Trade and Investment Liberalisation in APEC

Economic and energy sector impacts

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Foreword

Trade and investment is one of the key elements of the Asia Pacific Economic Cooperation (APEC) forum's economic agenda. At their historic meeting in Bogor, Indonesia, in November 1994, APEC Leaders agreed on a timetable to implement APEC's liberalisation program: developed member economies would move to free trade and investment by 2010 and developing economies by 2020. Since that time, APEC leaders have reaffirmed their commitment to the Bogor goals and to the role that liberalisation can play in strengthening economic growth and development. Important progress has been made in the region toward meeting the ambitious Bogor targets.

The objective in this study is to assess the impact on APEC economies of the implementation of the Bogor program. As well as examining the implications for economic growth in the region, the study analyses the specific impacts that trade and investment liberalisation are likely to have on the region's energy sector. The study shows that as economies grow and their economic structure changes as a result of liberalisation there will be some significant consequences for the levels and patterns of energy consumption, production and trade.

Managing the transition to a different energy future will be a challenge for APEC's energy policy makers. The study aims to contribute to energy policy making in the region by analysing the types of changes in the energy sector that are likely to flow from the liberalisation process.

The study was undertaken by ABARE for the APEC Energy Working Group.

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Summary

Trade and investment liberalisation is one of the core elements of the Asia Pacific Economic Cooperation (APEC) forum's overall economic program. At their second meeting in November 1994 at Bogor, APEC Leaders agreed on a timetable for implementing APEC's liberalisation program: developed member economies would move to free trade and investment by 2010 and developing economies by 2020. In articulating this agenda, APEC Leaders were building on an extended history of liberalisation throughout the region — trade liberalisation in particular has been an important feature of the economic environment in many APEC economies for a long period.

The key objective in this study is to provide a quantitative analysis of the impacts on the APEC economy and the energy sector of the implementation of the Bogor program. It is anticipated that the project's findings will allow APEC member economies to make more informed policy decisions about implementing this program.

The benefits of liberalisation in APEC are expected to flow from both unilateral liberalising action by individual economies and multilateral action by APEC as a whole. It can be expected that the benefits of liberalisation will be greatest for economies that have the highest trade and investment barriers.

Analytical framework

ABARE has used its Global Trade and Environment Model (GTEM) to quantify the impacts of APEC trade and investment liberalisation. GTEM is a dynamic general equilibrium model of the world economy developed to examine global change issues. It is an effective tool for analysing international trade and investment and the energy sector because:

- it can model the interaction between different sectors in the economy;

- it explicitly models bilateral trade flows;

- it incorporates global investment flows;

- its intertemporal capability permits the impact of policies to be tracked over time;

- it contains an explicit and realistic representation of interfuel substitution possibilities in key energy intensive processes; and

- its database contains a detailed representation of the world economy, including the majority of APEC economies, and a detailed treatment of the major energy and energy intensive commodities.

However, there are a number of barriers or aspects of liberalisation that can not be modeled, principally because the necessary data are not available. Examples include the removal of barriers from the important services sector, the removal of some subsidies (including some energy production subsidies) for which data are not available, and the productivity benefits that flow from trade liberalisation. The results reported in this study will therefore tend to underestimate the actual impacts of the implementation of the Bogor program. In order to illustrate the potential magnitude of the productivity benefits from liberalisation some additional analysis has been undertaken outside the standard GTEM framework.

In GTEM a reference case or 'business as usual' simulation provides a basis against which the impacts of policy changes can be measured. The reference case projects the growth in key variables in each region in the absence of policy changes. In this study the reference case represents the likely outlook for APEC energy production, consumption and trade in the absence of APEC trade and investment liberalisation.

Reference case results

Total demand for energy in the reference case increases significantly throughout the APEC region over the projection period (figure A). In 2020, energy demand is more than 50 per cent higher than its level in 1995. This implies that the region's energy consumption would reach 7500 million tonnes of oil equivalent (Mtoe) in that year, compared with 4900 Mtoe in 1995. Growth is especially rapid in the developing and newly industrialised APEC economies because of strong growth in economic output, high population growth and increased consumption of personal services (including transport, space heating and the use of electrical appliances) that accompanies rising per person incomes. In the developed APEC economies, where economic and population growth rates are lower than elsewhere in the region, total energy demand rises by 27 per cent over the period to 2020. Because these economies represent such a large share of APEC energy demand, this implies large increases in the absolute levels of energy consumed in the region.

A   **Change in APEC energy consumption, 2020, reference case**

1995 = 1
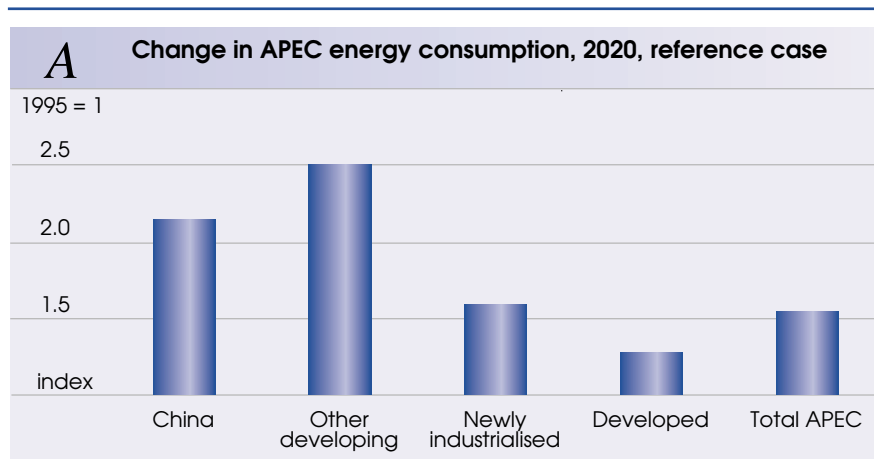
A key driver of increased coal and gas consumption in APEC is expansion of electricity generation, particularly in the rapidly growing developing and newly industrialised economies. Consumption of gas increases more strongly than that of other fossil fuels, reflecting gas's favored position for power generation across the region. However, coal fired generation increases more strongly in economies such as China and Indonesia where large indigenous coal reserves give coal a cost advantage over other technologies. Increased oil consumption is accounted for mainly by demand for transport fuels in both developed and developing economies.

The APEC region is relatively self-sufficient in energy terms, with the majority of energy output consumed within the region. Oil is the only fuel for which imports from outside the region constitute a significant proportion of supply. In the reference case APEC energy suppliers continue to produce cost effectively relative to their competitors. As a result, the region has the capacity to maintain these integrated regional trade relationships. Slower demand growth for oil relative to other energy sources also implies that APEC will become increasingly self-sufficient in energy over the projection period.

Energy imports rise strongly in some economies, particularly in Japan, Korea and Chinese Taipei where indigenous energy resources are limited. However, this growth in energy imports is insufficient to offset the overall growth in energy exports (particularly in coal) and APEC remains a net exporter of non-oil energy to the rest of the world. The major APEC coal exporters — Australia, Canada and the United States — supply most of the increased coal exports. Australia and Indonesia are the main suppliers of the increased gas exports.

Impacts of implementing the Bogor trade liberalisation program

The energy sector impacts of implementing APEC's Bogor trade liberalisation program arise from three groups of influences. These are:

- the macroeconomic effects of liberalisation, including changes in gross domestic product and exchange rates;

- the effects of reducing trade barriers in the energy sector; and

- the effects of economywide liberalisation on the sectoral composition of economic activity.

Macroeconomic effects: Liberalising trade regimes can be expected to lead to higher national incomes, principally through the benefits flowing from increased specialisation in economic activity. Reducing tariff and nontariff barriers to trade, including production subsidies, allows an economy to channel its natural, human and technical resources into activities in which they are used most productively. While liberalisation may involve costs for some sectors, the more efficient allocation of an economy's resources can lead to lower costs of production and, therefore, higher real output and income growth for an economy as a whole. Because energy is a fundamental input to production processes as well as to services such as transport, space heating and lighting, increases in economic output and incomes will lead (other things being equal) to increases in energy consumption.

Effects of reducing trade barriers in the energy sector: The removal of barriers to trade in the energy sector will have impacts on both energy consumption and energy trade. The removal of a tariff barrier in an economy will reduce the price of that fuel in the economy and therefore lead to an increase in its consumption. It will also lead to an increase in imports of cheaper internationally traded fuels. The removal of a production subsidy, in contrast, will lead to an increase in the domestic price of the fuel, a corresponding decrease in demand for the fuel in that economy and an increased role for imports in supplying the lower level of demand.

Relatively few energy sector barriers have been identified and quantified in APEC member economies. A number of energy sector tariff barriers in the APEC region are well documented because they are legislated: there are tariffs on imports of coal in China and the Philippines, and on oil imports in a number of economies. Some production subsidies have been identified and

quantified in the authoritative global databases, but a significant number of such subsidies have not yet been quantified and it is likely that many have not yet been identified.

Effects of changes in economic structure: The intersectoral allocation of an economy's resources will shift in response to trade and investment liberalisation. The movement of resources into or away from energy intensive sectors, such as iron and steel and nonferrous metals, will have significant implications for energy consumption. Similarly, changing comparative advantage relative to other economies can lead to different patterns of energy production. Together, these shifts in energy consumption and production at both the individual economy and regional levels can have implications for the pattern of energy trade.

Because of the relatively limited number of energy sector barriers identified in APEC member economies, the principal causes of the Bogor trade liberalisation impacts on energy consumption, production and trade in the simulations for this study are the macroeconomic and structural effects. The effects of the above influences can be seen at the economywide level — for example in changes in gross domestic product (GDP) — and at the energy sector level.

Impacts of APEC trade liberalisation on GDP

The findings in this study indicate that by 2020 the developing APEC economies will experience increases in GDP of up to 5 per cent relative to the reference case following the implementation of trade liberalisation. These constitute very significant increases in economic output. Newly industrialised and developed APEC economies will, on average, experience smaller increases (0.7 per cent and 0.25 per cent) relative to the reference case because, with some exceptions, they have relatively lower levels of protection (figure B). The net effect at the APEC-wide level is an increase in GDP of 0.75 per cent relative to the reference case. While apparently modest, this is nevertheless a significant number. It is equivalent to additional economic output in the region in 2020 of approximately US$225 billion (at 1995 prices) — about the size of the current Indonesian economy and approaching the size of the current economy of Chinese Taipei.

However, these estimates of the impacts of trade liberalisation do not capture the productivity gains that can be expected to accrue to APEC economies as trade barriers are removed. If these additional productivity benefits are

B   **Change in APEC GDP**
Relative to the reference case
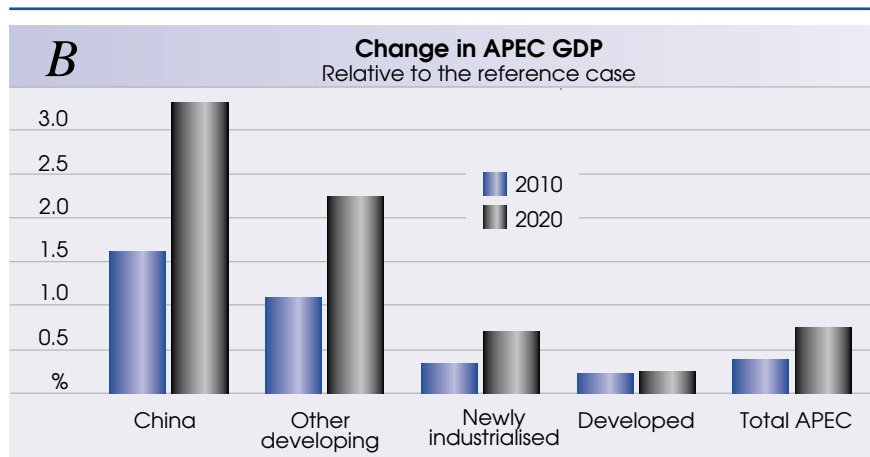
included, illustrative analysis indicates that the impact on APEC GDP could be much larger. These results suggest that by 2020, APEC GDP could be up to US$345 billion (at 1995 prices) higher than in the reference case.

Because the developed APEC economies complete their liberalisation plans by 2010, most of their gains in economic output are realised by this point. The difference in GDP between 2010 and 2020 reflects the additional benefits of improved access to developing and newly industrialised economy markets. These are relatively small because, at an aggregate level, the developed economies trade more intensively with each other than they do with other economies in the region. This reflects, in particular, the very strong trade relationships between the United States and Canada and the United States and Japan.

In the developing and newly industrialised economies, GDP continues to increase strongly relative to the reference case between 2010 and 2020 as they continue to remove barriers to trade. As a result, these economies gain ongoing efficiency benefits from unilateral liberalisation as well as expanded access to other markets.

Energy sector effects of APEC trade liberalisation

The energy sector impacts of liberalisation result from a combination of the economic output effects described above and intersectoral effects. In the developing economies in particular, a major impact of liberalisation is to reduce the assistance (often substantial) that is provided to domestic agricultural industries. As a result the agriculture sector contributes less to

C   **Change in APEC production in selected sectors, 2020**
Relative to the reference case
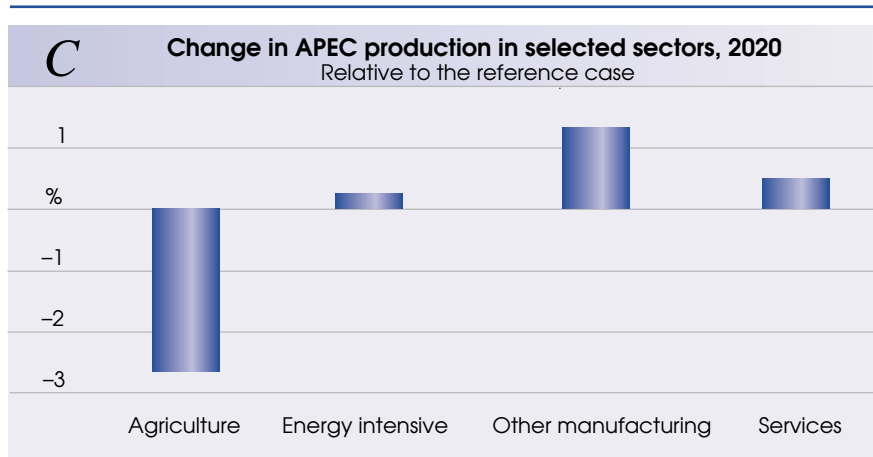
economic growth than do sectors in which these economies have a stronger comparative advantage. The sectors with a stronger comparative advantage include more energy intensive sectors such as heavy industry and manufacturing which, together with the services sector, account for increased energy, including electricity, consumption in developing economies.

In the developed economies, agricultural output declines relative to the reference case as the high levels of assistance in some economies are removed. While resources shift into energy intensive industries to a limited degree relative to the reference case, the small declines in output of electricity, petroleum and coal products and other manufacturing result in some reduction in coal, oil and gas consumption relative to the reference case. On balance, APEC agricultural production decreases while output in the energy intensive, other manufacturing and services sectors increases relative to the reference case (figure C).

Energy consumption impacts
The interaction of the macroeconomic and sectoral impacts of APEC trade liberalisation leads to some quite substantial changes in energy consumption in APEC by 2020 relative to the reference case. As shown in figure D, there are varying impacts on the consumption of different fossil fuels in different economies.

APEC oil consumption rises relative to the reference case in the newly industrialised economies. This is mainly because demand for transport services (including international transport for trade), which accounts for the largest share of oil consumption, increases as a result of increased per person incomes

D **Change in coal, oil and gas consumption, 2020**
Relative to the reference case
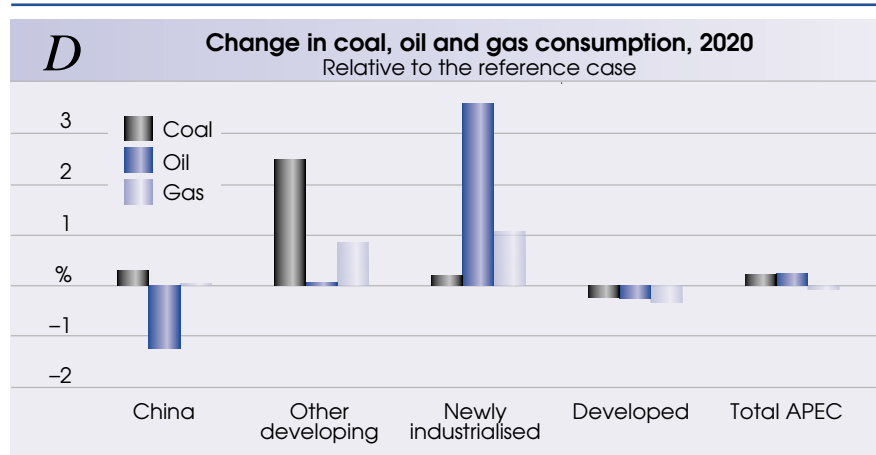
and increased trade flows among economies. Demand for coal in industry and power generation in the developing and newly industrialised economies increases relative to the reference case, while reduced demand in these sectors leads to a fall in coal consumption in the developed economies. Gas consumption increases relative to the reference case in economies where energy intensive production and electricity generation increase as a result of liberalisation. This includes a number of developing and newly industrialised economies. This is partly offset by falls in gas consumption relative to the reference case in Indonesia and Mexico, both of which are relatively large consumers of gas in the regional context. These are insufficient to outweigh the increases in other developing and newly industrialised economies, however, and total gas consumption in these regions in 2020 is higher than in the reference case.

E **Change in coal, oil and gas production in selected APEC economies, 2020** Relative to the reference case
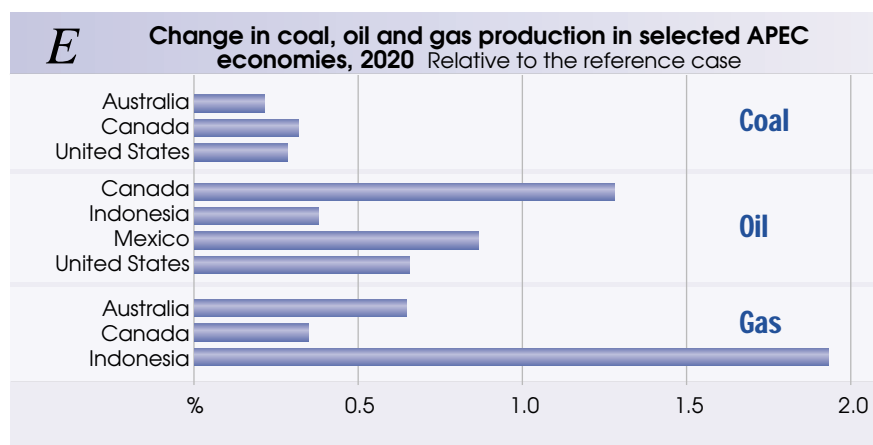
Energy production impacts

APEC trade liberalisation results in increased production of fossil fuels in the region relative to the reference case (figure E). An important driver of the changes in energy production is the resource shifts that arise from liberalisation in the major energy producing economies. For example, production of coal, oil and gas increases in Australia, Canada and the United States, as trade liberalisation results in the release of resources from previously protected industries, such as manufacturing, and increasing specialisation in resource based sectors, including the energy sector.

Trade impacts

Relative to the reference case, fossil fuel trade in the APEC region increases significantly as a result of liberalisation (figure F). This is mainly driven by the shifts that occur in APEC fossil fuel consumption and production. The largest changes are in coal trade, mainly reflecting strong growth in coal fired power generation throughout the region. The majority of the increased demand for imported fossil fuels in APEC occurs in the region's key import markets — Japan, Korea and Chinese Taipei — as their economies grow, and as energy intensive output increases, as a result of liberalisation.

The same forces underpin increased imports of energy relative to the reference case in a number of developing APEC economies. While trade impacts arise mainly from the balance of the consumption and production impacts of liberalisation, the removal of barriers on fossil fuel imports also has an impact on the level of APEC fuel trade. For example, the removal of tariffs on imported coal in China and the Philippines encourages coal imports. Similarly, the removal of tariffs on oil imports in Korea and Chinese Taipei,

F Change in APEC coal, oil and gas trade, 2020
Relative to the reference case
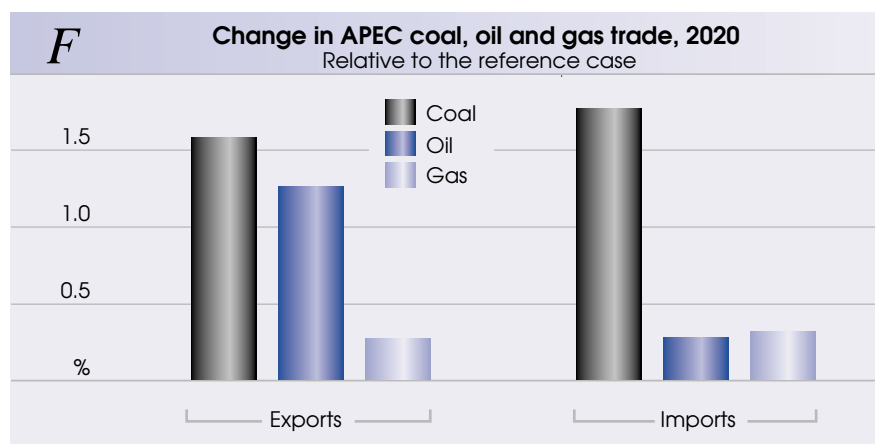
as well as in smaller import markets such as Chile, promotes increased oil imports relative to the reference case.

APEC's major coal exporters — Australia, Canada and the United States — meet most of the increase in demand for coal imports relative to the reference case. Oil exports increase from Canada, Indonesia and Mexico. Malaysia's oil exports are constrained by strong increases in domestic energy consumption as a result of the economic gains that flow from liberalisation. This also reduces Malaysia's gas exports relative to the reference case, allowing Australia and Indonesia to increase exports of gas. The absolute level of Malaysia's gas exports does not fall, however, and Malaysia is well able to maintain its long term contractual commitments.

Effects of changing the pace of liberalisation

Analysis was also undertaken on the effects of both increasing and slowing the rate at which developing and newly industrialised member economies implement the Bogor program. The results indicate that if these economies meet their trade liberalisation objectives by 2010 they will obtain higher real output growth than under the Bogor timetable (figure G). In the developing economies (excluding China), for example, GDP in 2020 is 2.6 per cent higher than in the reference case, compared with a difference of 2.2 per cent under the Bogor timetable. These increased benefits occur because economies capture the efficiency gains and consequent additional investment growth from unilateral liberalisation earlier than under the alternative scenario. They also reap the benefits of wider market access as all economies liberalise within the same timeframe. In contrast, if the developing and newly

G **Change in GDP under different liberalisation scenarios, 2020**
Relative to the reference case

industrialised economies do not commence trade liberalisation until 2010, their economic output by 2020 is lower than if they commence liberalisation from 2000. This results in reduced demand for energy relative to the reference case.

Effects of investment liberalisation

The economic gains that arise from trade liberalisation can be enhanced by the concurrent liberalisation of investment regimes. This is because removing barriers to investment allows international capital flows to be allocated more efficiently because capital is able to flow to the sectors or economies that use it most productively. Increasing access to capital means that economies with large investment opportunities have greater access to foreign

H Change in GDP in developing and newly industrialised economies, 2020 Relative to trade liberalisation only

I Change in energy consumption in developing and newly industrialised economies, 2020 Relative to trade liberalisation only
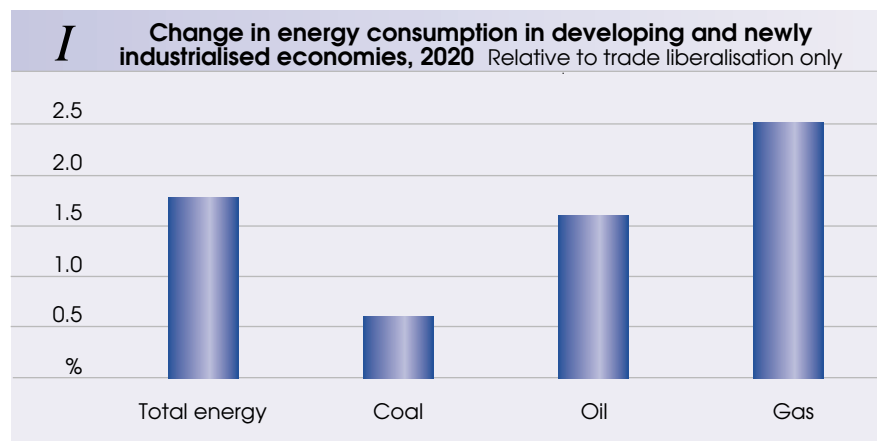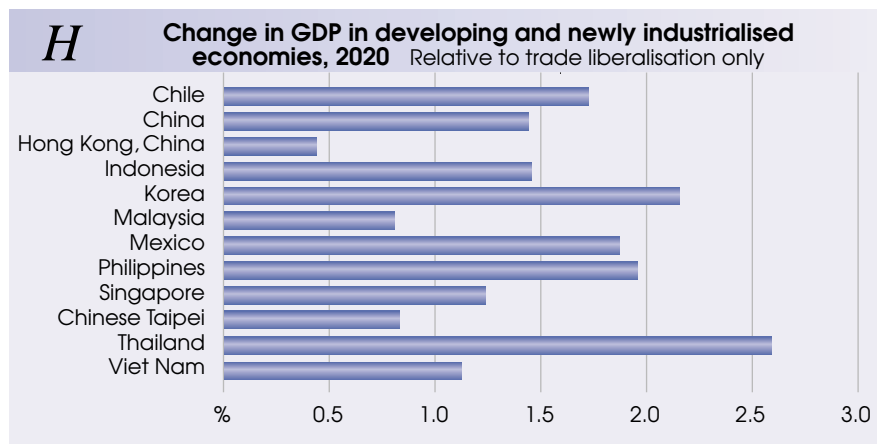
investment funds. As a result, the increase in APEC GDP that arises when investment regimes are liberalised concurrently with trade regimes is significantly larger than when trade alone is liberalised (figure H). The energy consumption changes following investment liberalisation are also larger (figure I), as are the consequential supply responses.

