.0%
Service orientation	7.7%	27.7%	39.4%	19.8%	3.4%	2.0%	100.0%
Negotiation	1.4%	16.9%	40.2%	33.4%	6.3%	1.8%	100.0%
Cognitive flexibility	1.1%	8.6%	31.7%	43.5%	12.5%	2.5%	100.0%
Active listening	2.3%	13.2%	35.4%	36.1%	10.7%	2.5%	100.0%
Quality control	5.7%	22.2%	41.5%	22.7%	6.6%	1.4%	100.0%

7. Please rank the following in terms of their preparedness to deal with the training, upskilling and possible disruption coming from new technologies in your economy.

	Not at all prepared	Somewhat prepared	Moderately prepared	Very prepared	Extremely prepared	Don't know	Total
Education System	29.5%	37.2%	22.7%	7.2%	2.0%	1.4%	100.0%
Labor market	31.7%	44.3%	17.4%	4.3%	1.1%	1.1%	100.0%
Social security system	39.8%	36.2%	14.5%	6.1%	1.8%	1.6%	100.0%

8. More specifically on labor and education issues, how satisfied are you with the following in your economy?

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Extremely satisfied	Don't know	Total
Child care, early childhood education and primary schooling	27.3%	33.3%	29.2%	5.6%	0.9%	3.7%	100.0%
Secondary schooling	25.4%	32.1%	33.9%	5.8%	0.5%	2.3%	100.0%
Math, science and digital education	32.0%	32.0%	24.2%	9.2%	0.9%	1.6%	100.0%
Business management education	9.0%	35.2%	41.4%	10.9%	1.4%	2.1%	100.0%
Match between educational training and needs in the economy	31.8%	40.8%	22.1%	3.5%	0.5%	1.4%	100.0%
Cooperation between education providers and employers	27.9%	38.9%	24.4%	6.0%	0.0%	2.8%	100.0%
Ability to secure skilled staff	19.8%	42.8%	26.9%	7.6%	0.7%	2.3%	100.0%
Wage and working hour flexibility	27.5%	37.7%	25.7%	6.3%	0.9%	1.9%	100.0%
Freedom to hire and dismiss employees	23.3%	29.6%	29.6%	12.2%	1.4%	3.9%	100.0%
Vocational education and training and apprenticeships	22.2%	40.4%	26.8%	6.2%	1.4%	3.0%	100.0%
STEM (science, technology, engineering and maths) university education	23.0%	35.5%	25.8%	11.1%	2.3%	2.3%	100.0%
Other university education including postgraduate	13.4%	30.7%	37.0%	13.4%	2.5%	3.0%	100.0%

9. Please indicate your agreement or disagreement with the following statements:

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree	Don't know	Total
APEC is as important or more important today compared to 1989 when it was created	2.3%	13.6%	18.7%	38.5%	24.9%	2.1%	100.0%
APEC should focus its work on trade policy to achieving a Free Trade Area of the Asia-Pacific (FTAAP)	1.8%	7.8%	20.0%	46.0%	22.8%	1.6%	100.0%
APEC should expand its membership	4.9%	16.0%	28.1%	30.5%	16.3%	4.2%	100.0%
APEC should put less emphasis on free trade and more on broad economic growth, infrastructure, and jobs	1.8%	20.0%	21.9%	29.3%	25.3%	1.6%	100.0%

10. How do you assess the political environment for freer trade and investment today? Please tick the box that best fits your assessment.

	1-Very negative	2-Negative	3-Neither positive nor negative	4-Positive	5-Very Positive	Don't know	Total
Response	12.0%	50.0%	17.3%	18.2%	1.6%	0.9%	100.0%

11. What do you think should be the top 5 priorities for APEC Leaders to address at their upcoming meeting in Port Moresby? Please select ONLY five (5) issues, using a scale of 1-5, please write 1 for the issue you think is most important, 2 for the next most important issue, 3 for the third most important, 4 for the fourth most important and 5 for the fifth most important.

	1 - most important	2	3	4	5 - least important	Total
Rising trade tensions and the future of the WTO and multilateral trading system	17.9%	9.9%	7.1%	5.7%	6.0%	46.6%
Progress towards the Bogor Goals and the Free Trade Area of the Asia-Pacific (FTAAP)	8.9%	10.3%	7.3%	5.0%	3.2%	34.9%
Implementation of the APEC Roadmap on Services Competitiveness	2.1%	4.1%	4.8%	3.2%	2.8%	17.0%
Progress on the APEC Connectivity Blueprint	2.1%	2.5%	3.4%	4.6%	2.8%	15.4%
The emergence of anti-globalization & anti-trade sentiments	10.6%	8.3%	7.1%	4.8%	6.7%	37.4%
The implementation of APEC's agenda on structural reforms	5.7%	5.0%	4.6%	5.5%	5.3%	26.1%
The development of regional financial systems	3.0%	3.4%	3.9%	3.9%	3.4%	17.7%
The reform of regional institutional architecture	1.4%	0.7%	1.6%	4.6%	3.0%	11.2%
Enhancing energy security	1.6%	1.6%	1.8%	3.2%	3.2%	11.5%
Reducing corruption	3.7%	5.0%	6.7%	3.9%	6.0%	25.2%
Climate change cooperation	5.3%	7.6%	5.5%	5.7%	7.1%	31.2%
Combatting cybersecurity	1.4%	4.4%	3.9%	4.4%	2.5%	16.5%
Tackling youth unemployment	3.9%	3.9%	4.1%	2.5%	3.0%	17.4%
Strengthening MSMEs' Competitiveness and Innovation in the Digital Age	2.1%	6.4%	6.7%	7.6%	5.0%	27.8%
Investing in human capital development in the digital age	5.5%	5.3%	7.8%	9.4%	6.0%	33.9%
Improving women's participation in the economy	1.6%	1.8%	4.4%	4.1%	6.2%	18.1%
Implementing the APEC Roadmap on the Internet and Digital Economy?	4.4%	5.5%	7.6%	6.9%	5.0%	29.4%
Expanding of APEC membership	2.8%	1.4%	0.7%	1.8%	6.7%	13.3%
Formulating a vision to drive APEC's work beyond 2020	5.3%	6.0%	5.0%	6.0%	8.3%	30.5%
Progress on the APEC growth strategy to promote balanced, inclusive, sustainable, innovative and secure growth	11.0%	6.9%	6.0%	7.1%	8.0%	39.0%

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