Policy implications of the findings

It can be concluded that member economy adoption of policies to implement APEC's Bogor program of trade and investment liberalisation will produce economic benefits for APEC as a whole, but particularly for developing and newly industrialised economies. Indeed, because a number of barriers or aspects of liberalisation could not be modeled, the actual impacts will in general be greater than the results reported in this study. These benefits will be increased if the rate of liberalisation is more rapid and will be reduced by slowing the rate of implementation.

The study also shows that there will be important direct implications for APEC energy policy makers. The size and structure of member economy energy sectors will be significantly altered by the implementation of the Bogor program. Changes will be experienced in energy consumption, production and trade. Again, these impacts will be greatest in the developing and newly industrialised economies. The enhanced role for natural gas in these economies will also require additional investment in both gas supply infrastructure and end use equipment. While most of these changes will result from the energy sector impacts of removing protection in other sectors, significant changes will occur in some economies from the removal of specific energy sector protection measures. The removal of production subsidies that could not be quantified and evaluated in this study will produce additional responses.

The study results show that for most member economies, growth in electricity sector investment will be necessary if the benefits of the Bogor liberalisation program are to be realised. This is particularly true for the developing and newly industrialised economies. The enhanced role for natural gas in these economies will also require additional investment in both gas supply infrastructure and end use equipment. These findings reinforce the priority that the APEC Energy Working Group has given to the development of policy frameworks that will facilitate investment, including business sector investment, in the energy sectors of member economies.

The study also demonstrates that trade and investment liberalisation will contribute to meeting some of the key energy policy principles endorsed by APEC Energy Ministers. These include the development of more efficient production, distribution and consumption of energy; the pursuit of open energy markets; the progressive reduction of energy subsidies; and the promotion of capital flows. Indeed, open and undistorted trade and investment regimes are likely to enhance the benefits of other market liberalising initiatives that are being pursued in the APEC region.

1

Introduction

The Asia Pacific Economic Cooperation (APEC) forum was established in 1989 in response to increasing economic integration in the Asia Pacific region. From its initial membership of twelve, APEC has expanded to include the twenty-one economies identified in table 1. These span a broad range of economic structures and levels of development. Despite the economic downturn that has affected some of the region's economies since 1997, APEC remains the fastest growing region in the world and a major contributor to global economic output. In 1997, gross domestic product (GDP) in the region exceeded US$17 trillion and accounted for almost 60 per cent of world GDP (World Bank 1999).

Notwithstanding the diverse characteristics of its member economies, APEC has, since its inception, emerged as an important vehicle for creating more open trade and investment regimes and strengthening economic cooperation in the region. In doing so, it has built on an extended history of liberalisation throughout the region — trade liberalisation in particular has been an important feature of the APEC economic environment for much longer than in most other regions. Nevertheless, APEC members have embarked on an ambitious program of liberalisation to remove the barriers to trade and investment flows that persist in the region. The APEC program supports the global trading system by extending the region's liberalisation initiatives to all trading

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1 **APEC member economies**

Developed economies	**Newly industrialised economies**	**Developing economies**
Australia	Hong Kong, China	Brunei Darussalam
Canada	Korea	Chile
Japan	Mexico	China
New Zealand	Singapore	Indonesia
Russian Federation	Chinese Taipei	Malaysia
United States		Papua New Guinea
		Peru
		Philippines
		Thailand
		Viet Nam

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partners without discrimination. Trade and investment liberalisation has been afforded high policy priority by APEC member economies in recognition of the mutual economic benefits that more open and outward oriented trade and investment regimes can bring.

The effects of trade and investment liberalisation in APEC are potentially significant for the region's economies and energy sectors because international trade and investment are key drivers of economic growth. Increased economic growth can be expected to generate increased energy consumption and, ultimately, energy production. Because trade and investment liberalisation leads to the movement of resources between sectors in an economy it will also generate different patterns of economic output and energy consumption across economies. This could have important implications for the magnitude and direction of energy trade.

Objectives and structure of the study

It is against this background that in 1998 the APEC Energy Working Group approved the commissioning of a study with the key objective being to provide a quantitative assessment of the impacts on the energy sector of the APEC trade and investment liberalisation program that was articulated in the Bogor Declaration (APEC 1994).

The process of trade and investment liberalisation within the APEC framework is likely to have both direct and indirect impacts on the regional energy sector. The direct impacts will occur as impediments to trade and investment in fuels and energy services are removed, affecting energy prices, output and trade. Indirect impacts will arise as the benefits of economywide liberalisation lead to higher real output growth and higher real incomes across the region. Because energy is a fundamental input to production processes as well as to services such as transport, space heating and lighting, increases in economic output and incomes will lead (other things being equal) to increases in energy consumption.

The economywide economic changes that follow trade and investment liberalisation will also produce shifts in the intersectoral allocation of an economy's resources. As liberalisation allows an economy to exploit its comparative advantage it is likely that there will be movements of resources — principally labor and capital — away from sectors that were relatively highly insulated from competition toward those where the potential for income generation is higher. The movement of resources into or away from

energy intensive sectors, such as iron and steel and nonferrous metals, could have significant implications for energy consumption. Similarly, changing comparative advantage can lead to different patterns of energy production. Together, these shifts in energy consumption and production at both the economy and regional level could have significant implications for the pattern of energy trade.

Understanding the broad macroeconomic impacts of trade and investment liberalisation is important for policy making at the economywide level. But equally important are the policy implications for the energy sector of the changes in energy consumption, production and trade that are likely to follow implementation of the liberalisation agenda. Managing the transition to a different energy future will be a challenge for APEC energy policy makers. In this context the study aims to inform the policy making process by analysing the types of changes in the energy sector that are likely to result from liberalisation.

Several alternative liberalisation scenarios are simulated in the study. The main scenario is the implementation of trade and investment liberalisation according to the Bogor timetable. Alternative liberalisation schedules are also analysed to indicate the sensitivity of impacts to the timing of liberalisation. This is significant because of the voluntary nature of the APEC commitments and because of the range of factors that will influence member economies' commitments to implement their liberalisation agendas. For example, delaying liberalisation has sometimes been viewed as an appropriate response to economic downturn or as a means of restoring current account balances. Alternatively, accelerating liberalisation can be seen as a means of enhancing the gains from the liberalisation process.

The sensitivity of the results to assumptions about the likely recovery paths from the Asian economic downturn that has affected much of the region over the past two years is also considered. This is relevant because of the continued uncertainty about the pace of recovery in some of the region's key economies. It is possible that faster than anticipated recovery from the economic downturn could have an impact on the gains from trade and investment liberalisation.

It is important to note that the APEC liberalisation agenda is multidimensional and that the study does not aim to capture the impacts of all the market liberalising initiatives that are occurring throughout the region. For example, it does not assess the impacts of APEC's trade and investment facilitation

measures that are designed to remove administrative barriers to the flow of goods, services and capital. In addition, there are a number of barriers or aspects of liberalisation that cannot be analysed, principally because the necessary data are not available. These include the removal of barriers from the important and growing services sector and the removal of some domestic production and other subsidies.

The study also does not include some other trends that are occurring in the region concurrently with the opening of trade and investment regimes that will be important for energy sector outcomes. Deregulation of electricity industries and the growing role of independent power producers are key examples. Electricity sector deregulation, for example, could have significant impacts on productivity and prices throughout an economy by increasing competition and efficiency.

The impacts on economic growth and on the energy sector of APEC trade and investment liberalisation are examined in this study using ABARE's Global Trade and Environment Model (GTEM). This is a dynamic general equilibrium model of the world economy developed at ABARE to examine global change issues. GTEM is an appropriate tool for analysing international trade and investment issues because it can take into account the interaction between different sectors in the economy and because it explicitly models international trade and investment flows. The model's database contains a detailed representation of the majority of APEC economies and detailed treatment of the major energy and energy intensive commodities. In addition, the intertemporal nature of GTEM permits the change in variables, and hence the impacts of policies, to be tracked over time.

A qualitative assessment of the benefits that are likely to flow from trade and investment liberalisation is provided in chapter 2. Chapter 3 is focused on international trade in APEC member economies, including an overview of trade patterns, barriers to trade, and the nature of APEC trade liberalisation. A similar treatment of foreign direct investment is provided in chapter 4. Chapter 5 includes a description of GTEM and how the model is used to examine the impacts of trade and investment liberalisation on APEC's energy sector. Results from the model analysis are presented in chapters 6 to 8. The energy policy implications of APEC trade and investment liberalisation for the energy sector and the APEC Energy Working Group are discussed in chapter 9.

2

The APEC trade and investment liberalisation agenda

The APEC commitment

APEC's commitment to trade and investment liberalisation has been articulated at the highest level in a series of statements by the forum's economic leaders (box 1). The Blake Island Economic Vision Statement (APEC 1993) recognised that one of the foundations of growth in the region has been the open multilateral trading system. It pledged to continue to reduce barriers to trade and investment in the region in order to ensure the expansion of trade and the unimpeded flow of investment resources.

The Bogor Declaration of 1994 (APEC 1994) established the broad framework and timetable for the trade and investment liberalisation process. One of the overriding principles of APEC liberalisation established at Bogor is that it should support and complement the multilateral trading system developed under the World Trade Organisation and act as a catalyst for the promotion of trade and investment liberalisation globally. Open regionalism — or the extension of liberalisation initiatives to all trade and investment partners without discrimination — is an essential part of the APEC liberalisation philosophy. Under the Bogor parameters, industrialised member economies of APEC agreed to achieve the goal of free and open trade and investment by 2010. The same goal is to be reached by developing APEC economies by 2020.

The Bogor commitment was reaffirmed at Osaka in 1995, where APEC leaders agreed to develop individual and collective action plans that would present concrete and substantive proposals to achieve the Bogor goals (APEC 1995). The individual action plans, which have been submitted each year since 1996 under the Manila Action Plan for APEC, are the main vehicle for communicating APEC trade and investment liberalisation proposals.

The Osaka Action Agenda also articulated the core principles on which the APEC liberalisation process is based (table 2). These include comprehensiveness, or the inclusion of all impediments to free and open trade and investment in the liberalisation process; consistency with the principles of the World Trade Organisation; comparability of the contributions to trade and investment liberalisation by each economy, accounting for the level of liber-

1 The APEC commitment to liberalisation

'Recognising our economic independence as well as our economic diversity, we envision a community of Asia Pacific economies in which:

> we continue to reduce trade and investment barriers so that our trade expands within the region and with the world and goods, services, capital and investment flow freely among our economies.'

> APEC Leaders' Economic Vision Statement
> Blake Island, Seattle
> 20 November 1993

'With respect to our objective of enhancing trade and investment in the Asia-Pacific, we agree to adopt the long term goal of free and open trade and investment in the Asia-Pacific.

'We further agree to announce our commitment to complete the achievement of our goal of free and open trade and investment in the Asia-Pacific no later than 2020. The pace of implementation will take into account differing levels of economic development among APEC economies, with the industrialised economies achieving the goal of free and open trade and investment no later than the year 2010 and developing economies no later than the year 2020.'

> APEC Economic Leaders' Declaration of Common Resolve
> Bogor, Indonesia
> 15 November 1994

'Reflecting the diverse character of APEC and the broad scope of our activities, we will achieve the long term goal of free and open trade and investment in several ways. We will:

> encourage and concert the evolving efforts of voluntary liberalisation in the region; take collective actions to advance our liberalisation and facilitation objectives; and stimulate and contribute to further momentum for global liberalisation.'

> APEC Economic Leaders' Declaration for Action
> Osaka, Japan
> 19 November 1995

'We need to deal urgently with the financial crisis which has spread beyond the APEC region.

'The expansion of trade and investment remain essential elements of our economic recovery and we reiterate the need for liberal and open markets and an enabling environment for investment.'

> APEC Economic Leaders' Declaration: Strengthening the Foundations for Growth
> Kuala Lumpur, Malaysia
> 18 November 1998

alisation already achieved; nondiscrimination; transparency; and flexibility (APEC 1995).

Areas of activity included in the action plans encompass tariffs and nontariff barriers, services, investment, customs procedures, intellectual property rights and competition policy, among others. A particularly important area, nontariff measures, includes quantitative import and export levies, minimum import prices, discretionary import and export licensing, voluntary export restraints and export subsidies.

Further statements by economic leaders in the years since the Osaka meeting have refined the vision for APEC liberalisation and have developed additional mechanisms for achieving the Bogor goals (APEC 1996a, 1997a). Critical to this process has been the submission on an annual basis of individual action plans by member economies that were agreed at Osaka and that contain concrete proposals for achieving APEC's liberalisation goals. Expanding trade and investment was also given high priority in the APEC response to the Asian financial downturn that has affected the region since 1997 (APEC 1998a).

APEC's trade and investment liberalisation agenda is also highly supportive of initiatives taken in the context of the APEC Energy Working Group.

2 **Osaka Action Agenda: general principles and areas of action**

General principles	Areas of action
Comprehensiveness	Tariffs
WTO consistency	Nontariff measures
Comparability	Services
Nondiscrimination	Investment
Transparency	Standards and conformance
Standstill	Customs procedures
Simultaneous start, continuous process and differentiated timetables	Intellectual property rights
	Competition policy
Flexibility	Government procurement
Cooperation	Deregulation
	Rules of origin
	Dispute mediation
	Mobility of business people
	Implementation of the Uruguay Round
	Information gathering and analysis

Source: APEC (1995).

In 1996, APEC Energy Ministers, at their inaugural meeting, agreed a set of nonbinding energy policy principles (APEC 1996b). These included the development of more efficient production, distribution and consumption of energy; the pursuit of open energy markets; the progressive reduction of energy subsidies and the introduction of efficient energy pricing practices; and the promotion of capital flows. Liberalising energy markets as part of the economywide trade and investment liberalisation process has the potential to contribute to each of these objectives.

Benefits of trade liberalisation

The strong APEC commitment to trade liberalisation is based on the expectation that open and outward looking trade regimes will lead to higher national incomes, principally through the impacts of specialisation on economic activity. There is a strong historical relationship between the expansion in global trade and world economic growth. The volume of world merchandise and services trade increased almost ninefold between 1960 and 1996, while world economic output expanded by a factor of 3.7 (figure 1).

The economies that have fostered trade openness, and as a result have high ratios of imports and exports to GDP, have experienced the highest rates of economic growth (figure 2). The key roles that trade plays in promoting economic growth include increasing savings and investment by raising income levels, transferring technology and accumulating physical capital and encouraging innovation and specialisation.

1 **Trends in world exports and GDP**

1960 = 1

Exports of goods and services

Real GDP
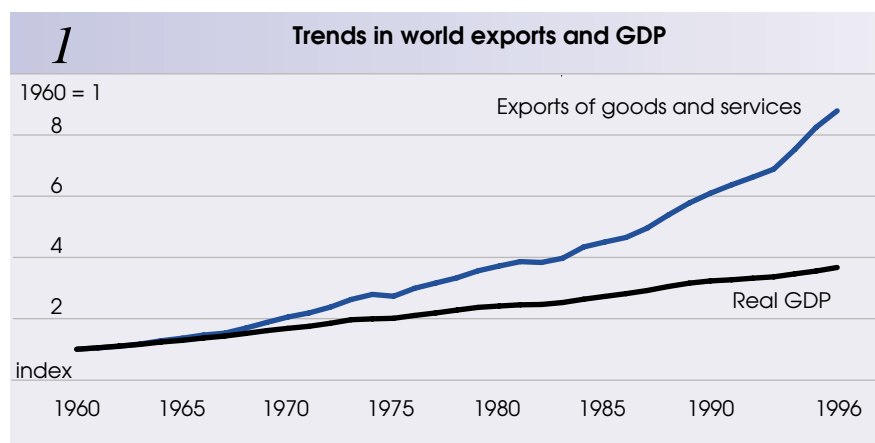
Source: World Bank (1999).

International trade in goods and services occurs because economies differ in terms of their natural, human, technical and financial resources. Open trade regimes benefit economies because they allow them to specialise their production in the activities and commodities in which they have a comparative advantage — that is, in activities in which resources are used most competitively.

Some specialisation of economic activity is based on the abundance of high quality resources that are required for particular industries (Roberts 1997). Australia's large and internationally competitive minerals sector, for example, is based on its greater abundance of mineral resources relative to other resources and compared with other economies. Other advantages may be developed through technical innovation and the establishment of infrastructure. Japan, for example, has a highly competitive automotive industry, based on advanced manufacturing technology and equipment. However, specialisation in other industries stems less obviously from relative opportunities both within and between economies. China, for example, has a large export oriented textile and clothing sector, not so much because it is better at producing textiles and clothing than other economies, but because it has a large supply of labor that does not have higher value uses within China.

When an economy's resources are allocated to their most competitive uses and trade is open and undistorted there will be additional dynamic benefits to firms and consumers in the form of enhanced productivity. This occurs

2 Trade openness and economic growth in developing and Asian newly industrialised economies

Low growth is defined as per person real income growth of less than 0.5 per cent a year, medium growth is 0.5–2.9 per cent a year and high growth is greater than 2.9 per cent a year.
Source: International Monetary Fund (1997).

because domestic industries are not protected from international competition and are stimulated to attain higher levels of efficiency in order to compete with imported goods and services.

Increased openness also allows firms to source the lowest cost and most competitive inputs to production and increases the prospects for innovation and technological advancement. This is likely to lead to lower prices and increased availability of goods and services. When trade liberalisation is reciprocated in other economies, access to international markets expands. This allows a firm to broaden its sales potential and to exploit the benefits of scale economies (OECD 1998). In addition, trade barriers, especially non-tariff barriers such as import quotas, provide an incentive for firms to engage in unproductive rent seeking activities. The programmed elimination of these barriers can reduce the returns to rent seeking and lead to overall productivity gains for a firm or an industry.

However, reducing or removing barriers to trade in an economy can result in adjustment costs in some industries. The magnitude of adjustment costs depends on the mobility of resources, including labor. Some displaced physical resources, such as capital equipment, may be highly specialised and result in losses to investors. Others may be adaptable to alternative uses, thereby limiting adjustment costs. Similarly, if labor markets are flexible and displaced workers are mobile and have adaptable skills, adjustment costs will be less than if those workers are immobile and lack skills to adjust to alternative occupations (Roberts 1997).

In some economies the costs of adjustment are very visible and immediate because of the regional concentration of supported industries and the regional employment effects that removal of support can produce. This compares with benefits that are less apparent because they are diffused throughout the economy and are usually longer term. This can impede public acceptance of reforms that will benefit an economy.

It should also be noted, however, that trade liberalisation is only one component of a constantly evolving environment to which all industries must adapt. For example, industries encounter continuous pressures to adjust to changes in demand, advances in technology and changes in competitive conditions. In many instances, costs are incurred willingly by businesses in order to attain greater profitability or to avoid still greater future adjustment costs (Roberts 1997).

Benefits of investment liberalisation

The benefits that flow to an economy when barriers to foreign investment (box 2) are reduced are as compelling as those resulting from the liberalisation of trade. Investment flows across borders have contributed significantly to the integration of the global economy. Nominal inflows of foreign direct investment increased 43 times over the past quarter century and foreign direct investment increased steadily as a percentage of GDP (figure 3).

On a global basis the value of goods and services produced by foreign invested companies exceeded the value of global exports, indicating that this form of production has become the dominant mode of servicing foreign markets (OECD 1998). In addition to foreign direct investment, foreign portfolio investment, bank loans and other short term credit flows have grown strongly. In 1996 they were five times larger than foreign direct investment.

Liberalising investment regimes concurrently with trade regimes is likely to increase the economic gains from trade liberalisation by directing world savings to where they are most productive. Foreign direct investment by transnational corporations is one of the most important means by which the benefits of more liberal investment regimes are captured by both the source and host economies.

2   Forms of foreign investment

Foreign direct investment refers to the international transfer of financial resources by investors to establish commercial activities in another economy. This may involve a foreign parent company setting up a new enterprise by purchasing the resources directly, or purchasing enough shares in a domestic firm to actually or potentially influence the key policies of the enterprise. Foreign investment is usually counted as foreign direct investment when it represents 10 per cent or more of an enterprise's equity capital, on the basis that this level of investment indicates a long term interest in, or degree of control over, the management of the enterprise (UNCTAD 1997).

Foreign portfolio investment refers to foreign ownership of shares in domestic companies below levels regarded as foreign direct investment. While foreign direct investors are concerned with the production of goods and services, foreign portfolio investors are typically interested in the financial returns on their investments. As a result, foreign portfolio investment tends to be shorter term than foreign direct investment and more easily reversible.

3   **Trends in global foreign direct investment**
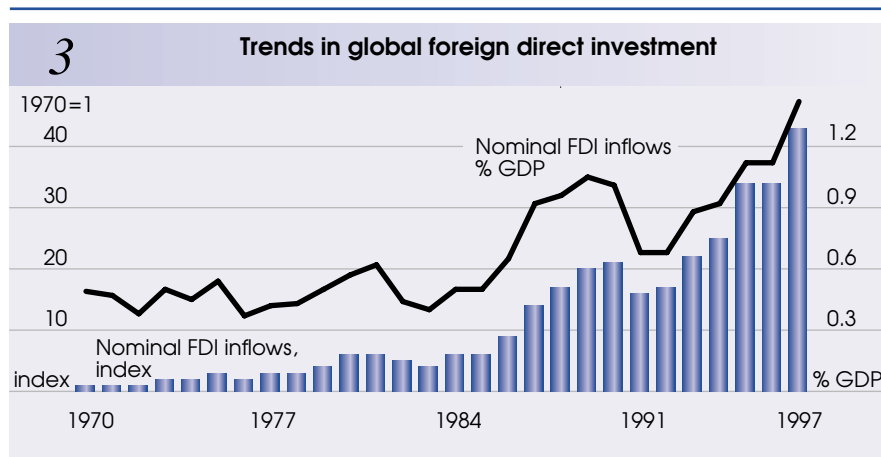
Source: World Bank (1999).

Through foreign direct investment, transnational corporations establish production activities in foreign, or host, economies. This so-called 'international production' is an integrated package of capital, technology, skills, managerial practices and trade links (UNCTAD 1997). Direct benefits arise in the host economy if the subsidiaries of transnational corporations are more productive than the local competition. Indeed, there is strong evidence that transnational corporations have higher multifactor productivity than domestic rivals, because of superior technical efficiency (International Monetary Fund 1995). As a result, the host economy's resources are used more efficiently. In addition, foreign direct investment increases the efficiency with which domestic capital is used because transnationals use domestic capital to finance asset purchases. For example, assets held by transnational corporations were 3.5 times larger than foreign direct investment stocks in 1997, due largely to finance from domestic lenders and shareholders (UNCTAD 1998).

Indirect or spillover effects can also arise in the host economy from the increased competition and consequent productivity improvements that transnationals can create in an industry. Foreign direct investment can also increase domestic investment by creating backward (input) and forward (distribution and maintenance services) links with local firms. These links can facilitate the transfer of technology, assets or operational procedures to domestic companies from transnational corporations, allowing domestic firms to become more productive. Benefits external to transnationals or their customers arise if they employ local workers who become more skilled as a result and later use these skills elsewhere in the local economy.

In the source economy, foreign direct investment increases total income because domestic resources are paid an appropriate rate of return. That is, the rate of return is no longer limited by the availability of domestic investment opportunities. The source economy may also benefit if technology and other improvements achieved by transnational subsidiaries are transferred back to the parent company.

Impacts of APEC's 'open regionalism'

As noted above, one of the key characteristics of APEC's liberalisation agenda is that it does not limit its liberalisation initiatives to APEC members. The benefits of liberalisation are extended to all economies on a nondiscriminatory basis. This is important because the gains to an economy from both trade and investment liberalisation are higher under an open regime than under one that restricts its scope to member economies. This is because openness increases the scope for competition and specialisation in economic activity and, hence, the efficiency gains that are likely to follow from trade liberalisation. Openness also broadens the potential pool of investment funds following the liberalisation of investment regimes. As a result, an open regime such as APEC will lead to the most efficient allocation of productive and investment resources throughout the region.

3

Trade in APEC

Trade by APEC member economies has increased rapidly since the 1980s and has been a key determinant of economic growth. Exports grew at more than twice the rate of GDP over the period and almost twice as rapidly as exports from non-APEC economies. While APEC's strong export performance is at least partly related to trade liberalisation by member economies, impediments to undistorted trade in the region remain.

Trade flows in APEC

APEC trade has more than trebled since 1980, outstripping growth in GDP and non-APEC trade (figure 4). Merchandise and services exports from APEC economies grew at an annual rate of 7.6 per cent from 1980 to reach US$3060 billion in 1996. With exports from the rest of the world growing at only 4.4 per cent a year over the same period, APEC's share of world exports increased from 35 per cent in 1980 to 46 per cent in 1996.

At the same time, total GDP of APEC economies grew at 3.6 per cent a year, or less than half the rate of export growth. As a result, the role of trade in APEC economic activity has increased — the ratio of exports to GDP in APEC economies increased from 10 per cent in 1980 to 19 per cent in 1996.
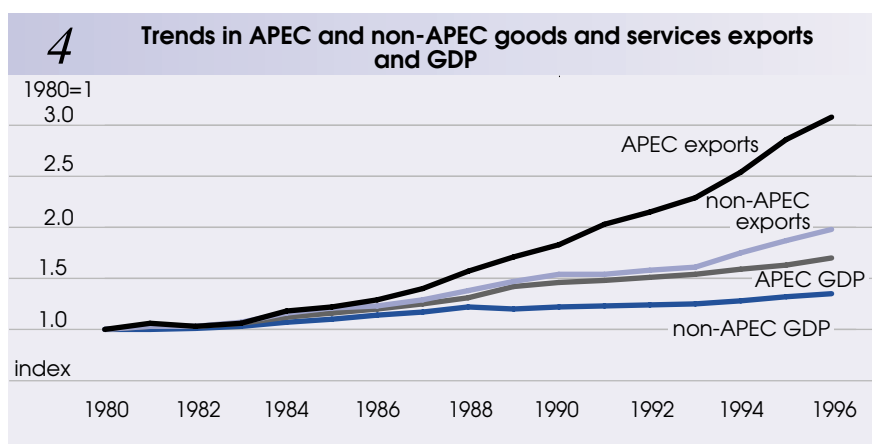
4 **Trends in APEC and non-APEC goods and services exports and GDP**

Sources: World Bank (1999); Council for Economic Planning and Development (1998); International Monetary Fund (1987, 1994).

5   APEC exports, by economy, 1996
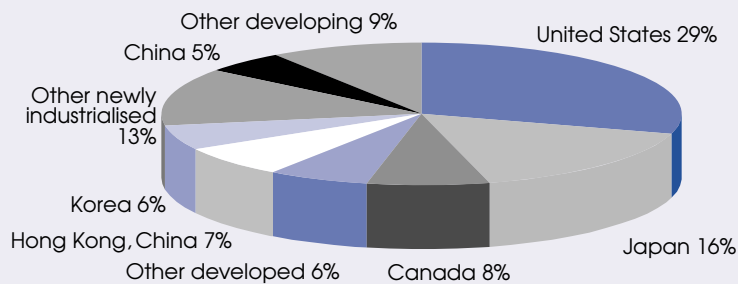
Other developing 9%
China 5%
Other newly industrialised 13%
Korea 6%
Hong Kong, China 7%
Other developed 6%
Canada 8%
Japan 16%
United States 29%

Sources: World Bank (1999); Council for Economic Planning and Development (1998); International Monetary Fund (1987, 1994).

APEC trade is dominated by the developed APEC economies, especially the United States and Japan (figure 5). However, the developing and newly industrialised economies achieved higher rates of growth in trade over the period 1980–96. As a result, their shares of total APEC exports in 1996 are substantially higher than they were in 1980 (figure 6).

An important aspect of APEC trade is the increasing level of intraregional trade. For example, the proportion of APEC merchandise exports delivered to other APEC economies increased from 58 per cent in 1980 to 72 per cent

6   APEC exports, by level of development as a share of total APEC exports
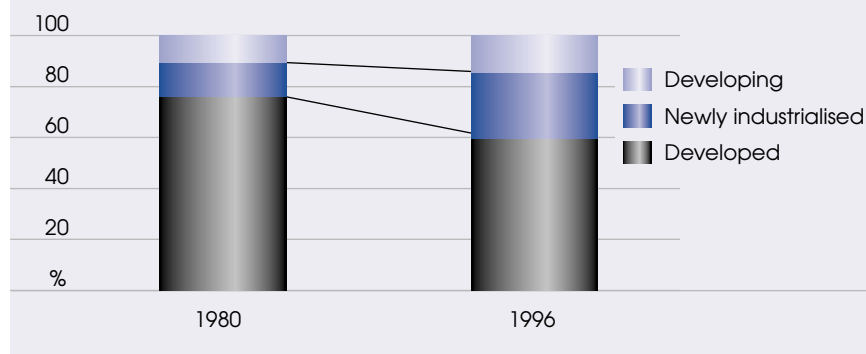
Developing
Newly industrialised
Developed

1980   1996

Sources: World Bank (1999); Council for Economic Planning and Development (1998); International Monetary Fund (1987, 1994).

7   **Destination of APEC's merchandise exports**
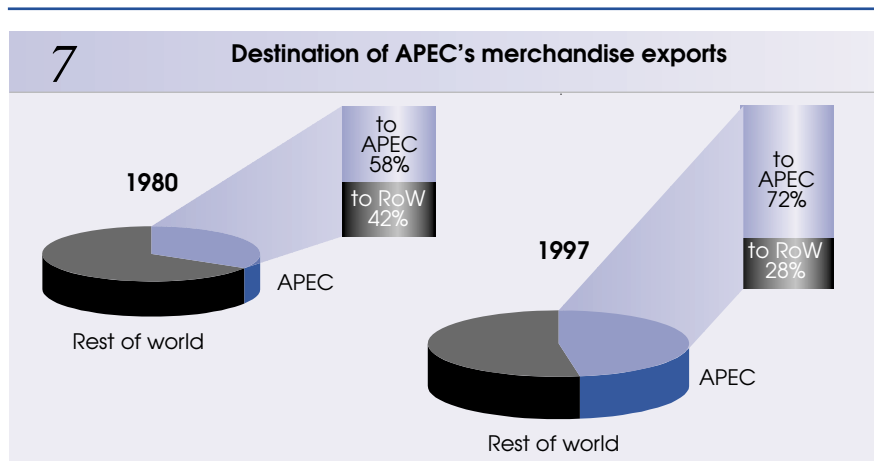
Source: World Bank (1999).

in 1997 (figure 7). APEC intraregional trade is dominated by several key trade relationships, the most important of which is that between the United States and Canada. In 1997, 83 per cent of Canada's exports were to the United States, which exported 22 per cent of its exports to Canada. Other examples of significant trade relationships are those between the United States and Japan and Mexico, and between China and Hong Kong, China and Chinese Taipei.

Trade liberalisation in APEC

The growing role of trade in the APEC region has been encouraged, at least in part, by the reduction in government imposed measures that distort the free flow of trade, including tariffs and nontariff barriers (box 3).

Trade liberalisation initiatives were implemented in APEC prior to the commitments made in the Manila Action Plan for APEC in 1996 and have been pursued unilaterally and in regional and multilateral forums. Unilateral efforts to liberalise trade reduced the unweighted average tariff level in the APEC region from 15.4 per cent in 1988 to 9.1 per cent in 1996. Unweighted tariff rates are calculated as the average *ad valorem* duty across all tariff lines regardless of the value of imports under each tariff line. They do not include specific duties. The incidence of nontariff measures also declined over the same period, from 9 per cent to 5 per (APEC 1997b).

Multilateral liberalisation under the Uruguay Round has complemented uni-lateral tariff reductions by binding tariffs at the new lower levels. In addition,

commitments under the Uruguay Round have played an important part in the reduction of nontariff barriers in APEC economies. Commitments have included the reduction of domestic production subsidies, export subsidies and voluntary export restraints in agriculture, and reductions of bilateral quotas on textiles and garments (APEC 1997b).

Subregional trading arrangements within APEC have also played a role in trade liberalisation among APEC economies, with fourteen member economies participating in at least one such arrangement. The most significant of these are the North American Free Trade Agreement (NAFTA), the ASEAN Free Trade Area and the Australia–New Zealand Closer Economic Relations Trade Agreement. Some APEC member economies are also involved in trading agreements with non-APEC economies.

Since 1996, APEC trade liberalisation has occurred within the framework of member economies' individual action plans. These identify, on an annual basis, tariff and nontariff measures that will be reduced or eliminated in the short, medium and long term, in accordance with the guiding principles of APEC liberalisation. The 1999 individual action plans indicate that consid-

3	Measures that distort trade

Tariffs
Tariffs are a tax on imports. The most common form of tariff is an *ad valorem* duty, calculated as a percentage of the value of the imported good. Tariffs may also be levied on a specific, or per unit, basis. Tariffs or taxes on exports are also applied by some economies.

Nontariff barriers
Nontariff barriers refer to measures other than tariffs that distort trade. The most common nontariff barrier is an import quota which limits the quantity or value of a good allowed into an economy. Import quotas can be combined with tariffs to form tariff quotas where a tariff is applied to imports above the quota level. Other nontariff barriers include licensing schemes; the imposition of standards and technical requirements; prohibitions; and voluntary export restraint arrangements.

Export and production subsidies
Export subsidies are government payments to local producers for the export of certain products while production subsides are paid on actual output levels. While not applied to trade directly, production subsidies distort international trade by giving local producers an advantage over producers of imported products.

erable progress has been made in liberalising APEC trade regimes in the period since 1996. This is confirmed by data that show that unweighted average tariff levels have fallen in at least thirteen APEC economies over the period 1996–98. Thailand has implemented the largest reduction in average tariff levels, with other significant reductions occurring in the Philippines and China.

Quantifying barriers to trade in APEC

The estimates of support provided to domestic industries that are used in this study are based on the GTAP 4E database, the most authoritative database of its kind (McDougall, Elbehri and Truong 1998). The estimates are provided for 1995. They have been modified by ABARE for use in this study to take account of the changes (generally reductions) in support that have occurred between 1995 and 2000 under different trade liberalisation initiatives. These include the Uruguay Round, APEC and unilateral action.

Included in the measures of support in the GTAP database are tariffs on merchandise imports derived from the GATT Integrated Database and the UNCTAD-TRAINS database. These are averages of most favored nation applied tariff rates obtained at the tariff line level and aggregated up to the appropriate concordance using trade weights. Because nontariff barriers, including quotas, tariff quotas and market access arrangements, have been particularly important in agriculture in some economies, estimates of these distortions have also been included, based on work by the World Bank (McDougall et al. 1998).

In addition to tariff equivalents of tariff and nontariff barriers, estimates are also provided of the tariff equivalents of domestic production subsidies and export subsidies in the agriculture sector. In the latter case, voluntary export restraints and export price undertakings have also been included. The impact of these measures is to allow the domestic price of a commodity to exceed the prevailing world price. The production and export subsidy equivalents are therefore measured as the percentage difference between the domestic market price and the world price.

Unweighted average tariff equivalents at the economywide level in 1995 are presented in figure 8. These indicate that average tariff equivalents are generally highest in the developing economies, particularly in China, the Philippines and Thailand. The lowest rates of protection are in the developed APEC economies where average rates are generally less than 5 per

8 **Unweighted average tariff equivalents, APEC economies, 1995**

Australia	
Canada	
Chile	
China	
Hong Kong, China	
Indonesia	
Japan	
Korea	
Malaysia	
Mexico	
New Zealand	
Philippines	
Singapore	
Chinese Taipei	
Thailand	
United States	
Viet Nam	

%   5   10   15   20
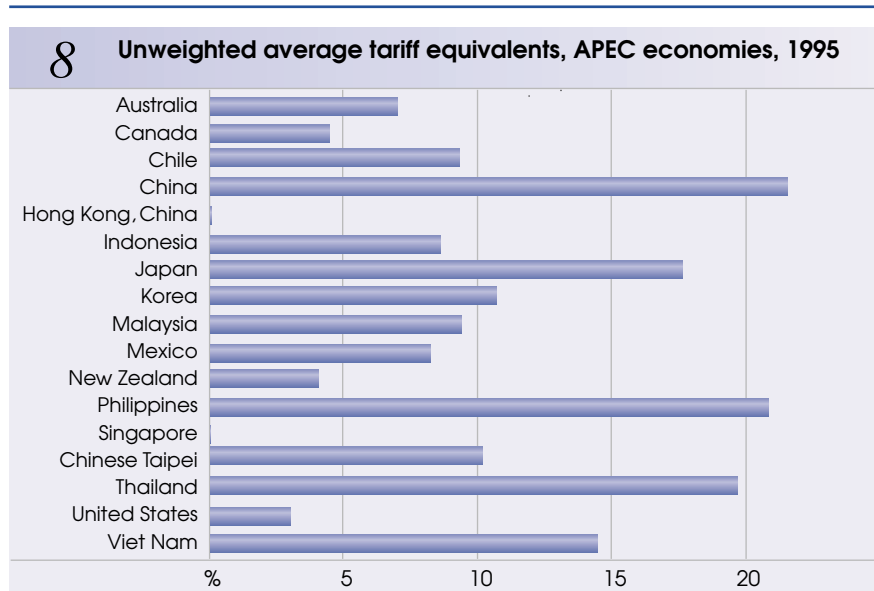
Sources: McDougall et al. (1998); UNCTAD (1999).

cent. Japan is an exceptional case because of the impact of policies in the agriculture sector. The figure for Japan reflects high levels of support for agriculture in the form of quotas, tariff quotas and market access arrangements.

The average tariff equivalents presented in figure 8 mask significant differences in support across sectors in APEC economies (figure 9). Agriculture

9 **Unweighted average tariff equivalents, by sector, APEC economies, 1995** Selected sectors

15

10

5

%

Agriculture   Energy intensive   Other manufacturing   Fossil fuels   Other
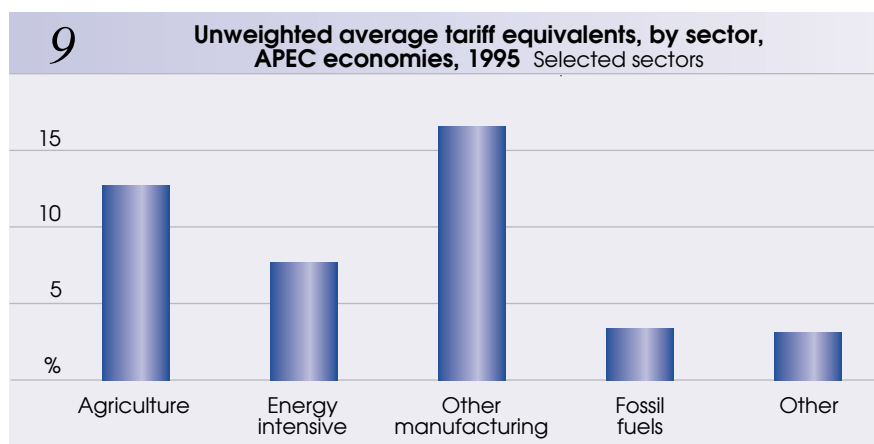
Sources: McDougall et al. (1998); UNCTAD (1999).

is one of the sectors most heavily protected by tariff and nontariff barriers in the APEC region. This is particularly true in Japan, Korea, Chinese Taipei and Thailand. In Japan, for example, import barriers for rice, wheat and other grains range from 450 to 535 per cent on a tariff equivalent basis. Other economies with high tariff equivalents on other grains include Korea, Malaysia, the Philippines, Chinese Taipei and Thailand. Meat and dairy products in these economies are also heavily protected.

Outside agriculture, it is the light manufacturing industries that are the most heavily protected by tariff and nontariff barriers. Food processing tends to be the most highly protected sector while textiles, wearing apparel and motor vehicles are also higher than the average. Energy intensive manufacturing industries are less protected by tariff barriers, although there are some clear exceptions in individual economies.

Fossil fuel industries generally receive less than the average economywide level of tariff protection. In many economies, there is no tariff protection on fossil fuels. However, relatively high tariff levels remain in some economies and for some fuels (figure 10). Data for 1995, for example, indicate fossil fuel tariffs above 10 per cent in Chile, China and the Philippines.

Information on agricultural production subsidy equivalents shows that these are highest in Japan, Canada and the United States where they are used primarily to support the production of rice, wheat and other grains. Export subsidy equivalents on agricultural commodities are also highest in the APEC developed economies.

10 Tariff equivalent rates on fossil fuels, selected APEC economies, 1995
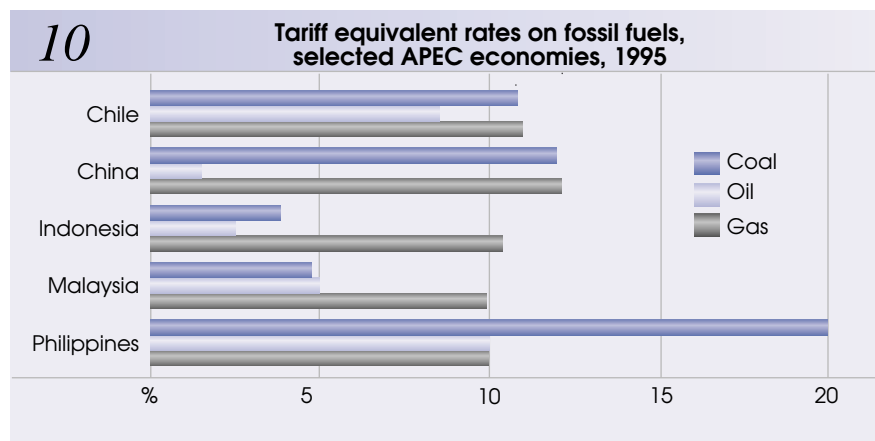
Sources: McDougall et al. (1998); UNCTAD (1999).

Some significant liberalisation of tariff and subsidy equivalent measures has occurred in the APEC economies since 1995. This has taken place under various agreements including the Uruguay Round and APEC and also reflects unilateral initiatives. This has particularly affected agricultural export subsidies that have been largely eliminated as a result of the Uruguay Round negotiations. Hence the trade barrier starting points for the modeling of trade liberalisation in this study will in a number of cases be lower than those presented above. The complete set of starting point support levels is provided in appendix A.

Foreign direct investment in APEC

The role of foreign direct investment in APEC economies has grown rapidly since the late 1980s. This has occurred mainly through transnational corporations establishing and expanding operations in newly industrialised and developing economies. This process has been facilitated by the gradual liberalisation of restrictions on foreign investment in many APEC economies. However, a range of government measures that directly influence the level and direction of foreign direct investment, including investment incentives, still present significant impediments to the undistorted flow of foreign investment in the region.

Foreign direct investment flows in APEC

Inflows of foreign direct investment to APEC economies increased at an average rate of more than 12 per cent a year over the period 1980–97, with annual growth of over 24 per cent in the 1990s (figure 11). This rapid growth increased APEC's share of world foreign direct investment inflows from 38 per cent in 1992 to 54 per cent in 1997 (UNCTAD 1998), reflecting the greater expansion of transnational corporations into APEC economies relative to the rest of the world.

11   **Foreign direct investment in APEC**
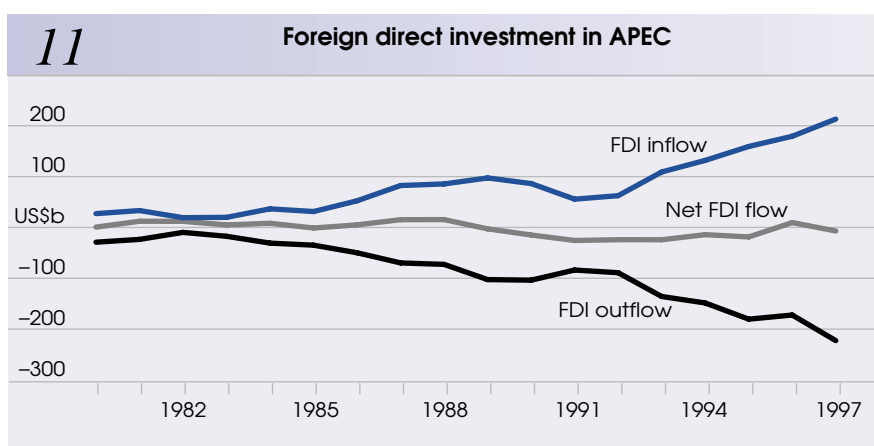
Note: Foreign direct investment flows are expressed in nominal terms in the absence of appropriate price deflators (UNCTAD 1997). As a result, they are likely to overestimate the value of real foreign direct investment flows.
Sources: International Monetary Fund (1998); UNCTAD (1996b, 1998).

Transnational corporations, which account for the large majority of global foreign direct investment flows, have become key drivers of economic growth and integration, not just in APEC but globally. In 1997, for example, foreign affiliates of transnational corporations accounted for a third of world exports and 7 per cent of world GDP (UNCTAD 1998).

While foreign direct investment inflows and outflows are relatively balanced across APEC as a whole, the pattern of flows across APEC's developed, newly industrialised and developing economies varies markedly, reflecting differences in investment opportunities between economies. As shown in figure 12, the developed and newly industrialised economies in APEC were net providers of foreign direct investment to the world in 1997 while the developing economies were net recipients. Reflecting the size of its economy, the United States is the most important source and destination of foreign direct investment in APEC, accounting for 56 per cent and 43 per cent of total APEC outflows and inflows respectively in 1997.

China dominates the pattern of foreign direct investment inflows in the developing APEC economies, accounting for 21 per cent of total inflows in 1997. Foreign direct investment flows to China have increased rapidly since 1990 from US$3.5 billion to US$44.2 billion in 1997 (World Bank 1999).

Of the newly industrialised economies, Mexico and Singapore are the major recipients of foreign direct investment while Hong Kong, China is the major source of investment flows to other economies. Most of Hong Kong, China's foreign direct investment is directed to China.
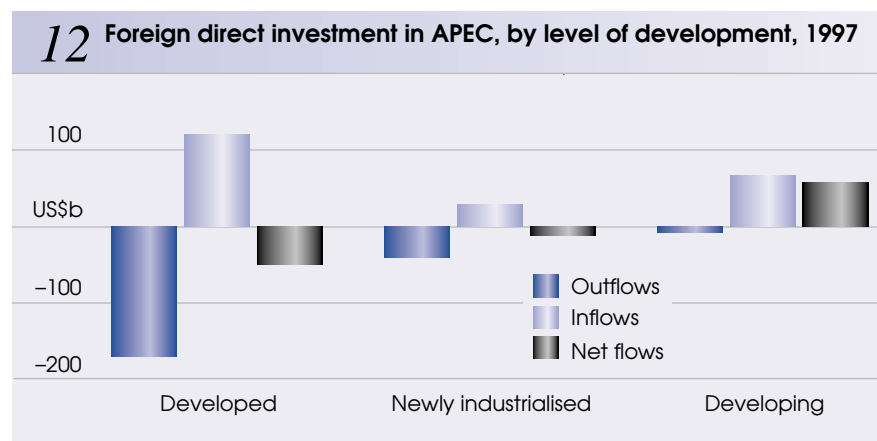
12 **Foreign direct investment in APEC, by level of development, 1997**

Sources: International Monetary Fund (1998); UNCTAD (1998).

13 APEC foreign direct investment inflows as a share of gross fixed capital formation
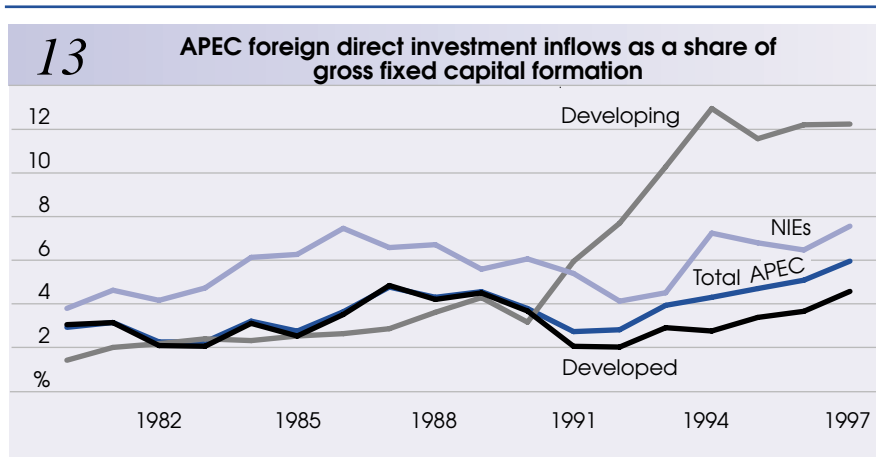
Source: International Monetary Fund (1999).

It is important to assess the rapid growth in absolute levels of APEC foreign direct investment flows in the context of broader economic activity. As shown in figure 13, foreign direct investment inflows have made an increasing contribution to gross fixed capital formation in APEC member economies, particularly in developing economies and especially since the beginning of the 1990s. Similarly, foreign direct investment inflows have increased as a proportion of GDP, from 0.9 per cent of total APEC GDP in 1989 to 1.3 per cent in 1997 (figure 14). The large increase in both measures in developing economies is strongly related to increased foreign direct investment inflows to China.

14 APEC foreign direct investment inflows as a share of GDP
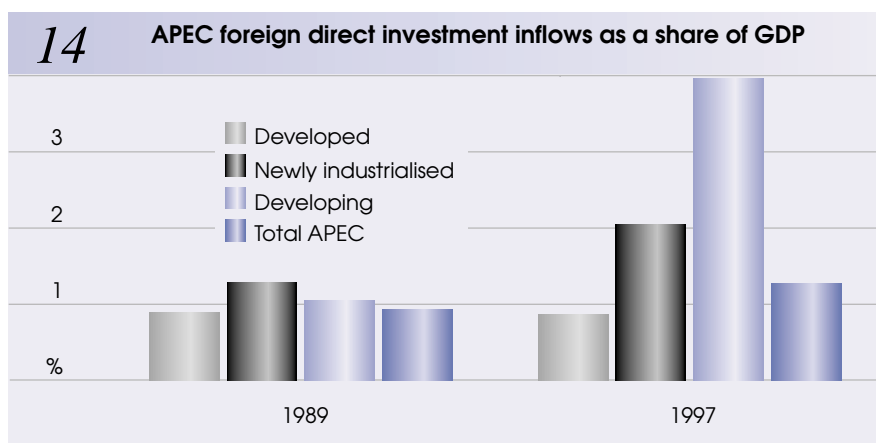
Sources: Council for Economic Planning and Development (1998); Directorate-General of Budget, Accounting and Statistics (1998); APEC (1998b); International Monetary Fund (1999); World Bank (1999).

As with absolute levels of foreign direct investment, the pattern of inflows as a percentage of GDP varies across economies. The ratio of foreign direct investment inflows to GDP for developing economies was 4 per cent in 1997, compared with 2 per cent for the newly industrialised economies and less than 1 per cent for developed economies (figure 14).

The information presented in figures 13 and 14 indicates that foreign direct investment is a more important source of capital and economic growth in the developing, relatively capital poor economies of APEC than in the newly industrialised and developed economies.

Investment liberalisation in APEC

The increased role of foreign direct investment in APEC economies has been facilitated to a large extent by reductions in government imposed barriers to investment flows. A wide range of government measures, while not dealing explicitly with foreign direct investment, may influence the decision to invest in another economy. For example, a taxation system with high company tax rates may deter foreign investors even though it does not differentiate between domestically and foreign owned companies.

Measures taken by governments can act as either barriers or incentives to foreign direct investment (box 4). Barriers to foreign direct investment can be categorised according to the stage of investment they influence — entry and establishment, ownership, and management and operations. Examples of the main types of measures used to influence foreign direct investment are listed in box 4. Foreign direct investment incentives typically influence the management and operations of foreign direct investment activities, and can be categorised as fiscal incentives, financial incentives or others that do not fit into either of these categories.

APEC investment liberalisation is underpinned by twelve nonbinding investment principles that were endorsed by APEC leaders in 1994. The nonbinding investment principles provide a basis for the treatment of investment in the individual action plans of APEC economies that were implemented from November 1996, and which represent the principal vehicle for APEC investment liberalisation. As with trade, the key feature of APEC's approach to foreign investment is the principle of nondiscrimination, whether between foreign investors from different economies (which underpins most favored nation treatment), or between foreign and domestic investors (which is the basis of national treatment). An implication of the national treatment

| *4* | **Measures that distort foreign direct investment** |

Barriers

Entry and establishment
- Bans on foreign investment in certain sectors
- Screening and approval
- Restrictions on the legal form of the entity
- Minimum capital requirements
- Conditions on subsequent investment
- Admission taxes
- Restrictions on the form of entry (eg no mergers and acquisitions)

Ownership
- Limits on foreign investment in some sectors
- Compulsory joint ventures with locals
- Mandatory transfer of ownership to locals
- Nationality restrictions on the ownership of the company or shares thereof
- Restrictions on ownership of land and intellectual property

Management and operations
- Performance requirements
- Local content restrictions
- Restrictions on import of labor, capital and raw materials
- Operational permits or licences
- Ceilings on royalties
- Restrictions on repatriation of
- capital/profits

Incentives

Fiscal
- Reduced corporate tax rate
- Tax holidays
- Accelerated depreciation on capital taxes
- Investment and reinvestment allowances
- Value added based incentives
- Import (export) based incentives, including exemption from import (export) duties on capital goods

Financial
- Direct subsidies to cover costs
- Subsidised loans
- Loan guarantees
- Guaranteed export credits
- Publicly funded venture capital
- Government insurance at preferential rates

Others
- Subsidised dedicated infrastructure
- Subsidised services, such as technical facilities for developing expertise
- Preferential government contracts
- Closing the market to further entry
- Protection from import competition
- Special treatment regarding foreign exchange

Source: UNCTAD (1996a).

principle is that foreign direct investment incentives as well as barriers should be avoided. APEC economies aim to achieve free and open investment in the region by progressively reducing or eliminating exceptions and restrictions to national treatment and most favored nation treatment of foreign investors.

Actions have centred on the easing or removal of restrictions on the level of foreign direct investment in specific industries (see box 5 for energy sector actions), and the elimination or simplification of administrative procedures such as approval and screening of foreign investment projects. Impacts have been particularly evident in the developing APEC economies, where the liberalisation of relatively restrictive foreign direct investment regimes has allowed record levels of foreign direct investment inflows over much of the 1990s (UNCTAD 1996a).

Despite a slowing of foreign direct investment inflows to APEC as a result of the Asian economic downturn, recognition of the key role that foreign direct investment can play in economic recovery has prompted an acceleration of investment liberalisation, particularly in the most affected economies, including Indonesia, Korea, the Philippines and Thailand. These economies

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5   **Foreign direct investment policies in the energy sector in APEC**

While APEC investment liberalisation is driven by efforts to achieve the broad, long term goal of free and open investment in the region, sector specific issues also shape the process. A good example is the energy sector, and the electric power sector in particular, where financing requirements to meet expected demand increases are very large. It is projected, for example, that APEC electricity demand could increase by up to 80 per cent over the period 1992–2010, and that additional power infrastructure to meet that demand would require as much as US$1.6 trillion in new capital investment (Blake Dawson Waldron and ABARE 1995). It is further projected that around 75 per cent of this investment would be required by the developing and newly industrialised APEC economies, and that at least 35 per cent would need to come from overseas capital markets.

In response to this financing challenge, a number of APEC governments have liberalised foreign direct investment policies related to power infrastructure. Among the APEC developing economies, for example, China, Indonesia, Peru and the Philippines have opened their power sectors to foreign investors, subject to various conditions and regulations. The trend of increased foreign provision of power infrastructure in APEC is part of a global trend toward private sector provision of infrastructure more generally (UNCTAD 1996b).

have undertaken a range of liberalising measures including opening banking and other financial services to foreign direct investment and relaxing rules of entry, ownership, operation and financing of foreign direct investment projects.

The increasing role of foreign direct investment in APEC economies also reflects the recent tendency for governments globally to use incentives to attract foreign direct investment. For example, of the 151 changes to foreign direct investment regulations that governments around the world made in 1997, 41 involved increases in incentives (UNCTAD 1998).

With APEC economies eager to attract foreign direct investment following the Asian economic downturn, there is a risk that the use of incentives will grow. This is a concern because government incentives can be just as market distorting as barriers if they subsidise the true cost of an investment. In addition, once some economies start using incentives more liberally, 'incentives competition' may arise, further distorting foreign direct investment flows and resource use (UNCTAD 1996b).

Impediments to foreign direct investment in APEC

Despite the liberalisation of investment regimes in APEC member economies to date, significant government imposed distortions remain. The use by APEC economies of a selection of key types of foreign direct investment measures is provided in figure 15. The information in the figure is from the APEC Investment Guidebook and the most recent individual action plans of member economies (APEC 1999a,b). The latter are self-reported documents and their content varies in detail and completeness across economies. The table updates earlier information provided by the Pacific Economic Cooperation Council for APEC (PECC 1995).

It should also be noted that the table shows only the *existence* of some type of restriction in each of the categories represented and does not quantify the number or impact of the measures used in each category. Moreover, the figure represents only policies that violate most favored nation and national treatment. It does not, therefore, indicate the existence of distortionary policies where they apply equally to domestic and foreign investors.

As shown in figure 15, governments in all APEC member economies either restrict or ban foreign ownership of domestic assets in certain sectors, most commonly the transport, financial and broadcasting sectors. Where foreign

direct investment is allowed, the most important government imposed barrier is the screening of foreign investment proposals (World Trade Organisation 1998). Most APEC economies use screening or notification procedures across sectors. Other commonly used measures that are disincentives to foreign direct investment include performance requirements — usually local content requirements and export requirements — which are used by more than a third of APEC economies. Some APEC economies impose exchange controls, whereby the conversion of domestic currency to foreign currency by foreign investors is restricted.

More than half the APEC economies use tax incentives to attract foreign direct investment and more than a third use one or more of the many different types of nontax fiscal incentives, some of which are listed in box 4. Because foreign direct investment usually results in technology transfer to the host economy, a number of APEC economies actively seek foreign direct investment in export oriented industries that depend heavily on technological innovation.

15 Summary of major distortions to foreign direct investment in APEC

✔ used
✗ not used

	Australia	Brunei Darussalam	Canada	Chile	China	Hong Kong, China	Indonesia	Japan	Korea	Malaysia	Mexico	New Zealand	Peru	Philippines	Papua New Guinea	Russia	Singapore	Chinese Taipei	Thailand	United States	Viet Nam
Screening/notification	✔	✔	✔	✔	✔	✗	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✗	✔	✔	✗	✗
Restricted/closed sectors	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Performance requirements	✗	✗	✗	✔	✔	✗	✔	✗	✔	✔	✗	✗	✗	✔	✗	✗	✗	✔	✔	✗	✗
Nontax fiscal incentives	✗	✗	✗	✗	✔	✗	✗	✔	✔	✔	✗	✗	✗	✗	✔	✗	✔	✔	✗	✗	✔
Taxation incentives	✗	✗	✗	✔	✔	✗	✗	✔	✔	✔	✗	✗	✗	✔	✔	✗	✔	✔	✔	✗	✔
Priority sectors	✔	✔	✗	✗	✔	✗	✔	✔	✗	✔	✔	✗	✔	✔	✔	✔	✗	✗	✔	✗	✔
Exchange controls	✗	✗	✗	✗	✔	✗	✗	✗	✔	✗	✗	✗	✗	✗	✔	✗	✗	✔	✗	✗	✗

Source: APEC (1999a,b).

In general, developing and newly industrialised APEC economies have more extensive and complicated foreign investment regimes than developed APEC economies. While the information in figure 15 cannot show this conclusively, it does indicate that developing economies use measures across a broader range of the key categories presented than do developed economies. For example, economies that apply the broadest range of measures to foreign direct investment inflows include China; Korea; Malaysia; Papua New Guinea; and Chinese Taipei. In contrast, Canada; Hong Kong, China; New Zealand; and the United States apply measures from relatively few of the categories presented.

Quantifying barriers to foreign direct investment in APEC

Information on the nature and range of barriers to foreign direct investment such as that outlined above is useful for understanding the policy context for investment liberalisation. However, in order to measure the impacts of barriers on trade and other economic variables, as well as the impacts of their removal, it is necessary to quantify the existing impediments to investment.

An ideal measure of barriers to foreign direct investment would be a tariff equivalent that quantified the impact of the barrier on the costs of the good or service that is, or could potentially be, produced with foreign capital. However, there is a range of conceptual and practical difficulties in estimating tariff equivalents for foreign direct investment barriers (Industry Commission 1997). These include the wide variety of restrictions that are used and their often ambiguous and case by case nature.

As an alternative to a tariff equivalent, the Australian Industry Commission has developed a measure that captures the degree of restrictiveness of foreign direct investment barriers and that incorporates information on the types of barriers and their likely relative economic impacts (Industry Commission 1997). An index of restrictiveness is derived for eleven of the twelve service sectors identified in the World Trade Organisation's General Agreement on Trade in Services and for several sub-sectors (table 3).

3 Sectors included in foreign direct investment restrictiveness indexes

Business	Finance
Communications	Health
Construction	Tourism
Distribution	Recreation
Education	Transport
Environment	

The investment barriers incorporated in the index include restrictions on entry and establishment; restrictions on control and management; and restrictions on operations (table 4). Each component of the index is assigned a weight to reflect the relative economic costs of the different types of restrictions. For example, where foreign direct investment is completely banned a higher weight is assigned than in the case where up to 50 per cent foreign equity is permitted. A maximum score of one is assigned where there is a complete ban on foreign ownership. A score of one is also possible when there is a partial ban on foreign ownership as well as stringent approval, management and operational restrictions. In contrast, a region that applied no restrictions would score zero, while one that used only a simple notification process would score 0.05 (Industry Commission 1997).

The indexes derived from the above method (see appendix B) indicate that communications and financial sectors tend to be subject to the most stringent foreign direct investment controls across the APEC region. Scores are high for the communications sector because many economies impose ownership limits on telecommunications and broadcasting and close their postal

4 **Components of a foreign direct investment restrictiveness index**

Type of restriction	Weight
Foreign equity limits on all firms	
• no foreign equity permitted	1.0
• less than 50 per cent foreign equity permitted	0.5
• 50–100 per cent foreign equity permitted	0.25
Foreign equity limits on existing firms, none on greenfield	
• no foreign equity permitted	0.5
• less than 50 per cent foreign equity permitted	0.25
• 50–100 per cent foreign equity permitted	0.125
Screening and approval	
Investor required to demonstrate net economic benefits	0.1
Approval unless contrary to national interest	0.075
Notification (pre or post)	0.05
Control and management restrictions	
All firms	0.2
Existing firms, none for greenfield	0.1
Input and operational restrictions	
All firms	0.2
Existing firms, none for greenfield	0.1

Source: Industry Commission (1997).

services to foreign participation. The least restricted sectors include business, distribution, environment and recreational services (Industry Commission 1997).

Across the economies examined, China, Indonesia, Korea, the Philippines and Thailand have high scores, reflecting the foreign ownership bans applied in several sectors and restrictions on the management and operation of foreign firms. Hong Kong, China and the United States have the lowest index values (Industry Commission 1997).

Although the weights assigned to the different categories of foreign direct investment barriers are to an extent arbitrary, the method employed is the best available way of quantifying restrictions on foreign direct investment. It forms the basis of the quantitative analysis of the impacts of investment liberalisation presented later in this report. More information on the modeling of investment liberalisation is presented in chapter 5.

5

Analytical framework

Global Trade and Environment Model

The analysis of the impacts of trade and investment liberalisation reported in this study is based on simulation results from ABARE's Global Trade and Environment Model (GTEM). GTEM is a multiregion, multisector, dynamic general equilibrium model of the world economy. It is derived from the MEGABARE model (ABARE 1996) and the GTAP model (Hertel 1997). The model code is available on ABARE's website at http//www. abareconomics.com.

GTEM is an appropriate framework for analysing complex issues such as those addressed in this study because it takes into account the interaction between different sectors in the economy and estimates the impacts of policies on key economic variables. These include trade and investment flows between regions, the prices of consumer goods and inputs into production, sectoral and regional output and, ultimately, regional income and expenditure levels.

GTEM has a strong capability for analysing trade issues. It explicitly models bilateral trade flows of all commodities between all regions. The model adopts an 'Armington' preference structure such that a good produced in one region is an imperfect substitute for goods produced by the same industry in other regions (Armington 1969a,b).

The model also captures global investment flows. The international flow of investment funds modeled in GTEM is similar to foreign direct investment as these funds are used to invest in physical capital. GTEM does not, however, account for bilateral investment flows. Rather, each economy sells or buys bonds from a central 'banker' that are traded internationally to facilitate the flow of investment. GTEM also does not explicitly model the financial sector. Hence it does not capture the impacts of flows of portfolio funds that can be short term and highly volatile.

The model's database is also highly suited to an assessment of APEC's trade and investment liberalisation agenda. The database separately identifies all but four of the APEC member economies and incorporates all of the other

major global trading blocs. The database also includes a high level of commodity disaggregation, including detailed treatment of energy and energy related sectors. This enhances GTEM's ability to analyse the impacts of policy changes on the energy sector.

The model's database also contains detailed representation of assistance to domestic merchandise industries in the APEC region, through import tariffs, nontariff barriers and export and production subsidies. The representation of assistance has been updated for this study to take account of recent changes implemented under the Uruguay Round, APEC and unilateral liberalisation initiatives. Only very limited information is available in the database on the assistance provided to service industries although it is known that this can be a significant barrier to trade in services in some economies (Industry Commission 1996).

GTEM's dynamic capability is also important when assessing the impacts of trade and investment liberalisation because it allows the impacts of policies to be tracked over time. This is significant because the timing of policy implementation and the adjustment path that economies follow are highly relevant in the liberalisation policy debate.

Two features that distinguish GTEM from other general equilibrium models are the 'technology bundle' approach to modeling input substitution in key energy intensive sectors and the handling of population dynamics.

In the standard general equilibrium modeling approach, industries produce a commodity by combining primary factors (usually land, labor and capital) and intermediate inputs in fixed proportions. Substitution is only possible between primary factors. In GTEM, electricity and iron and steel production are modeled using the 'technology bundle' approach. With this approach, different production techniques are used to generate a homogeneous output from each industry. Electricity can be generated from coal, petroleum, gas, nuclear, hydro or renewable based technologies, while iron and steel can be produced using blast furnace or electric arc technologies. Industries are able to substitute between technologies in response to changes in their relative costs. By modeling energy intensive industries in this way, GTEM restricts substitution possibilities to known technologies, thereby preventing technically infeasible combinations of inputs being chosen as model solutions.

GTEM is also distinct in the way that population and labor supply for each region are determined endogenously over time. GTEM contains a detailed

description of population dynamics, which captures the idea that as regions move along the economic development path, with increasing per person incomes, changes in fertility and mortality rates follow a well defined pattern. The model uses estimates of the dependence of fertility and mortality rates on income and an exogenously imposed migratory pattern to predict age and gender specific population changes.

Some characteristics of the energy sector are also important in the modeling context. This includes the fact that investment in energy infrastructure tends to be long term and expensive. GTEM is able to capture the cost of investment in new infrastructure that is often required when fuel switching occurs — for example, the expansion of gas distribution networks — where these costs are reflected in the database.

For the gas sector, GTEM models only one form of natural gas. It does not separately identify pipeline natural gas and LNG. It is, however, necessary to capture the fact that purchasers cannot readily switch between either different forms of gas (pipeline or LNG) or different sources of gas supply. This is because the infrastructure required to develop either form of gas supply is costly and long lasting and, reflecting this, contracts for gas supply tend to be very long term. This lack of substitutability in the gas sector is captured in the modeling by the Armington assumption, referred to earlier, which recognises that the ability to switch between different forms and sources of supply is not perfect. The rate of possible substitution between different forms and sources of gas supply is reflected in the Armington trade elasticity. These elasticities are derived from the GTAP database.

GTEM also contains a sophisticated greenhouse gas emissions accounting framework. GTEM models emissions of three greenhouse gases — carbon dioxide, methane and nitrous oxides. This allows the impacts of policies such as trade and investment liberalisation on international emissions of greenhouse gases to be tracked.

Further information on GTEM is given in appendix C.

Despite GTEM's strengths, there are some effects of liberalisation that cannot be captured, largely because the necessary data are not available. This means that the results reported in the study will understate the impacts of implementing the Bogor program. Specifically, the following effects of liberalisation have not been captured.

First, liberalisation of the services sector has not been fully modeled because the necessary protection data are not yet available. Services sector protection can be a significant barrier to trade in some economies (Industry Commission 1996). This sector constitutes, moreover, a large proportion of economic output in the developed APEC economies and is an increasingly important sector in the developing and newly industrialised member economies. Removing barriers to services could have significant and complex effects on the economy and the energy sector. For example, including the liberalisation of the services sector will produce further GDP gains and will lead to the expansion of the services sector, potentially at the expense of other sectors. The GDP gains will tend to increase energy use while the sectoral shift will tend to reduce overall energy intensity and to change the fuel mix of the economy. The absence of a complete representation of the liberalisation of the services sector will therefore result in an understatement of the overall impacts of liberalisation.

Second, some trade and investment barriers in other sectors could not be modeled because the data were not available. These include some energy sector production subsidies.

Finally, in the standard GTEM framework it is only possible to evaluate the resource allocation or efficiency benefits of liberalisation. The productivity benefits that are also generated by the liberalisation process are not captured although, as discussed in chapter 2, these can be significant. For example, trade and investment liberalisation typically transfers benefits such as improved technology to an economy and tends to increase the ability to capture economies of scale and to innovate in efficient sectors.

In order to illustrate the potential impacts of such productivity improvements on GDP an empirical analysis has been undertaken based on information in the economics literature. This relates the magnitude of the reduction in trade barriers in the manufacturing sector to increases in manufacturing sector productivity. The analysis is illustrative only and is limited to the productivity impacts of trade liberalisation in the manufacturing sector because the available information sources do not extend beyond this area. The details of the analysis are outlined in appendix D.

Regional and sectoral aggregation

At its most disaggregated level, GTEM consists of equations and data that describe the production, consumption, trade and investment behavior of

representative producers and consumers in 45 regions across 50 commodity groups. The database used to simulate the impacts of subsidy and tariff reductions in this report has been aggregated to the 21 regions and 22 commodity groups presented in table 5.

The commodity aggregation has been chosen to include the three fossil fuels and electricity as well as the major energy intensive industries that are likely to influence total energy consumption. In addition, six groups of agricultural commodities are included because the agriculture sector is, on average, one of the most heavily protected in the APEC economies. As a result it is likely to experience substantial restructuring following liberalisation. The regional aggregation separately identifies all APEC economies with the exception of Brunei Darussalam, Papua New Guinea, Peru and the Russian Federation. These are not yet disaggregated in the GTAP database. Other key economies or groups of economies — the European Union, India, Latin America and

5 Regions and sectors in GTEM

Regions	Sectors
1 Australia	1 Coal
2 Canada	2 Oil
3 Chile	3 Gas
4 China	4 Electricity
5 Hong Kong, China	5 Petroleum and coal products
6 Indonesia	6 Chemicals, rubber and plastics
7 Japan	7 Nonmetallic mineral products
8 Korea	8 Primary iron and steel
9 Malaysia	9 Primary nonferrous metals
10 Mexico	10 Fabricated metal products
11 New Zealand	11 Motor vehicles and parts
12 Philippines	12 Other transport equipment, electronics and manufactures
13 Singapore	13 Other minerals
14 Chinese Taipei	14 Textiles, wearing apparel, leather products
15 Thailand	15 Paddy rice
16 United States	16 Unprocessed crops
17 Viet Nam	17 Unprocessed livestock
18 European Union	18 Processed rice
19 India	19 Processed crops
20 Rest of Latin America	20 Processed livestock
21 Rest of World	21 Forestry and fisheries
	22 Services

the Rest of World — are also identified. These represent large energy producing and trading regions that might be affected by APEC trade and investment liberalisation. As a result, GTEM is able to capture the effects of domestic policy reform at both the regional and the global level.

Developing a reference case

GTEM requires a reference case or a 'business as usual' simulation, against which the impacts of a policy change can be measured. The reference case projects the growth in key variables in each region in the absence of any policy changes. In this study, for example, the reference case represents the likely outlook for APEC's energy sector and general economic conditions in member economies in the absence of any APEC specific reductions in barriers to trade and investment in the region. This provides the benchmark against which the impacts of trade and investment liberalisation can be assessed.

Recognising that most APEC member economies are participants in other trade and investment liberalisation initiatives, the reference case includes the impacts of the Uruguay Round of the World Trade Organisation and the North American Free Trade Agreement (NAFTA). This means that it is assumed that the Uruguay Round and NAFTA are fully implemented and that any further changes are due only to the implementation of the Bogor agreement. The ASEAN Free Trade Agreement is not included in the reference case because the timing and the extent of commitments under this arrangement are unclear for at least some ASEAN economies.

In developing a reference case for APEC, assumptions have been imposed for the likely rates of growth in GDP over the projection period. The GDP growth rates used in the study are based on historical data from 1995 to 1998 from the International Monetary Fund (1999). Short term projections to 2003 are derived from GTEM's GDP module and have been adjusted to take account of the Asian economic downturn that began in late 1997. Projected long term growth rates from 2004 to 2020 have been derived from GTEM's convergence procedure. Under this procedure, per worker GDP in all economies is assumed to converge toward that of the United States in the very long term. This hypothesis is based on a number of econometric studies that have found convergence of per worker GDP between economies to varying degrees (Baumol 1986; Barro and Sala-i-Martin 1992; Mankiw, Romer and Weil 1992; Bernard and Jones 1996).

Because of the inherent uncertainty in the rate of recovery from the Asian downturn in several key economies, a sensitivity analysis to alternative rates of economic growth has been undertaken. This analysis examines the implications of faster than expected recovery from the downturn.

Implementing policy simulations

To assess the impacts on the energy sector of liberalising trade and investment in APEC member economies, four policy simulations are examined:

- ***Implementation of trade liberalisation according to the principles and timetable agreed in the Bogor Declaration of 1994***: Under this simulation, economies are assumed to implement reductions in trade barriers and production and export subsidies in equal annual increments beginning in 2000. Developed economies and developing economies are assumed to achieve a free and open trade regime by 2010 and 2020 respectively. All tariff equivalents of tariff and nontariff barriers fall to zero for all trade flows into each APEC economy — that is, APEC members are assumed to provide improved market access to both APEC and non-APEC economies on a nondiscriminatory basis. All export subsidies and domestic production subsidies are also phased out.

- ***More rapid implementation of trade liberalisation***: The objective in this simulation is to assess the impacts of advancing the Bogor Declaration timetable for trade liberalisation. It examines, in particular, the impacts if developing economies liberalised their trade regimes at the same pace as developed economies and achieved the target of a free and open trading system by 2010.

- ***Slower implementation of trade liberalisation***: This simulation recognises that some economies may delay the implementation of liberalisation for a range of policy reasons. It assesses the impacts if developing economies delayed the commencement of trade liberalisation until 2010 and achieved their Bogor commitments progressively to 2020.

The protection levels at the start of liberalisation in each of the above simulations are provided in appendix A. They indicate the broad scope of APEC's trade liberalisation commitments. The removal of protection in each simulation is a stylised representation of APEC economies' approach to liberalisation. It assumes that there will be no barriers to trade remaining at the end of the liberalisation period. To the extent that this does not occur the simulation results will tend to overstate the impacts of the trade liberalisation

initiative. However, because there are only limited data on services protection, the overall results are likely to underestimate the impacts of liberalisation.

- *Implementation of investment liberalisation according to the provisions of the Bogor Declaration*: This simulation assesses the impacts when foreign direct investment regimes are liberalised in developing APEC economies over the same time period as liberalisation of trade regimes. That is, the impacts of investment liberalisation are considered as an addition to the impacts of trade liberalisation. In GTEM, restrictions on capital markets result in underinvestment in a region, leading to a regional rate of return greater than the global average rate of return. When capital market restrictions are removed in a region, this differential is reduced, encouraging capital to flow into the region. The extent of this capital inflow depends, to a large extent, on the size of the barriers that existed before liberalisation. These starting point levels are provided in appendix B.

Interpreting results

General equilibrium models of the world economy such as GTEM are able to capture the impacts of policy changes on large numbers of economic variables. These include the prices of producer and consumer goods, sectoral and regional output, trade and investment flows and regional income and expenditure levels. The estimated impacts of policy changes, such as tariff and subsidy reduction measures, on economic variables are expressed as the percentage deviations between the equilibrium levels of those variables in the reference case and their equilibrium levels in the policy simulation.

For example, the impact of trade and investment liberalisation on the level of gross domestic product in

16 Deviation from the reference case in a GTEM simulation
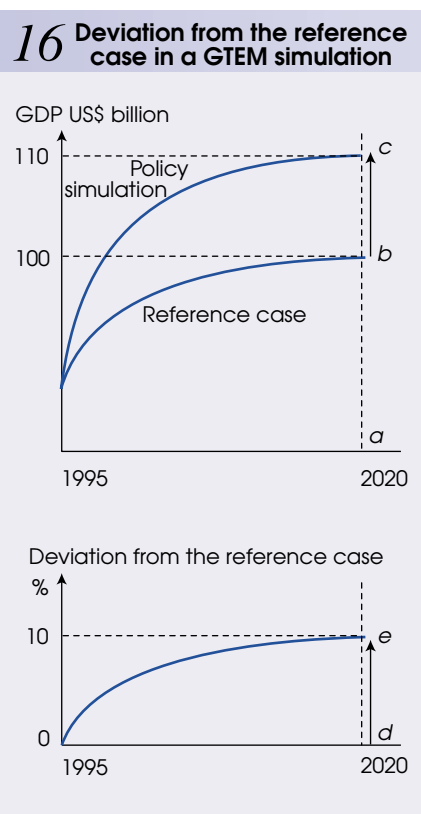
an APEC member economy can be identified by comparing the growth in GDP in the policy simulation against GDP growth in the reference case, as illustrated in figure 16. To provide a numerical example, consider that reference case GDP at 2020 is projected to be $100 billion (distance *ab*). Following the introduction of a tariff and subsidy reduction policy, GDP at 2020 is projected to be 110 billion dollars (distance *ac*). This corresponds to the 10 per cent increase in GDP from the reference case (distance *de*). Hence the effect of trade and investment liberalisation in this example would be to increase GDP by 10 per cent compared with the reference case projection for 2020.

Impacts of APEC trade liberalisation

An assessment of the impacts of APEC trade liberalisation is provided in this chapter. Reference case projections are presented, including underlying assumptions, as a baseline for the analysis. The reference case is a business as usual simulation in which it is assumed that no new policies are implemented by APEC member economy governments. Specifically, it assumes that APEC economies implement no trade opening policies beyond those committed to in the Uruguay Round and NAFTA. The reference case is important because it is against this that the impacts of policy changes — in this case the implementation of the Bogor trade liberalisation commitments — are measured. The analysis of results takes account of the impacts of trade liberalisation on economic growth as well as on energy consumption, production and trade in APEC economies. It also explores the sensitivity of the impacts to the timing of the liberalisation process.

Results in this chapter are presented for groups of economies according to their level of development. These groups are the developing economies, the newly industrialised economies and the developed economies. Although there are differences between the economies in these groups, their similarities in terms of trade barriers and economic structure mean that the general pattern of responses to trade liberalisation are comparable.

China is represented separately from the other developing economies because it is so large and distinctive. Developments in China's economy and energy sector, especially coal related developments, would overshadow the pattern of responses in other developing economies if they were grouped together.

Key results for individual economies are presented in chapter 7.

Reference case projections

Assumptions

The reference case presented in this section highlights the outlook for key energy variables in the APEC region over the period to 2020. In developing a reference case, several important assumptions have been imposed. The first of these relates to projected GDP growth rates in APEC economies, as

described in the previous chapter. The GDP assumptions used in the study are shown in table 6.

The shares of electricity production by different fuels (coal, oil, gas, nuclear, hydropower and other renewables) are also determined exogenously (outside the model) in the reference case. The shares to 2010 are determined on the basis of an assessment of government and other projections of the fuel mix for power generation (table 7). Because government plans and projections for the power sector are less certain after 2010, no change in fuel shares is assumed to occur between 2010 and 2020.

Changing the above assumptions on GDP growth rates and electricity fuel shares would lead to different reference case results. This could also have an impact, ultimately, on the results of policy simulations but it is unlikely that this would be significant. The reference case assumptions have been chosen to reflect a likely path of these variables over the period to 2010. They also incorporate the changes that have occurred in fuel use patterns between 1995 and 2000 such as the increasing share of gas in electricity generation in some APEC economies. Where it is known that other developments in energy use are likely to occur over the period to 2020, these have also been incorporated. This includes known policy changes such as the introduction of LNG imports to China and broader fuel use impacts that are likely to flow from the deregulation of electricity and gas sectors. In order to allow for variations in GDP assumptions, a sensitivity analysis of alternative recovery rates from the Asian economic downturn has been undertaken.

It is also assumed in the reference case that economies meet their commitments to trade liberalisation under NAFTA and the Uruguay Round. Although not members of the World Trade Organisation,

6	**GDP assumptions, reference case** Average annual growth	
	1995–2000	**2000–20**
	%	%
Australia	3.84	2.77
Canada	2.93	2.80
Chile	4.85	4.81
China	7.94	5.72
Hong Kong, China	1.22	2.84
Indonesia	0.07	5.53
Japan	0.93	2.13
Korea	3.64	4.35
Malaysia	3.19	5.76
Mexico	4.40	5.20
New Zealand	2.37	3.72
Philippines	3.06	5.99
Singapore	4.82	2.83
Chinese Taipei	5.56	4.39
Thailand	0.41	5.02
United States	3.46	1.81
Viet Nam	5.90	6.06

China and Chinese Taipei are assumed to implement reductions equivalent to those agreed to by developing economies in the round.

No other new policy measures are considered in the reference case. For example, potential actions by developed economies to reduce their emissions of greenhouse gases in response to the Kyoto Protocol are not included.

Projections

Total demand for energy in the reference case increases significantly throughout the APEC region over the projection period. In 2020, energy demand is more than 50 per cent higher than its level in 1995. This implies that the region's energy consumption would reach 7500 million tonnes of oil equivalent (Mtoe) in that year, compared with 4900 Mtoe in 1995.

Growth is especially rapid in the developing and newly industrialised APEC economies (figure 17). For example in China, which accounted for 17 per

| 7 | Share of electricity generated by each fuel under the reference case, APEC economies |

	Coal		Oil		Gas		Nuclear		Other	
	1995	2010	1995	2010	1995	2010	1995	2010	1995	2010
	%	%	%	%	%	%	%	%	%	%
Australia	77.0	74.0	1.7	2.0	10.3	16.0	0.0	0.0	11.0	8.0
Canada	14.8	13.7	1.9	0.7	4.0	16.0	17.0	11.3	62.3	58.3
Chile	24.3	24.3	8.4	8.4	1.1	1.1	0.0	0.0	66.2	66.2
China	73.4	73.0	6.1	4.0	0.2	3.0	1.3	2.0	19.0	18.0
Hong Kong, China	97.5	81.0	2.3	7.0	0.1	11.0	0.0	0.0	0.1	1.0
Indonesia	27.7	32.0	17.1	16.3	35.7	40.0	0.0	0.0	19.5	11.7
Japan	17.5	22.0	22.3	9.0	19.3	22.0	29.4	34.0	11.5	13.0
Korea	34.0	34.0	20.8	7.0	9.6	23.0	32.9	32.9	2.8	3.1
Malaysia	7.3	13.9	16.8	8.4	62.1	65.2	0.0	0.0	13.8	12.5
Mexico	9.4	14.0	51.4	27.0	11.9	33.0	5.5	3.0	21.8	23.0
New Zealand	1.9	13.8	0.0	0.1	13.5	8.8	0.0	0.0	84.6	77.3
Philippines	6.0	35.0	57.1	22.0	0.0	20.0	0.0	0.0	36.8	23.0
Singapore	0.0	0.0	77.3	50.0	22.6	49.9	0.0	0.0	0.1	0.1
Chinese Taipei	35.3	44.0	24.0	6.0	4.6	21.0	28.7	21.0	7.3	8.0
Thailand	18.9	33.0	30.3	6.0	42.0	54.0	0.0	0.0	8.8	7.0
United States	51.2	49.4	2.4	1.0	14.8	26.3	19.9	13.7	11.7	9.6
Viet Nam	14.5	22.6	4.3	2.2	6.5	10.7	0.0	0.0	74.8	64.6

cent of total APEC energy consumption in 1995 (International Energy Agency 1998a), energy consumption more than doubles over the period to 2020. Even greater expansion occurs in the other developing economies. Under-pinning the rapid growth in energy demand in these regions and the newly industrialised economies is strong growth in economic output, high population growth and increased consumption of personal services (including transport, space heating and the use of electrical appliances) that accompanies rising per person incomes. Growth in energy consumption is moderated over the projection period by continued improvements in energy efficiency that are assumed to occur in the developing and newly industrialised economies as opportunities for technological catchup are exploited.

In the developed APEC economies, where economic and population growth rates are lower than elsewhere in the region, total energy demand rises by 27 per cent over the period to 2020. Because these economies represent such a large share of APEC energy demand this implies large increases in the absolute levels of energy consumed in the region.

In the reference case, APEC consumption of fossil fuels in 2020 is significantly higher than in 1995 (figure 18). A key driver of increased coal and gas consumption in APEC is expansion of electricity generation. This is particularly the case in the developing and newly industrialised economies where economic growth is high and where continued electrification is expected to accompany economic development (figure 19). In China, for example, electricity output is projected to be more than 2.6 times higher in 2020 than in 1995 and in the other developing economies around 2.7 times higher.

17   **Change in APEC energy consumption, 2020, reference case**

18   Change in APEC coal, oil and gas consumption, 2020, reference case

1995 = 1

Legend:
- China
- Other developing
- Newly industrialised
- Developed
- Total APEC
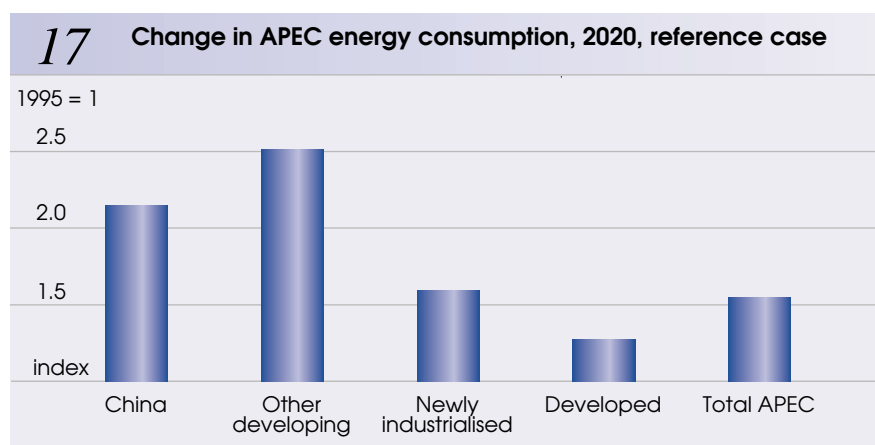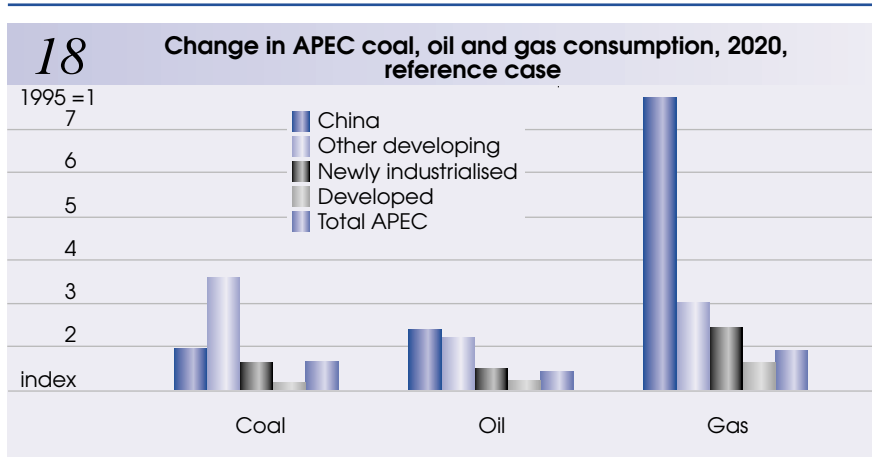
Consumption of gas increases more strongly than other fossil fuels, reflecting its favored position for power generation across the APEC region.

In most of the APEC developed economies, technological improvements in combined cycle gas turbines, increasing deregulation in electricity markets and the requirement to fit costly pollution control equipment to coal fired plants has resulted in gas being the preferred fossil fuel technology for new electricity generation (International Energy Agency 1996). Gas also increases its share of electricity generation in many of the developing and newly industrialised economies in APEC. However, coal fired generation increases more strongly in economies such as China and Indonesia where large indigenous coal reserves give coal a cost advantage over other technologies.

19   Change in APEC electricity production, 2020, reference case

1995 = 1
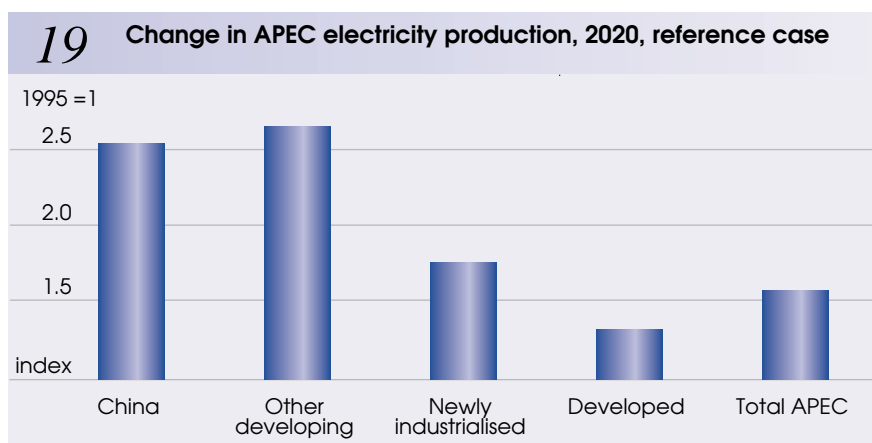
Total gas consumption in the region is likely to be constrained by the saturation of gas demand in nonpower generation sectors in developed economies — for example, for space and water heating in the residential sector. In addition it is assumed that the demand for gas in the manufacturing sector will be moderated by improved end use efficiencies.

Oil consumption in the power generation sector increases less than consumption of coal and gas because of the relatively high marginal cost of oil fired power generation and ongoing energy security considerations in many economies. Increased oil consumption is accounted for mainly by demand for transport fuels in both developed and developing economies.

The shares of nuclear and hydropower in total electricity generation fall over the projection period, mainly reflecting continued problems with siting of projects and the relatively high cost of power generation from nonfossil fuel sources.

An important source of growth in energy demand over the projection period is the increased production of energy intensive goods. Output of iron and steel, nonferrous metals, nonmetallic minerals and chemicals, rubber and plastics increases most significantly in developing economies, including China, where rapid economic development underpins expansion in these sectors (figure 20). Relatively modest growth in energy intensive production in the United States results in moderately higher energy consumption but the quantum of increase is significant in terms of total APEC energy consumption. This is because of the size of US industries compared with those in developing economies.

20 Change in APEC production of energy intensive goods, 2020, reference case

21 Change in APEC coal, oil and gas production, 2020, reference case
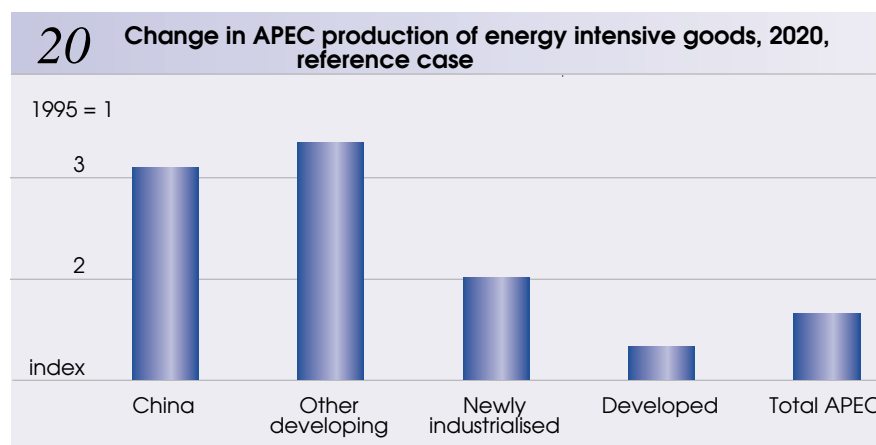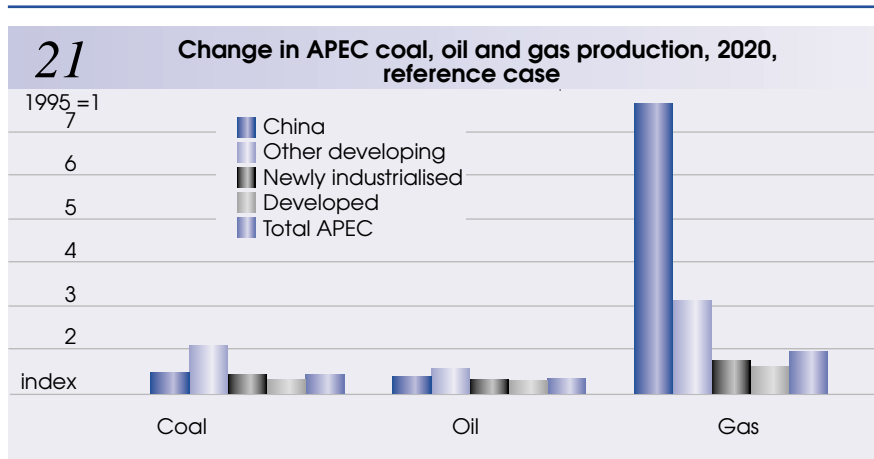
While other sectors such as services and other manufacturing are not as energy intensive as those presented in figure 20, the strong growth they experience in developed economies raises the demand for energy, particularly electricity.

Growth in energy production (figure 21) over the period exceeds growth in consumption by a small margin. The APEC region is relatively self-sufficient in energy terms, with the majority of energy output consumed within the region. Oil is the only fuel for which imports from outside the region constitute a significant proportion of supply. APEC energy suppliers continue to produce on a cost effective basis relative to their competitors. As a result, the region has the capacity to maintain these integrated regional trade relationships. Slower oil demand growth relative to other energy sources also
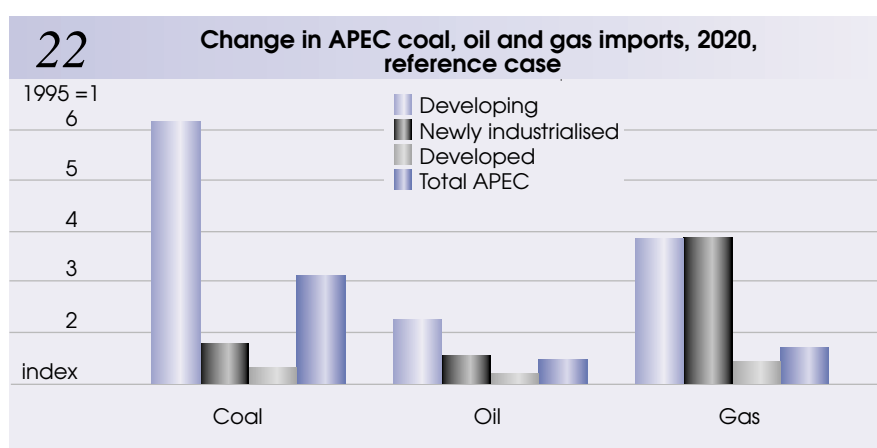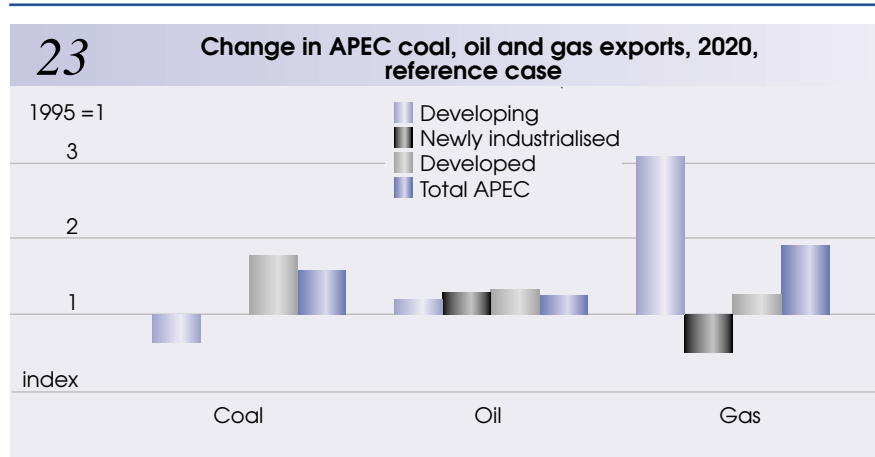
22 Change in APEC coal, oil and gas imports, 2020, reference case

23 Change in APEC coal, oil and gas exports, 2020, reference case

Legend: Developing / Newly industrialised / Developed / Total APEC

implies that APEC will become increasingly self-sufficient in energy over the projection period.

Energy imports rise strongly in some economies, particularly in Japan, Korea and Chinese Taipei where indigenous energy resources are limited (figure 22). However, this growth in energy imports is insufficient to offset the over-all growth in energy exports (particularly in coal) and APEC remains a net exporter of nonoil energy to the rest of the world. Increased coal exports are supplied by the major APEC exporters — Australia, Canada and the United States. Increased gas exports are supplied mainly by Australia and Indonesia (figure 23).

Simulation results

The APEC trade liberalisation scenario presented in this section is based on the principles agreed to by member economies in the Bogor Declaration. Developed and developing economies are assumed to achieve a free and open trade regime by 2010 and 2020 respectively. All tariff equivalents of tariff and nontariff barriers are assumed to fall to zero for all trade flows into each APEC economy. All export subsidies and domestic production subsidies in APEC members are phased out.

Because the reference case includes the impacts of trade liberalisation commitments made under the Uruguay Round and NAFTA, the results presented here reflect only the additional impacts that are expected to arise when economies meet the more stringent APEC targets. That is, the impacts of APEC trade liberalisation are measured as the difference between the

APEC simulation and the reference case inclusive of Uruguay Round and NAFTA effects.

Energy sector impacts

The energy sector impacts of APEC trade liberalisation arise from three main sources. These are:

- the macroeconomic effects of liberalisation, including changes in gross domestic product and exchange rates;

- the direct effects of removing barriers to trade in the energy sector; and

- the effects of liberalisation on the sectoral composition of economic activity.

Macroeconomic effects

As discussed in chapter 2, the strong APEC commitment to trade liberalisation is based on the expectation that open and outward looking trade regimes will lead to higher regional output, principally through increased specialisation in economic activity. The simulation results support this expectation.

At the APEC-wide level, gross domestic product at 2010 is 0.4 per cent higher than its level in the reference case (figure 24). By 2020, when developing economies have achieved their liberalisation targets, GDP is 0.75 per cent higher than in the reference case. Because trade barriers at the beginning of the period tend to be higher in the developing and newly industri-

24 **Change in APEC GDP**
Relative to the reference case

2010
2020

China   Other developing   Newly industrialised   Developed   Total APEC
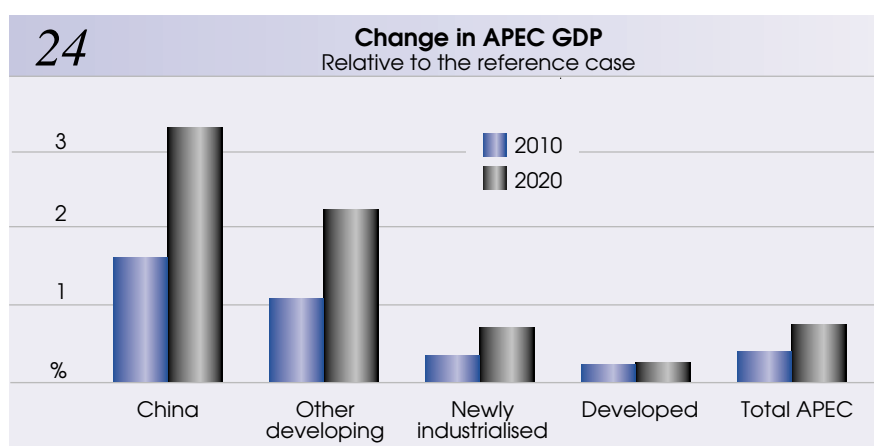
alised economies than in the developed economies, greater liberalisation is required in these regions to meet the Bogor targets. As a result, their gains in economic output are larger than in the developed economies. In China, for example, GDP in 2020 is 3.3 per cent higher than in the reference case and for other developing economies it is on average 2.2 per cent higher. For the newly industrialised economies, output is 0.7 per cent higher than in the reference case. This compares with an equivalent result of 0.25 per cent for the developed economies.

Because developed economies complete their liberalisation plans by 2010, most of their gains in economic output are realised by this point. The difference in GDP between 2010 and 2020 reflects the additional benefits of improved access to developing and newly industrialised economy markets. These are relatively small because, at an aggregate level, the developed economies trade more intensively with each other than they do with other economies in the region. This reflects, in particular, the very strong trade relationships between the United States and Canada and the United States and Japan.

In the developing and newly industrialised economies, GDP continues to increase strongly relative to the reference case between 2010 and 2020 as they continue to remove barriers to trade. As a result, these economies gain ongoing efficiency benefits from unilateral liberalisation as well as expanded access to other markets.

For APEC as a whole these results are significant. The increase in APEC GDP at 2020 relative to the reference case is equal to around US$225 billion (in 1995 prices). This is approximately equal to the current Indonesian economy and approaching the size of the current economy of Chinese Taipei.

As discussed in chapter 5, these estimates of the impacts of trade liberalisation do not capture all the benefits that are likely to accrue to economies as barriers to trade are removed. They do not, in particular, capture the impacts on GDP of the productivity gains that accompany trade liberalisation. These can arise from improved technologies, the enhanced ability to capture economies of scale and other efficiency benefits that flow from the more competitive economic environment following liberalisation.

These impacts have been estimated for the purposes of this study, however, on the basis of information in the economics literature (Okamoto 1994; Urata and Yokata 1994; Kwak 1994; Chand 1999; McKibbin 1999). The analysis
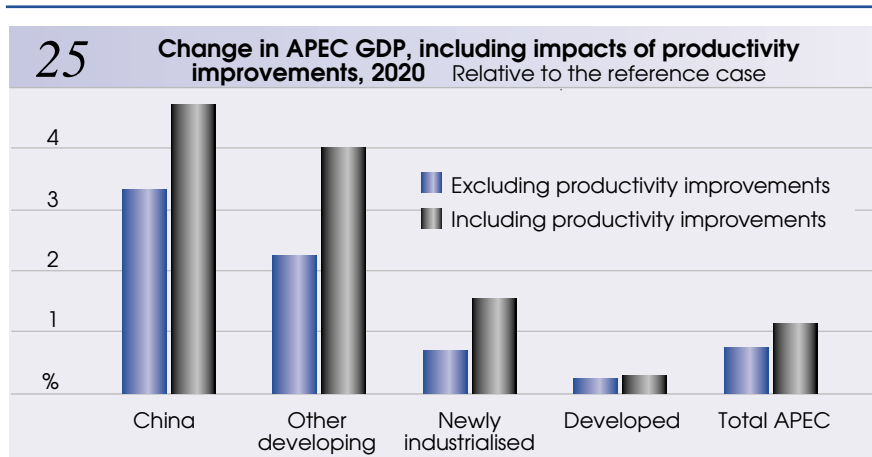
25 **Change in APEC GDP, including impacts of productivity improvements, 2020** Relative to the reference case

relates the size of the reduction in trade barriers implicit in the trade liberalisation scenario to productivity improvements. The analysis is restricted to the manufacturing sector because information is not available on the relationship between trade liberalisation and productivity improvements in other sectors of the economy. The productivity gains that are estimated to occur in the manufacturing sector following trade liberalisation are then modeled in GTEM to determine their impact on GDP. The details of this analysis are described in appendix D.

The results indicate that if the productivity benefits of trade liberalisation in the manufacturing sector are included, the impact on APEC economic output of the Bogor trade liberalisation program could be more than 50 per cent higher than the estimates provided above where productivity gains are not taken into account (figure 25). That is, the increase in APEC GDP in 2020 relative to the reference case could be equal to around US$345 billion (in 1995 prices).

Effects of removing barriers to energy trade

The removal of barriers to trade in the energy sector, including tariffs and subsidies, will have impacts on both energy consumption and trade. Removing tariffs will, other things being equal, lead to lower prices for energy and therefore to an increase in energy consumption. It will also lead to an increase in imports of energy if the price of internationally traded energy is lower than the domestic equivalent. The removal of a production subsidy, in contrast, will lead to an increase in the price of energy, a corresponding

decrease in consumption and an increased role for imports in supplying that consumption.

There are relatively few tariff barriers to energy trade in the APEC region. Some exceptions are tariffs on imports of coal in China and the Philippines and on oil imports in some economies. Some production subsidies have also been identified and quantified, including subsidies on the production of electricity in Mexico and the Philippines. It is almost certain, however, that production subsidies are used in other economies (Schneider et al. 1999; International Energy Agency 1999; World Bank 1997). To the extent that the database does not capture all production subsidies in the APEC region, the simulation results will underestimate the impacts of their removal.

Effects of changes in economic structure

More significant impacts on the energy sector will arise from changes in the intersectoral allocation of an economy's resources that occur in response to trade and investment liberalisation. In particular, the movement of resources, or the productive capacity of an economy, into or away from energy intensive sectors, such as iron and steel and nonferrous metals, will have significant implications for energy consumption. Similarly, changing comparative advantage in resource extraction industries can lead to different patterns of energy production. Together, these shifts in energy consumption and production can have implications for the pattern of energy trade.

The results indicate that in the developing economies, including China, a major impact of liberalisation is to reduce the assistance (often substantial) afforded domestic agricultural industries. As a result the agriculture sector contributes less to economic growth in 2020 compared with the reference case than sectors in which these economies have a stronger comparative advantage. These include the more energy intensive sectors such as manufacturing which, together with the services sector, account for increased electricity consumption in developing economies relative to the reference case.

In the developed economies, agricultural output declines relative to the reference case as the high levels of assistance in some economies are removed. While resources shift into energy intensive industries to a limited degree, the small declines in output of electricity, petroleum and coal products and other manufacturing result in some reduction in fossil fuel consumption relative to the reference case. For APEC as a whole, agricultural production

26 Change in APEC production in selected sectors, 2020
Relative to the reference case
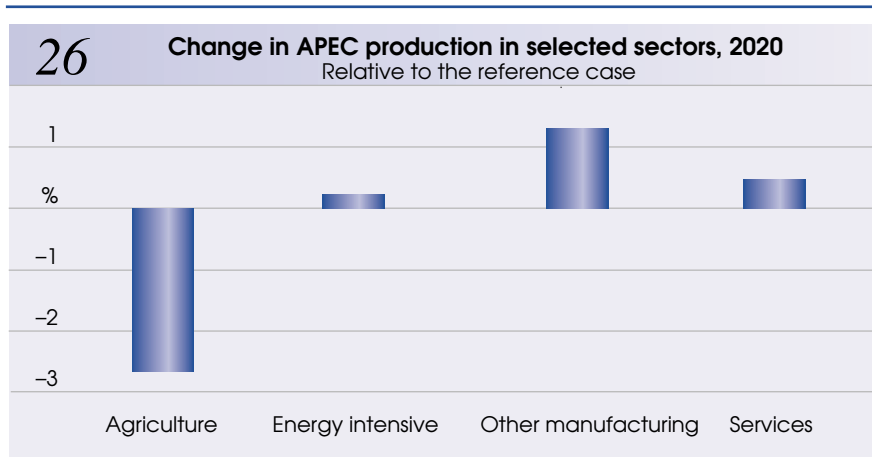
declines while output in the energy intensive, other manufacturing and services sectors increases (figure 26).

Energy consumption impacts

As a result of liberalisation, total consumption of energy in the APEC region rises by 0.12 per cent in 2020 relative to the reference case. Although this is relatively modest, the energy sector impacts vary across economies in the region (figure 27).

Growth in energy consumption relative to reference case levels is highest in the newly industrialised economies, reflecting strong economic growth following the removal of relatively high levels of protection across these

27 Change in APEC energy consumption, 2020
Relative to the reference case
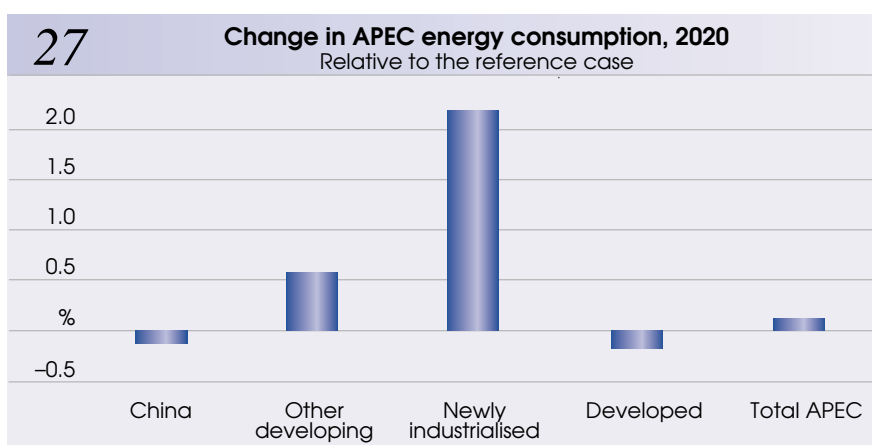
economies. The largest increases in energy demand occur in Korea and Chinese Taipei where economic growth is rapid and energy intensive production rises relative to the reference case. There is also strong growth in services sector output in Korea. The overall structure of the Korean and Chinese Taipei economies continues to favor light industry and services, leading to increasing consumption of electricity relative to the reference case. In Mexico, trade liberalisation results in a less energy intensive production structure, and energy use falls relative to the reference case as a result. This is because liberalisation in Mexico includes the removal of a subsidy on the production of electricity, leading to higher electricity prices.

Energy consumption at 2020 in the developing economies other than China is also higher than in the reference case. This is also driven by stronger levels of economic growth following the removal of widespread trade barriers. Where structural changes in economic output favor more energy intensive production, increases in energy consumption are enhanced. For example, in 2020, energy consumption in Malaysia is around 4 per cent higher than in the reference case. In this economy, the output of energy intensive sectors increases more strongly than in other manufacturing sectors.

In other economies, such as Indonesia and Thailand, liberalisation leads to a less energy intensive production structure and total energy consumption in 2020 is lower than in the reference case. In both of these economies this occurs when high levels of protection on energy intensive industries, including the chemicals, rubber and plastics industry, are removed. Although energy consumption in these economies is below reference case levels in 2020 it still grows very strongly over the period from 2000.

In China, energy consumption in 2020 is also slightly lower than in the reference case, by 0.1 per cent. The removal of high levels of protection in China results in strong economic growth, well above reference case levels, but it also leads to a less energy intensive production structure. This occurs as resources shift, in relative terms, from heavy industries such as chemicals to those that exploit China's comparative advantage in labor intensive production, especially textiles and services. As a result, China's consumption of electricity rises relative to the reference case, leading to modest increases in coal and gas consumption. However, the impact of the shift out of heavy industry is to reduce oil consumption relative to the reference case, despite increasing consumption of oil in the transport sector. This is sufficient to offset the expansion in consumption of other fuels.

In the developed economies, the removal of relatively low levels of economy-wide protection results in small economic gains and sectoral shifts that, on balance, result in lower energy consumption in 2020 relative to the reference case. However, the aggregate results hide differences between economies.

The removal of agricultural protection in Japan, for example, encourages resources to shift over time to the production of more manufactured goods relative to the reference case, resulting in increased energy consumption. In contrast, energy consumption falls in Australia, Canada and New Zealand following the removal of protection on energy intensive and other manufacturing, and resources shift into less energy intensive agriculture and resource sectors. In the United States, there is a relatively strong movement out of agriculture as protection in this sector falls with gains occurring in the services sector.

APEC trade liberalisation also leads to varying impacts across fuel types. APEC oil consumption rises relative to the reference case (figure 28), particularly in the newly industrialised economies. This is because demand for transport services (including international transport for trade), which accounts for the largest share of oil consumption, increases as a result of increased per person incomes and increased trade flows among economies. For example, oil consumption in Korea and Chinese Taipei in 2020 is 6.4 per cent and 4.8 per cent higher than in the reference case. Oil consumption declines relative to the reference case in China because of reduced consumption in energy intensive industry, particularly China's large chemicals, rubber and plastics sector.

28 Change in APEC oil consumption, 2020
Relative to the reference case
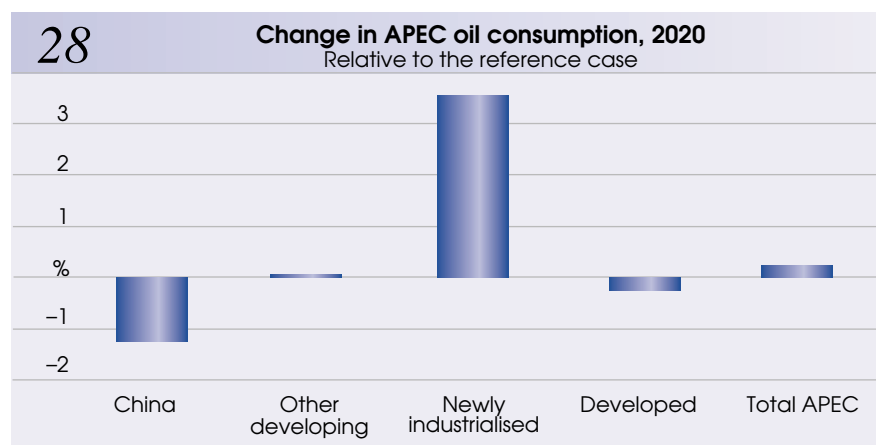
In 2020, total APEC coal consumption is 0.2 per cent higher than in the reference case. This reflects increased demand for coal in industry and power generation in the developing and newly industrialised economies that is sufficient to offset lower demand in these sectors in the developed economies (figure 29). Coal consumption in developing economies other than China is 2.5 per cent higher in 2020 relative to the reference case, compared with a decrease of 0.25 per cent in the developed economies. In China, additional growth in electricity production and the continuing dominance of coal fired power generation leads to coal consumption being almost 0.3 per cent higher than in the reference case in 2020.

While total APEC gas consumption falls slightly relative to the reference case following liberalisation, the absolute level of gas consumption continues to increase strongly over the period to 2020. Impacts differ significantly across economies (figure 30).

As with coal, gas demand increases relative to the reference case in economies where manufacturing production and electricity generation rise following liberalisation. This includes a number of developing and newly industrialised economies such as China; Hong Kong, China; Korea; Malaysia; the Philippines; and Chinese Taipei. Gas consumption in 2020 falls relative to the reference case in Indonesia and Mexico. In Mexico, this occurs because of the domestic price impacts following removal of the electricity production subsidy. In Indonesia, gas is diverted from domestic consumption to export markets. These declines are insufficient to offset the gains elsewhere and, as a result, total gas consumption in the developing and newly industrialised economies is higher than in the reference case.

29   **Change in APEC coal consumption, 2020**
Relative to the reference case
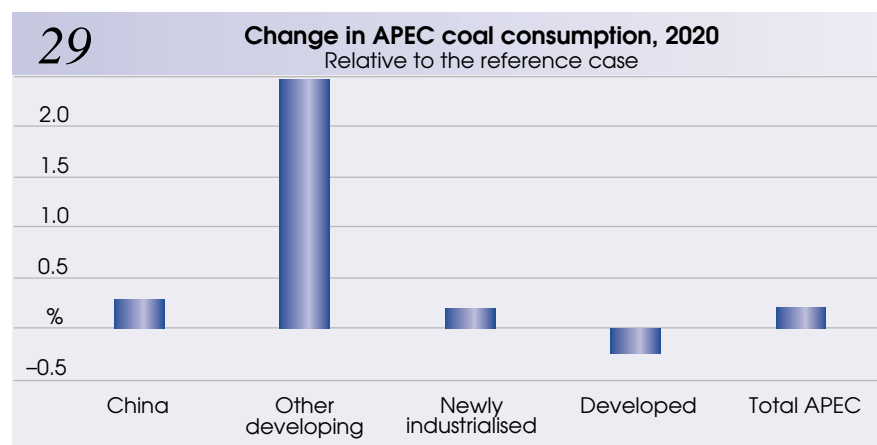
The modest decrease in gas consumption in the developed economies in 2020 relative to the reference case is driven mainly by the fact that electricity growth is below reference case levels.

Changes in energy consumption that follow from trade liberalisation might be expected to have implications for other policies being pursued by APEC member economies, including commitments to reduce emissions of greenhouse gases. The five developed member economies of APEC represented in this study are all parties to Annex B of the Kyoto Protocol and have agreed to limit their greenhouse gas emissions over the period to 2008–12. None of the developing or newly industrialised member economies is a party to Annex B of the protocol nor subject to any emission abatement commitment.

In the case of the developed economies, emissions of the three greenhouse gases included in GTEM are lower in 2020 than in the reference case following the implementation of APEC trade liberalisation policies (figure 31). This is because of lower overall energy consumption relative to the reference case and a shift away from the consumption of more emission intensive coal.

In most of the other developing and newly industrialised economies, emission levels at 2020 are above reference case levels. This is in response to higher energy consumption and the increased consumption of coal relative to the reference case. In China, however, emissions in 2020 are lower than in the reference case because of the decline in total consumption of energy compared with reference case levels. This is sufficient to offset the increase in emissions in other APEC non-Annex B economies and, at the APEC-wide

30 **Change in APEC gas consumption, 2020**
Relative to the reference case

31 **Change in APEC greenhouse gas emissions following trade liberalisation, 2020** Relative to the reference case
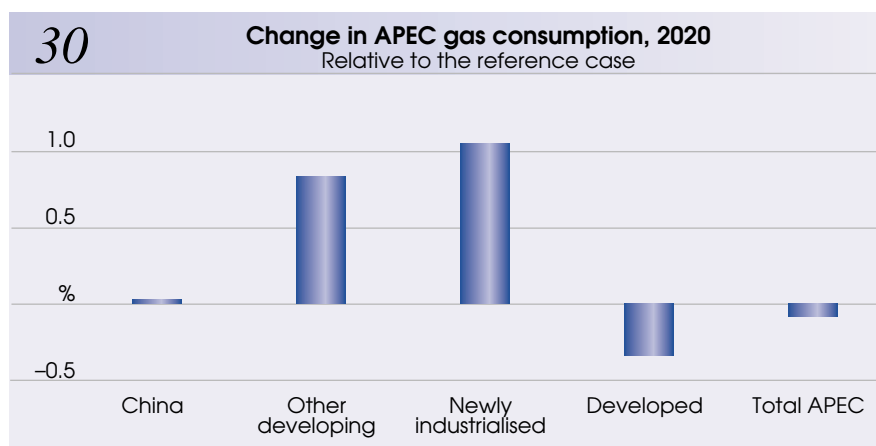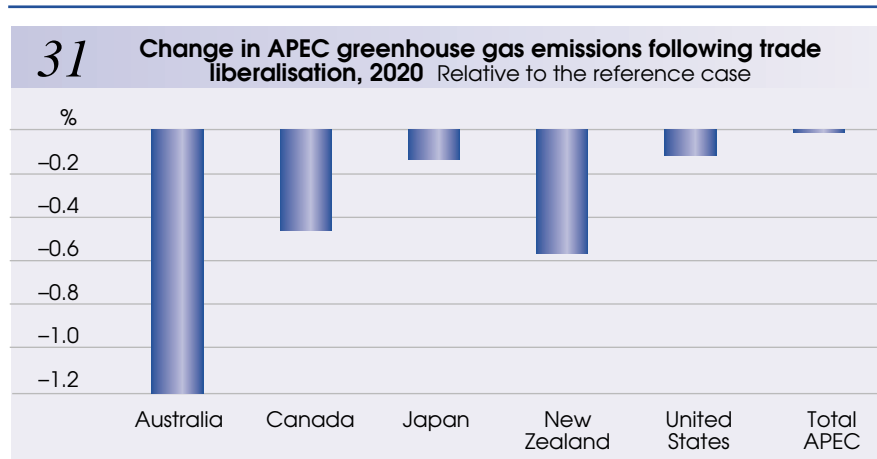
level, the impact of implementing trade liberalisation policies is to reduce emissions by 0.2 per cent relative to the reference case at 2020.

Energy production impacts

Trade liberalisation in APEC results in increased regional production of fossil fuels in 2020 relative to the reference case despite there being no large increase in the total level of APEC energy consumption. As a result, APEC becomes a more important supplier of coal and gas to the rest of the world. A significant driver of the changes in energy production are the resource shifts that arise from liberalisation in the major energy producing economies. For example, production of coal, oil and gas in 2020 is higher than in the reference case in Australia, Canada and the United States (figure 32). In these

32 **Change in coal, oil and gas production in selected APEC economies, 2020** Relative to the reference case
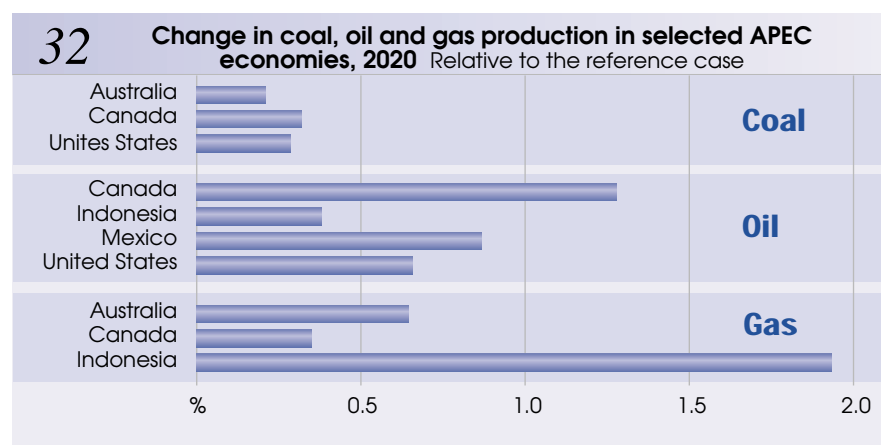
economies, trade liberalisation results in the release of resources from previously protected industries, such as agriculture and manufacturing, and increasing specialisation in resource based sectors, including energy. In contrast, coal production in China remains unchanged compared with reference case levels despite increased coal consumption. This is because resources are reallocated toward other sectors such as textiles and other manufacturing where comparative advantage increases most as a result of APEC-wide trade liberalisation.

Trade impacts

Fossil fuel trade in the APEC region in 2020 increases relative to the reference case as a result of liberalisation, due mainly to the balance of the consumption and production impacts (figure 33). The removal of barriers on fossil fuel imports also has a positive impact on the level of fuel trade in the region.

The largest changes occur in coal trade. The majority of the increased demand for imported coal in APEC occurs in the region's key import markets — Japan, Korea and Chinese Taipei — as their economies grow, and as energy intensive output increases as a result of liberalisation (figure 34). Similar trends occur in other smaller markets for imported coal, including Chile, Malaysia and the Philippines. The removal of tariffs on imported coal in each of these economies leads to higher coal imports at 2020 than in the reference case. China's coal imports also increase to meet the shortfall between consumption and production that follows liberalisation.

33 Change in APEC coal, oil and gas trade, 2020
Relative to the reference case

34 **Change in coal imports, selected APEC economies, 2020**
Relative to the reference case
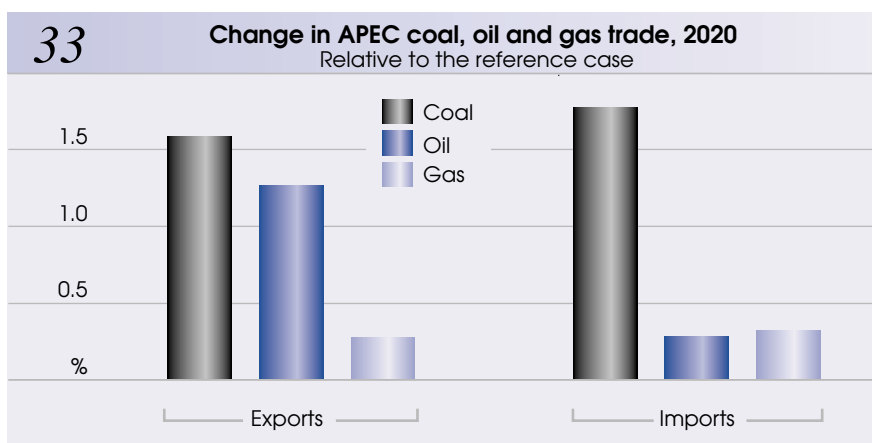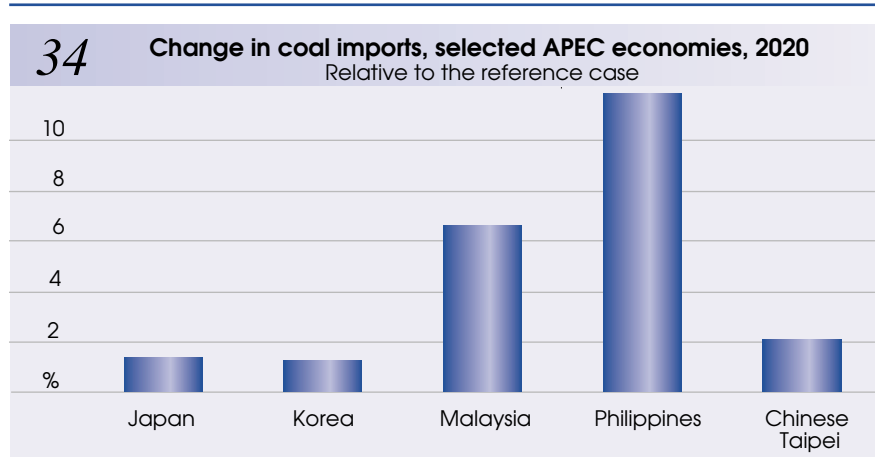
Increased demand for coal imports relative to the reference case is met largely by APEC's major coal exporters, including Australia, Canada and the United States (figure 35). As outlined above, resource shifts that arise in these economies result in increased production and decreased domestic consumption of energy, leaving more fuels for export, including coal. The increase in Australia's coal exports is moderated by a currency appreciation relative to the currencies of other APEC coal exporters. The Australian dollar appreciates relative to the Canadian and United States currencies largely because demand for Australia's agricultural exports rises following liberalisation of agricultural sectors in other economies, mainly Japan and the United States. Indonesia experiences a shortfall in coal production as a result of liberalisation and coal exports decrease. China's exports of coal remain largely unchanged.

35 **Change in coal exports from major APEC coal exporters, 2020**
Relative to the reference case

36 Change in oil trade, selected APEC economies, 2020
Relative to the reference case
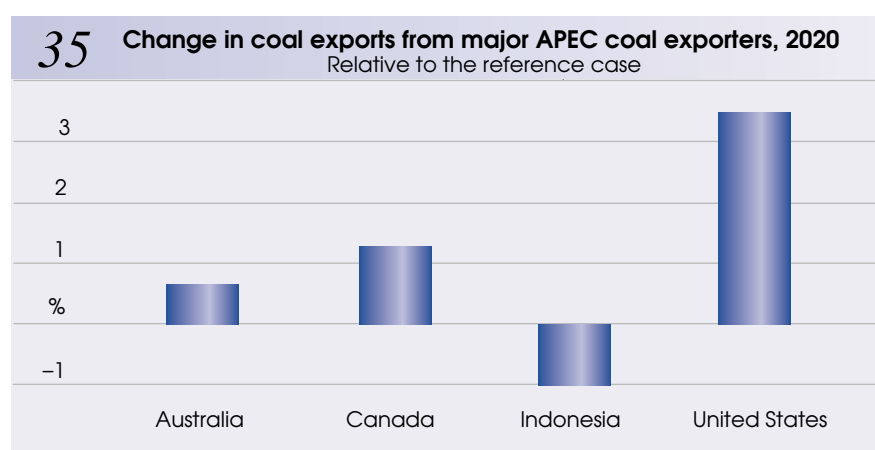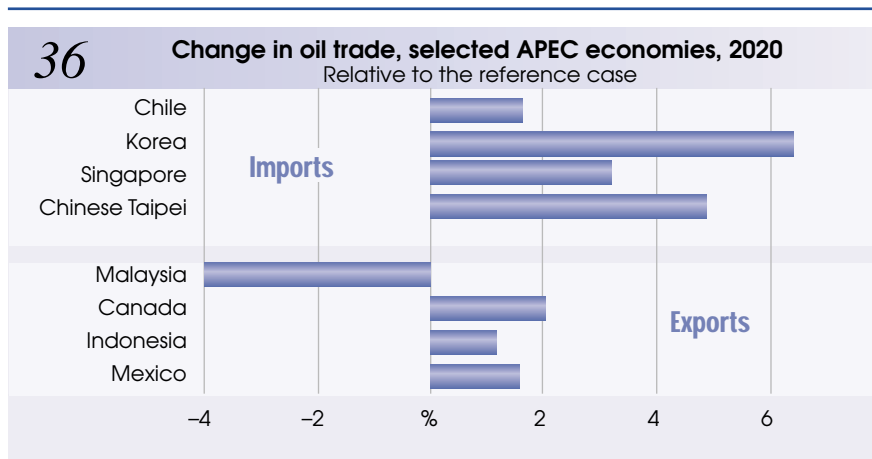
The largest increases in APEC oil imports relative to the reference case occur in economies where liberalisation results in increased economic activity and more energy intensive production, including Korea, Singapore and Chinese Taipei (figure 36). The removal of tariffs on oil imports in Korea and Chinese Taipei, as well as in smaller import markets such as Chile, promotes increased oil imports.

Oil exports increase relative to the reference case from all of APEC's main exporters with the exception of Malaysia, which experiences strong increases in domestic energy consumption as a result of the economic gains that flow from liberalisation. This also reduces Malaysia's gas exports relative to the reference case, allowing Australia and Indonesia to increase their exports of gas relative to reference case levels (figure 37). The absolute level of

37 Change in gas trade, selected APEC economies, 2020
Relative to the reference case
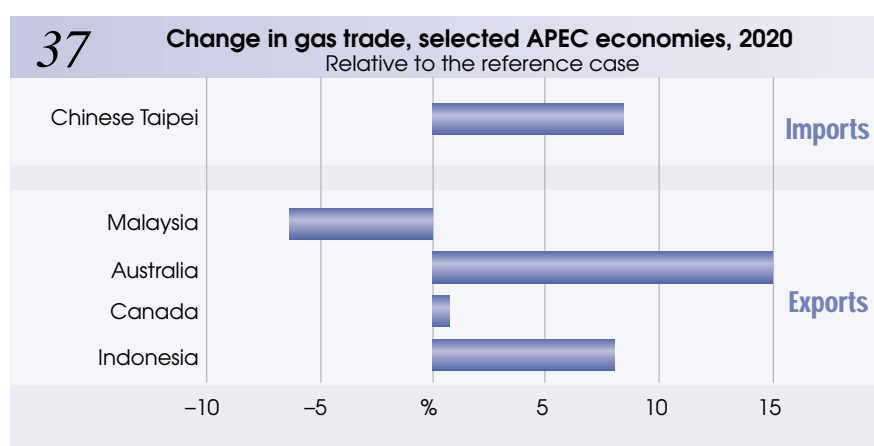
Malaysia's gas exports does not fall, however, and Malaysia is able to maintain its long term contractual commitments. Of APEC's large gas importers, Chinese Taipei experiences the greatest increase in gas imports relative to the reference case, reflecting strong economic growth and increased production of energy intensive goods relative to reference case levels.

Sensitivity of results to the timing of liberalisation

The analysis of results presented above is based on one interpretation of the timetable for liberalisation implied in the Bogor Declaration. That is, it assumes that APEC economies will start to open their trade regimes from 2000 but will not complete the process until 2010 or 2020, depending on their status as a developed or a developing economy. However, given the voluntary nature of the APEC commitment and its lack of specificity in relation to timing, it is likely that economies will implement their commitments in a less uniform and orderly manner.

Many factors will influence how rapidly an economy will meet its trade liberalisation commitments and how uniformly across sectors it will reduce its barriers to trade. These include general economic conditions and the perceived importance of trade in promoting economic growth. Specific issues in highly supported industries such as regional employment will also be a consideration in some economies.

The results of two simulations are presented in this section in order to demonstrate the significant impacts that can result when the timing of liberalisation is altered. The first of these assumes that developing economies liberalise their trade regimes at the same pace as developed economies and achieve the target of a free and open trade system by 2010. In the second, the developing economies delay the commencement of trade liberalisation until 2010 and reach their Bogor target progressively over the period to 2020.

The results of these simulations point to benefits from more rapid liberalisation (figure 38). If developing and newly industrialised economies meet their trade liberalisation objectives by 2010 they will obtain higher real output growth than under the Bogor timetable. In the other developing economies, for example, GDP in 2020 is 2.6 per cent higher than in the reference case, compared with a difference of 2.2 per cent under the Bogor timetable. This occurs because economies capture the efficiency gains and consequent additional investment growth from unilateral liberalisation earlier than under the

38   **Change in GDP under different liberalisation scenarios, 2020**
Relative to the reference case
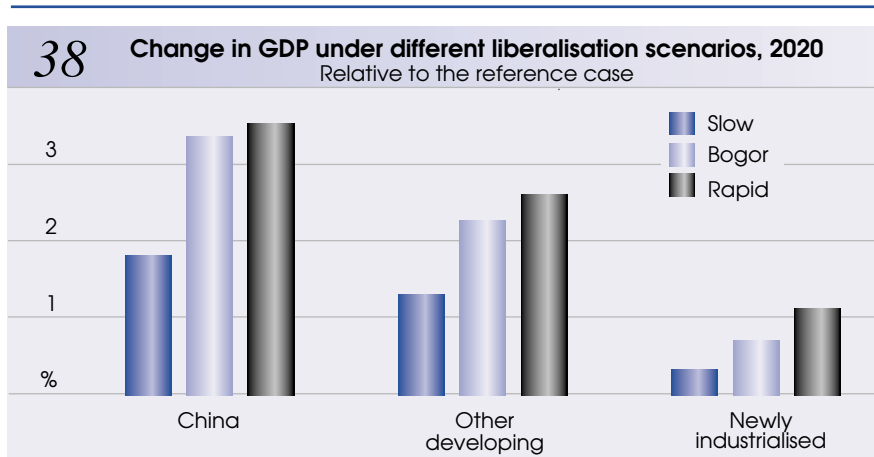
alternative scenario. They also reap the benefits of wider market access as all economies liberalise within the same timeframe.

Not surprisingly, when economies delay the implementation of trade liberalisation the benefits they obtain in terms of real output growth are smaller. In this case, they do not secure the efficiency gains from resource reallocation until later than under the Bogor timetable and the market access benefits do not begin to materialise until after 2010. As a result, GDP in the other developing economies in 2020 is 1.3 per cent higher than in the reference case compared with a difference of 2.2 per cent in the Bogor simulation.

The energy consumption impacts of slower and more rapid trade liberalisation are consistent with the impacts on GDP. When liberalisation is implemented more rapidly than the Bogor timetable, energy consumption either rises more strongly in 2020 relative to the reference case or does not fall as strongly as under the Bogor framework. Conversely, delaying liberalisation leads to lower impacts on energy consumption.

Sensitivity of results to economic growth assumptions

Because of the inherent uncertainty in the rate of recovery from the Asian downturn in several key economies, a sensitivity analysis of alternative rates of economic growth has been undertaken. This analysis examines the implications of faster than expected recovery from the downturn. Specifically, it assumes that in 1999 and 2000, economic growth is half of one percentage point higher than in the reference case in seven of the affected Asian

economies. These economies are Hong Kong, China; Indonesia; Japan; Malaysia; Philippines; Singapore; and Thailand.

The results indicate that accelerated recovery from the Asian downturn has no significant effect on the economic growth that the total APEC region experiences as a result of trade liberalisation under the Bogor program, and hence no marked impacts on the energy sector. Because the impacts of the downturn are relatively short term compared with the time frame of the simulation, GDP in these economies is the same at 2020 as in the reference case. This is because they recover their pre-downturn growth paths by around 2004. Total GDP in APEC still increases relative to the reference case by 0.4 per cent in 2010 and 0.7 per cent in 2020.

7

Impacts of APEC trade liberalisation on individual economies

An assessment of the impacts of APEC trade liberalisation on individual economies is presented in this chapter. Differences in key variables including sectoral output, energy consumption, fossil fuel production, consumption and trade are explored. These are expressed as differences from reference case levels in 2020.

Factors influencing the energy impacts of liberalisation

The energy impacts of liberalisation will differ across APEC economies because of three main factors.

First, the overall impact of APEC trade liberalisation on the aggregate output (measured by real GDP) of an individual economy will affect production, consumption and trade in energy products. For example, an economy that experiences a significant increase in economic output would be expected to increase energy consumption. This increased demand for energy would need to be met by domestic production or by imports or both.

Second, structural change resulting from APEC liberalisation will be an important determinant of energy consumption, production and trade. The pattern of industry protection varies significantly across APEC economies and sectors. This implies that the structural and energy effects of APEC liberalisation will also vary across regions. For example, an economy that increases agricultural production but reduces coal fired electricity output as a result of APEC liberalisation would be expected to reduce coal consumption. In this case, if the economy were a coal exporter, exporters would attempt to increase sales to overseas coal consumers.

Third, APEC liberalisation may result in fuel switching in a given APEC economy as a result of changes in relative fuel prices. For example, if as a result of APEC liberalisation the demand for gas rose in one sector of the economy, there would be upward pressure on gas prices. If the prices of competing fuels remained at the same level, other sectors in the economy would have a price incentive to substitute these fuels for gas.

Australia

There are two main impacts of liberalisation on Australia's energy markets and trade. First, there is an expansion in agricultural production as high levels of agricultural protection in other APEC economies are reduced, leading to increased demand for agricultural exports from Australia compared with the reference case (figure 39). Second, the removal of protection on Australian manufacturing industries results in a fall in manufacturing production relative to the reference case, reducing demand for primary energy and electricity. On balance these structural changes make the economy slightly less energy intensive compared with the reference case. As a result, domestic energy consumption is lower than in the reference case, freeing up fossil fuels for export. This, together with the increased regional demand for energy

39 **Impacts of trade liberalisation on Australia, 2020**
Relative to the reference case
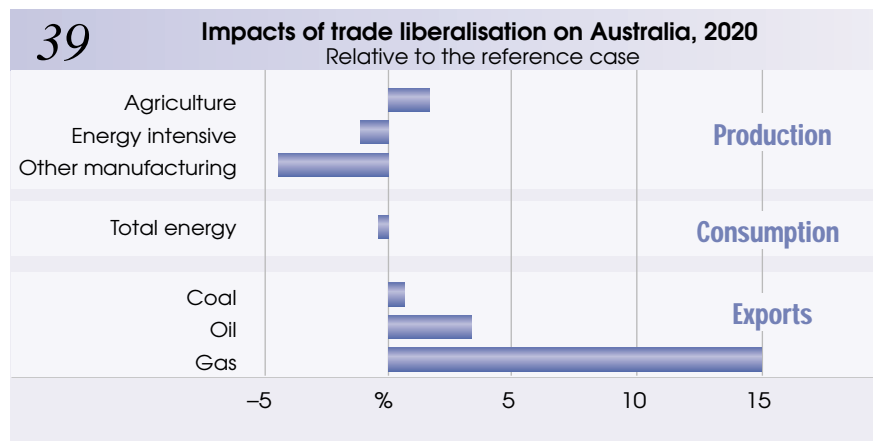
imports that results from trade liberalisation, leads to an increase in Australia's exports of coal, oil and gas relative to the reference case. Gas exports increase significantly compared with reference case levels as Australia, along with Indonesia, takes advantage of the fact that Malaysia's gas exports are below their reference case levels. The incentive to increase coal exports is reduced somewhat by an appreciation of Australia's currency relative to other major coal exporters, including Canada and the United States.

Canada

The impacts of trade liberalisation in Canada are similar to those in Australia although smaller in magnitude. This is because average starting point protection levels in Canada are relatively low, reflecting the implementation of NAFTA. Following trade liberalisation, Canada's agriculture sector expands

40   **Impacts of trade liberalisation on Canada, 2020**
Relative to the reference case
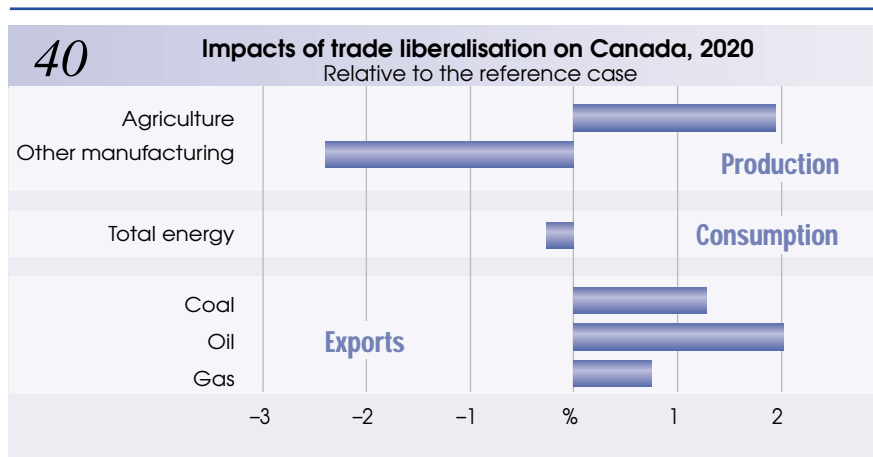
relative to the reference case in response to increased demand for agricul-
tural exports from economies where agricultural protection levels fall (figure
40). Conversely, manufacturing output in Canada contracts relative to the
reference case, particularly in the relatively highly protected textiles, apparel
and leather sector. As a result of these structural shifts, total energy consump-
tion in Canada in 2020 is lower than reference case levels. Lower domestic
energy consumption allows Canada to export more fossil fuels to meet the
increased regional demand for energy imports that results from trade liber-
alisation. Canada is one of APEC's key energy exporters, particularly of gas
and oil and also benefits from the decline in the Australian dollar in terms
of expanded coal export opportunities. The combined increase in coal, oil
and gas exports relative to the reference case represents a significant increase
in absolute energy exports from Canada in 2020.

Chile

Removal of relatively uniform levels of protection on the manufacturing and
agriculture sectors has only a small impact on Chile's economic structure.
Impacts on the energy sector stem largely from changes in export demand
which benefits from lower import costs following the removal of trade barri-
ers. For example, production of nonferrous metals, which is the largest of
Chile's energy intensive sectors, increases strongly relative to the reference
case. This is because of a significant increase in Chile's exports of nonfer-
rous metals to expanded markets throughout the APEC region compared
with reference case levels. As a result, energy intensive production in Chile
in 2020 is higher than in the reference case (figure 41). Although agricul-
tural output and services also expand, the economy is more energy intensive

41 **Impacts of trade liberalisation on Chile, 2020**
Relative to the reference case
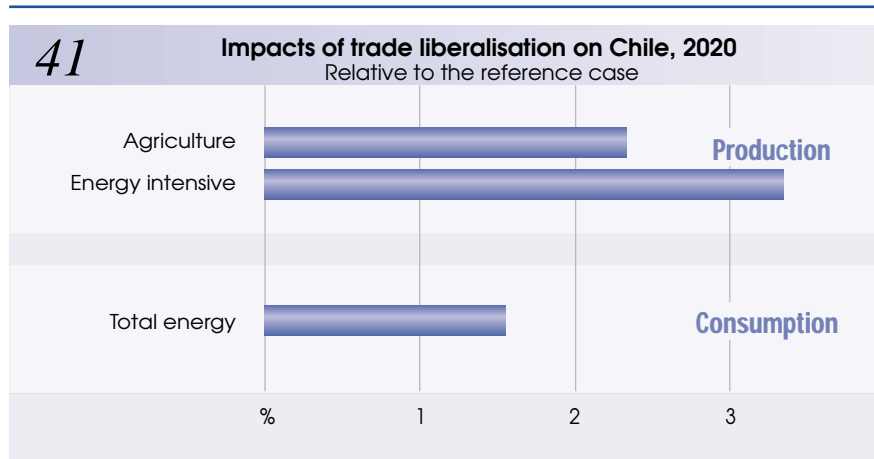
after liberalisation and consumption of energy in 2020 is higher than in the reference case.

China

The removal of high levels of protection in China results in stronger economic growth than in the reference case. However, China's output of energy intensive goods falls relative to the reference case as protection on these industries is removed (figure 42). For example, elimination of protection, including an export subsidy, on the chemicals, rubber and plastics industry, which is a significant user of oil in China, leads to a large fall in output of these commodities relative to the reference case. As a result, oil consumption in China in 2020 is lower than reference case levels. Following trade liberali-

42 **Impacts of trade liberalisation on China, 2020**
Relative to the reference case

APEC trade and investment liberalisation
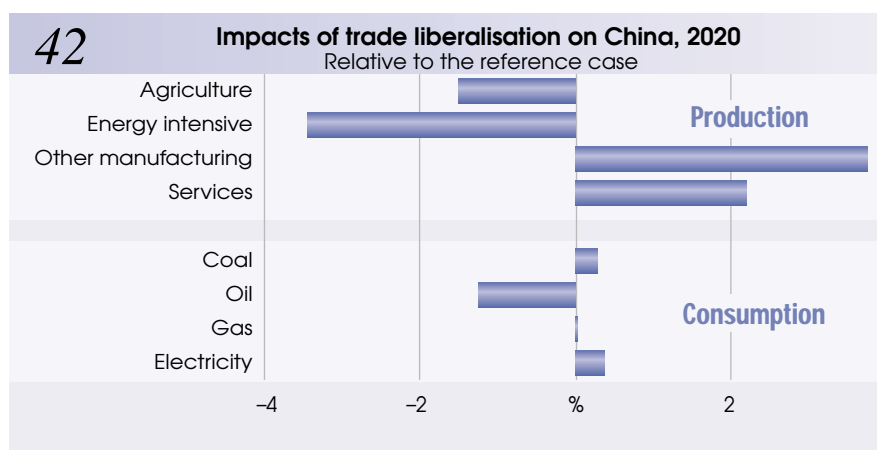
sation, increased resources are employed in less energy intensive manufacturing sectors in China, particularly textiles, and in services. This reflects the removal of large tariffs and other barriers on textile imports throughout the APEC region as well as China's comparative advantage in labor intensive production. As a result of these structural shifts, electricity consumption in China rises relative to the reference case. This is reinforced by increased household consumption of electricity relative to the reference case as demand for electricity services rises with higher per person incomes. As a result, consumption of coal, which fuels the majority of China's power generation, and gas, which is sold almost exclusively to electricity generation, increases modestly by 2020 relative to the reference case. This is insufficient to offset the falls in oil consumption, however, and China's total demand for energy in 2020 is slightly below reference case levels.

Hong Kong, China

The virtual absence of trade barriers in Hong Kong, China means that the impacts of APEC trade liberalisation on this economy arise from increased market access in the region rather than from the effects of unilateral liberalisation on domestic economic efficiency. As a result, Hong Kong, China's production and exports of manufactured goods increase relative to the reference case (figure 43), mainly in response to increased imports of these goods in China. As output in these sectors increases, there is upward pressure on capital and labor prices. This reduces the competitiveness of the electricity sector relative to the reference case and electricity output at 2020 is below its reference case level, although still well above current levels. This is mainly driven by a reduction in electricity exports to China relative to the reference

43 **Impacts of trade liberalisation on Hong Kong, China, 2020**
Relative to the reference case
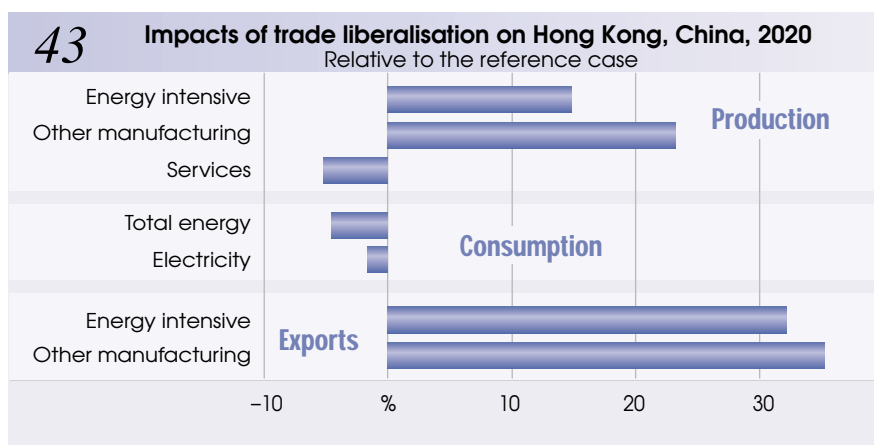
case. Exports of services from Hong Kong, China are also lower than reference case levels, although domestic consumption of services continues to rise. Because the services sector is the major consumer of electricity in Hong Kong, China this also contributes to the electricity sector outcome. The net effect of these structural changes is a reduction in total energy consumption in 2020 relative to the reference case.

Indonesia

The main impact of trade liberalisation in Indonesia is a reduction in the output of energy intensive manufacturing relative to the reference case (figure 44). This is driven by a contraction in Indonesia's chemicals, rubber and plastics sector relative to reference case levels following the removal of protection. The resulting decrease in consumption of energy is moderated by increased energy use in the smaller nonmetallic minerals and nonferrous metals sectors. Indonesia's production and exports of these goods increases relative to the reference case in part because lower capital and labor costs make Indonesian exports of these goods more competitive internationally, increasing import demand in the region. The economic gains that arise from liberalisation result in increased consumption of electricity in Indonesia, leading to higher coal consumption relative to the reference case. This is insufficient to offset the falls in oil and gas consumption, however, and Indonesia's total demand for energy in 2020 is below reference case levels. The removal of tariffs on oil imports in the APEC region increases international demand for oil and increases Indonesia's domestic oil production and exports. Indonesia's gas exports also increase relative to the reference case as importing economies substitute away from more expensive Malaysian gas.

44 **Impacts of trade liberalisation on Indonesia, 2020**
Relative to the reference case
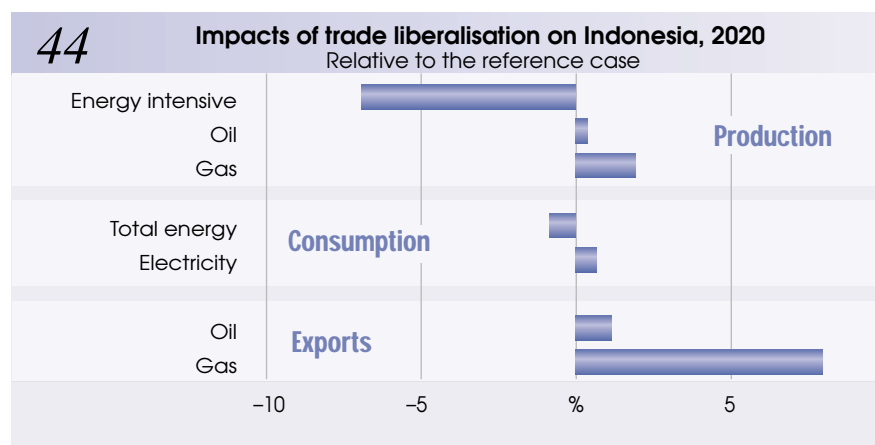
Japan

The removal of high levels of agricultural protection in Japan results in a substantial decline in agricultural production by 2020 compared with the reference case (figure 45). As structural shifts favor more competitive industries, Japan experiences relatively strong GDP growth — higher than in any of the other developed APEC economies. Output increases relative to the reference case in energy intensive industries such as iron and steel, nonferrous metals and nonmetallic minerals, and in other manufacturing. As a result, there is a small increase in demand for energy relative to the reference case, due mainly to increased demand for electricity. While oil consumption in the electricity, transport and chemicals, rubber and plastics sectors increases, total oil consumption falls relative to the reference case because of the large

45 **Impacts of trade liberalisation on Japan, 2020**
Relative to the reference case
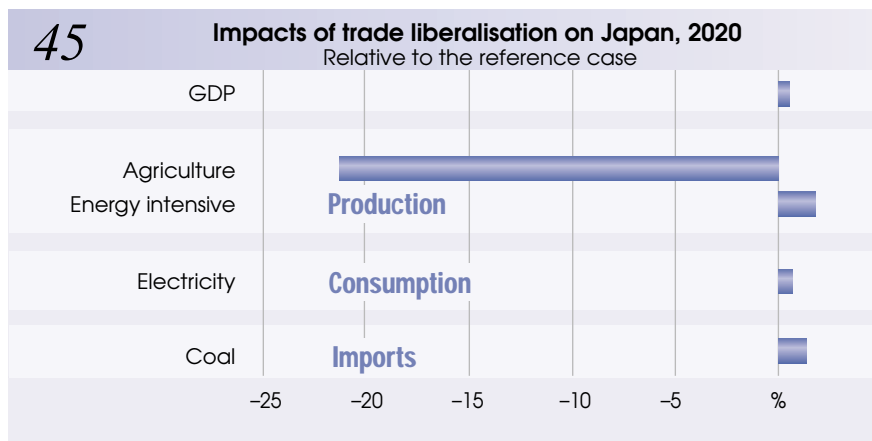
decreases in consumption of petroleum products in the agricultural sectors. Total gas consumption also declines slightly relative to the reference case because the import price of gas increases by more than that for coal, leading to a substitution into coal in electricity generation. Increased demand for coal is met by increased imports, mainly from Australia, Canada and the United States.

Korea

The removal of protection across a range of Korea's industries results in more efficient resource use and a significant increase in economic output relative to the reference case (figure 46). This increases the demand for energy relative to the reference case. The removal of relatively high agricultural protection in Korea results in reduced agricultural output. Structural shifts

46 Impacts of trade liberalisation on Korea, 2020
Relative to the reference case
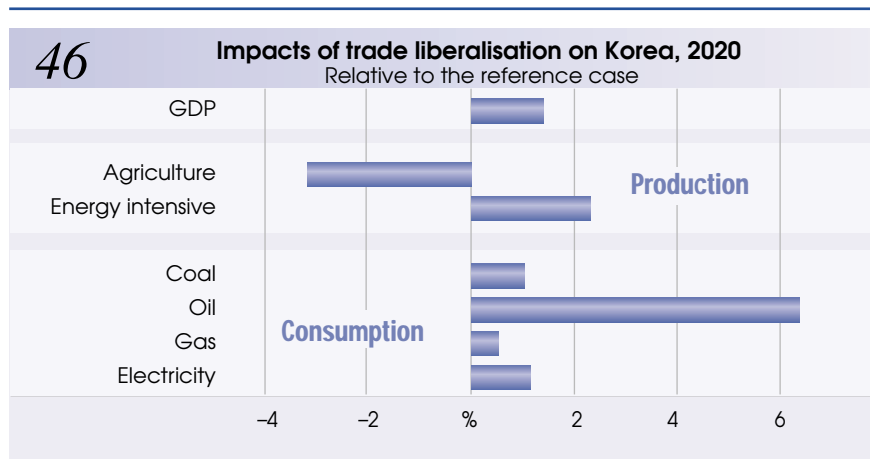
result in the expansion of energy intensive sectors relative to the reference case. These include Korea's large chemicals, rubber and plastics sector, which is the main industrial consumer of oil. Oil consumption rises also as a result of the increased transport demand that accompanies rising per person incomes. Other manufacturing output also increases relative to the reference case by 2020. For example, production of textiles, apparel and leather, which accounts for a significant share of Korea's electricity consumption, is significantly higher than in the reference case following liberalisation. Increased consumption of coal and gas is driven mainly by increased electricity generation. The demand for fossil fuels is met by increased imports.

Malaysia

The removal of relatively high levels of protection, including tariffs as well as production and export subsidies, across a range of Malaysia's industries results in the more efficient allocation of the economy's resources. This, together with the relative importance of trade to the Malaysian economy, delivers economic gains to Malaysia. As a result, total energy consumption increases significantly by 2020 relative to the reference case (figure 47), driven mainly by expansion of energy intensive production, particularly in the chemicals, rubber and plastics sector. This is underpinned by the removal of a rice production subsidy that makes land resources cheaper than in the reference case and increases the competitiveness of other land intensive industries such as rubber. Production also increases relative to the reference case in other manufacturing industries and in agriculture, reflecting Malaysia's comparative advantage in these sectors. Electricity generation increases at the same rate as GDP in response to strong industrial and household demand.

47 **Impacts of trade liberalisation on Malaysia, 2020**
Relative to the reference case
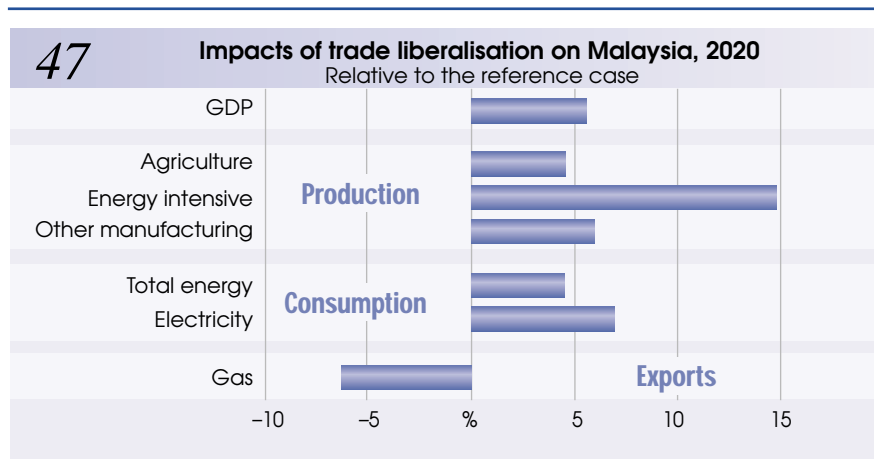
This results in increased domestic demand for oil and gas relative to the reference case. The fact that gas transport costs to peninsular Malaysia are relatively high is reflected in the underlying database and is not expected to constrain the overall gas outcome. Increased domestic gas consumption is in line with other forecasts for Malaysia which indicate that gas will play an increasingly important role in electricity generation as well as in the industry, commercial and residential sectors. However, the costs of Malaysia's oil and gas production rise compared with the reference case as a result of higher capital and labor prices throughout the economy. This constrains the expansion in international demand for Malaysia's energy exports, especially gas, and gas exports in 2020 are lower than in the reference case although still significantly above current levels.

Mexico

Trade liberalisation in Mexico includes the removal of protection on energy intensive industries. As a result, output in this sector declines relative to the reference case (figure 48). Although agricultural trade barriers, including production subsidies, also fall, Mexico's production and exports of agricultural commodities increase relative to the reference case because of rising import demand from the United States. As a result of these structural shifts, Mexico's energy consumption declines by 2020 compared with the reference case. This is reinforced by the removal of subsidies on electricity production, which results in reductions in electricity generation relative to the reference case. Because gas is used intensively in electricity generation, gas production and consumption also falls relative to the reference case. Despite falling use in power generation, oil production remains steady because of

48   **Impacts of trade liberalisation on Mexico, 2020**
Relative to the reference case
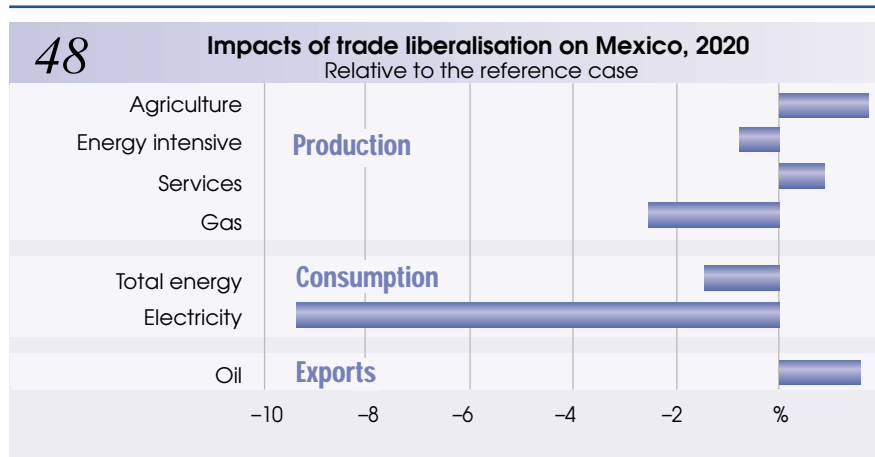
increased use in the domestic transport sector and increased exports to the United States.

New Zealand

The removal of relatively low levels of protection in New Zealand, mainly on manufacturing and energy intensive production, results in reduced output in those sectors relative to the reference case (figure 49). Industries that contract include textiles, apparel and leather, iron and steel and nonferrous metals. Agricultural output expands relative to the reference case, particularly in the processed livestock and dairy industries, in which New Zealand has a strong comparative advantage. This is underpinned by removal of trade barriers on these industries in Japan and results in increased trade in

49   **Impacts of trade liberalisation on New Zealand, 2020**
Relative to the reference case
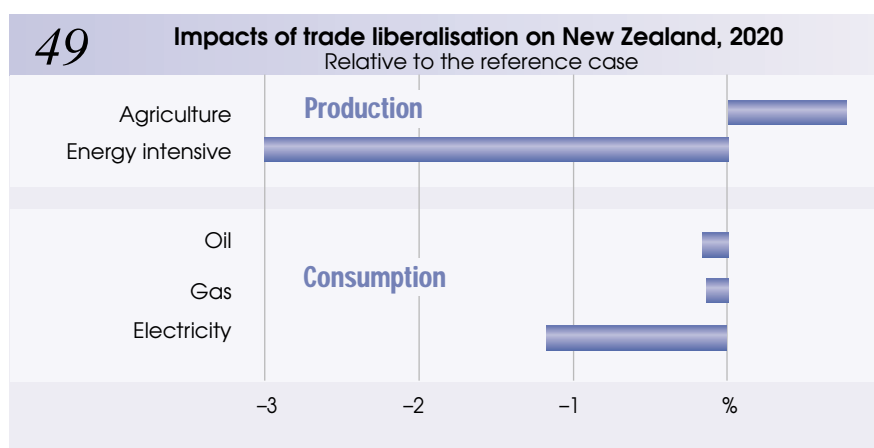
agricultural commodities between the two economies. As a result of these structural shifts, consumption of fossil fuels and electricity declines relative to the reference case in New Zealand. This is despite increased demand for energy services in the household sector as per person incomes increase following trade liberalisation. Oil consumption declines relative to the reference case by 2020 because of the fall in output of the chemicals, rubber and plastics industry, despite increased demand in the transport sector.

The Philippines

At the beginning of the liberalisation period, the Philippines had some of the highest trade barriers in APEC. As a result, liberalisation produces a significant increase in economic output and leads to total energy consumption

50   **Impacts of trade liberalisation on the Philippines, 2020**
Relative to the reference case
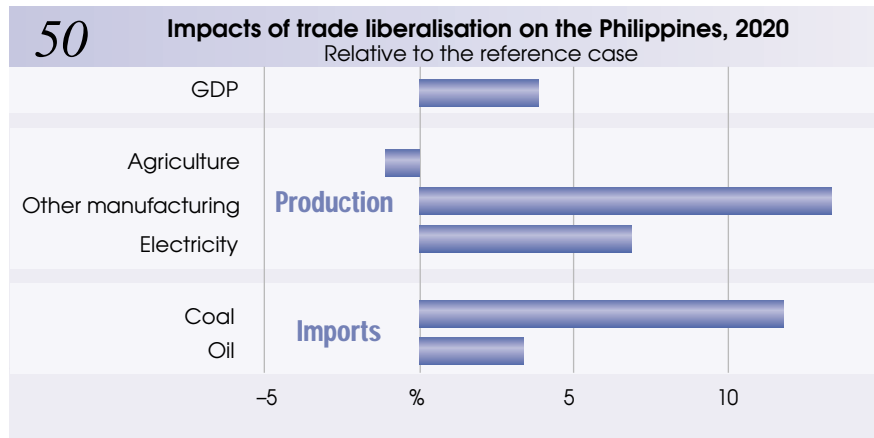
rising relative to the reference case. This effect is reinforced by sectoral shifts following liberalisation that increase the energy intensity of total production. Specifically, agricultural output declines relative to the reference case and manufacturing production increases significantly (figure 50). This, together with increased demand for electricity in the household sector, results in a large increase in electricity consumption compared with reference case levels. As a result, demand for imported fossil fuels, particularly coal, in 2020 is above reference case levels.

Singapore

As in Hong Kong, China, the virtual absence of trade barriers in Singapore means that the impacts of APEC trade liberalisation arise largely from increased market access in the region rather than from the effects of unilateral

51   **Impacts of trade liberalisation on Singapore, 2020**
Relative to the reference case
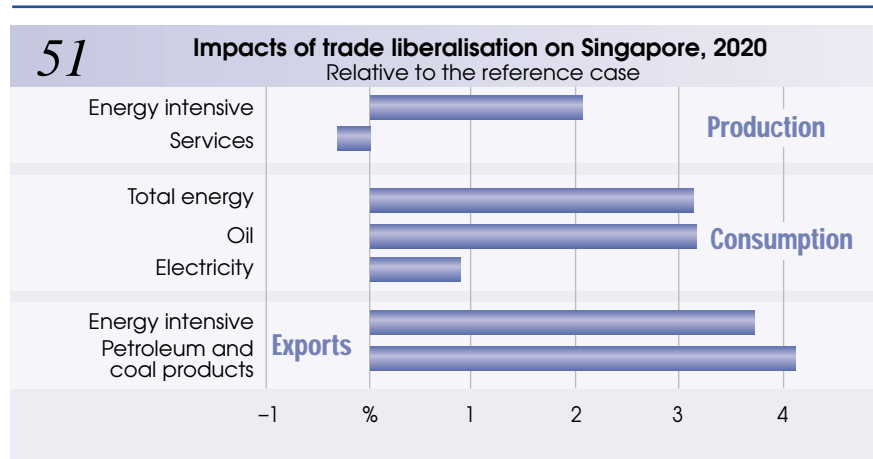
liberalisation on domestic economic efficiency. As a result, Singapore increases production and exports of energy intensive goods relative to the reference case (figure 51), mainly to China and other developing economies where production of these goods declines with the removal of trade barriers. At the same time, Singapore's output of other manufactures and services contracts relative to the reference case as other economies with higher trade barriers at the start of liberalisation become relatively more competitive in these areas. However, increased demand by households means that the demand for electricity at 2020 is higher than in the reference case. There is also significantly higher demand for Singapore's exports of petroleum products, especially from Viet Nam and other developing economies as these economies lower their barriers to imports. This leads to an increase in oil consumption in Singapore relative to the reference case. The net effect of these impacts is that energy consumption in 2020 in Singapore is higher than reference case levels.

Chinese Taipei

Trade liberalisation in Chinese Taipei involves the removal of protection across a range of industries, including in the agriculture sector. As resources are allocated more efficiently, economic output increases relative to the reference case, leading to increased demand for energy (figure 52). In addition, the energy intensity of Chinese Taipei's economy increases as a result of the decline in agriculture and the expansion of energy intensive production, particularly chemicals, rubber and plastics and nonferrous metals. Production of textiles, apparel and leather also expands strongly relative to the reference case, leading to increased exports of these commodities. The expan-

52 **Impacts of trade liberalisation on Chinese Taipei, 2020**
Relative to the reference case
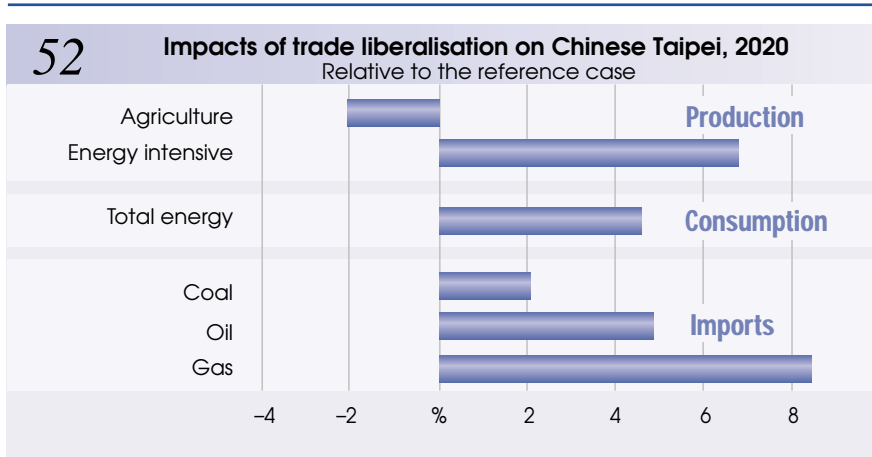
sion of these sectors increases the demand for electricity relative to the reference case and, as a result, coal and gas consumption also rises. The increase in gas consumption is greater than that of coal because the removal of a tariff on imported gas gives gas a competitive advantage. Increased oil consumption is driven by the expansion of energy intensive industry and by increased consumption in the transport sector. The higher demand for fossil fuels following trade liberalisation is met by imports.

Thailand

Trade liberalisation in Thailand involves the removal of relatively high trade barriers across a range of industries, including the energy intensive chemicals, rubber and plastics industry. As a result, output in these sectors declines

53 **Impacts of trade liberalisation on Thailand, 2020**
Relative to the reference case
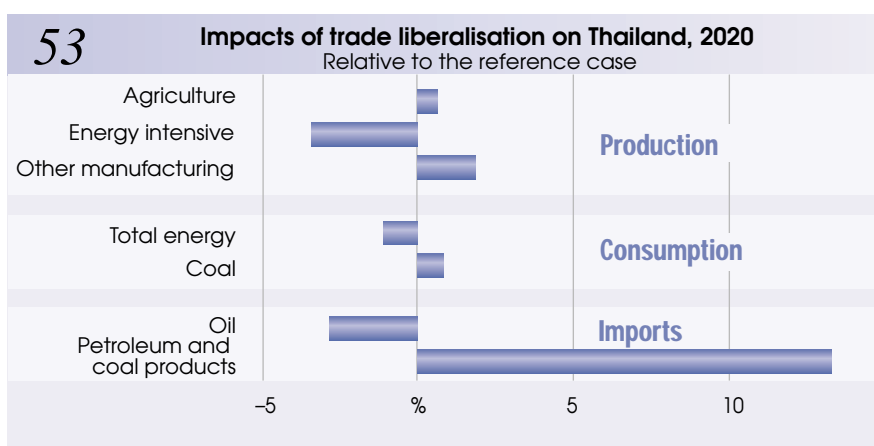
relative to the reference case (figure 53). Agricultural output expands relative to the reference case despite large falls in protection because Thailand is able to expand its exports of agricultural commodities, particularly rice. These structural shifts lead to a fall in Thailand's total energy consumption in 2020 compared with reference case levels, notwithstanding increased economic activity following liberalisation. While total energy use contracts relative to the reference case, coal consumption rises modestly as there is a shift toward coal fired electricity generation. This occurs mainly because coal becomes more price competitive relative to other fuels following the removal of a tariff on coal imports. In addition, the removal of tariffs on petroleum products leads to some substitution of imported petroleum products for imports of crude oil relative to reference case levels.

United States

With relatively low initial levels of protection, the United States experiences modest economic growth as a result of APEC liberalisation. However, there are large declines in agricultural production relative to the reference case following the removal of relatively high protection in this sector (figure 54). Production in some manufacturing sectors, particularly textiles, apparel and leather, also contracts relative to the reference case. In other industries such as motor vehicles, the removal of significant trade barriers in other APEC economies leads to increased production and exports in the United States. The net effect of the sectoral shifts that arise from liberalisation is a small decline in domestic consumption of energy relative to the reference case. In addition, there is some expansion in resource based sectors, including coal,

54 **Impacts of trade liberalisation on the United States, 2020**
Relative to the reference case
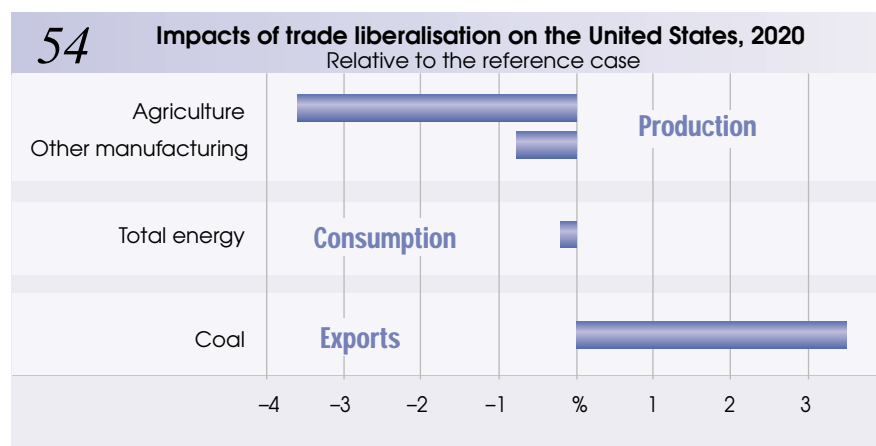
following liberalisation. As a result, exports of coal from the United States in 2020 are above reference case levels.

Viet Nam

Viet Nam benefits strongly from the removal of trade barriers in other APEC economies, particularly on agricultural commodities and manufactured goods. In 2020, exports of rice from Viet Nam as well as textiles and apparel are higher than reference case levels. Services output also expands relative to the reference case with increasing GDP (figure 55). As a result, the consumption of electricity at 2020 is higher than in the reference case. Conversely, the output of energy intensive industries is lower than in the reference case, leading to a contraction in the consumption of coal. The net effect of the economic and sectoral impacts of liberalisation in Viet Nam is a decrease in total energy consumption relative to reference case levels.

55   **Impacts of trade liberalisation on Viet Nam, 2020**
Relative to the reference case

8
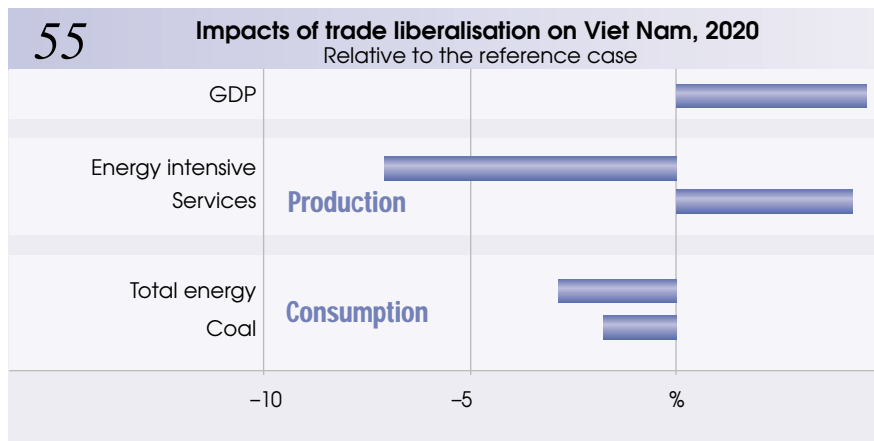
Impacts of APEC investment liberalisation

An assessment of the economic and energy sector impacts of APEC investment liberalisation in developing economies is provided in this chapter. This assumes that liberalisation of investment regimes occurs concurrently with trade regimes. That is, the impacts of investment liberalisation are considered to be an addition to the impacts of trade liberalisation. Changes to key macroeconomic variables, including investment, the capital stock and GDP are presented. The impact of changes in these variables on energy sector outcomes in the APEC region is also examined. The modeling of investment liberalisation focuses on the developing and newly industrialised APEC economies because, as discussed in chapter 4, it is in these economies that barriers to investment are likely to be greatest.

Simulating investment liberalisation

Investment liberalisation modeled in this study relates only to removing barriers that constrain foreign direct investment. The simulation does not account for liberalisation that accelerates the flow of international capital movements, or foreign portfolio investment, in response to short term economic developments. This is justified because the large majority of economies' plans for investment liberalisation under APEC are focused on reducing barriers to foreign direct investment and not on accelerating portfolio investment flows into and out of member economies.

The large number of restrictions on foreign capital inflows in the developing APEC region includes limits on foreign ownership, minimum capital requirements and local content requirements (see box 4). Capital will be relatively more scarce in a region that restricts capital inflows than in one where capital flows are open and unrestricted. Other things being equal, this scarcity will increase the rate of return to capital in that region compared with the global average rate of return. By allowing more capital to flow into an economy, investment liberalisation will reduce capital scarcity and allow the region's rate of return to move closer to the global average.

GTEM simulates the removal of restrictions on foreign direct investment in developing APEC economies by removing the differential between each economy's rate of return on capital and the global average return that results

from restrictions on capital entry. This requires quantification of the differential in rates of return. However, as noted in chapter 4, there are significant gaps in the data on the level of investment barriers in APEC economies that give rise to this differential in rates of return. Existing measures are qualitative in nature. In order to overcome these data deficiencies, two critical assumptions are made in this study:

- the Australian Industry Commission's measures of investment barriers reported in chapter 4 and appendix B are an effective proxy for a quantitative measure of investment barriers; and

- equal reductions in the Industry Commission measure of investment barriers in different economies are assumed to have an equal impact on the rate of return differential for each developing economy. Specifically, it is assumed that for every 0.1 point reduction in a region's investment barriers index, the differential between an economy's rate of return to investment and the world average falls by 0.5 percentage points. This yields rate of return differentials similar in magnitude to those used in other studies (for example, McKibbin 1997). This method implies that investment barriers have the greatest impact on rates of return in Korea and Thailand, while the lowest impact is in Hong Kong, China (table 8).

In simulating investment liberalisation, barriers to foreign direct investment are reduced in equal annual increments from 2000 to 2020. These increments are sufficiently large to eliminate barriers to foreign direct investment by 2020. The reference case for this simulation assumes the implementation of the APEC trade liberalisation schedule discussed in chapters 6 and 7. That is, results are presented as changes from the situation where only trade regimes in APEC economies are liberalised.

8 **Difference between rate of return on capital in developing and newly industrialised economies and the world average** Percentage points

Chile	China	Hong Kong, China	Indonesia	Korea	Malaysia
1.95	2.15	0.59	2.72	3.31	2.03

Mexico	Philippines	Singapore	Chinese Taipei	Thailand	Viet Nam
1.95	3.15	1.49	1.16	3.95	2.15

Simulation results

By eliminating investment barriers, developing economies with investment opportunities that are larger than their domestic savings gain greater access to foreign capital. As a result of these increased capital flows, investment levels in all the developing economies increase by 2020 relative to the situation where only trade regimes are liberalised (figure 56). Indonesia, Korea, the Philippines and Thailand experience the greatest increase in investment relative to trade liberalisation only, reflecting the higher initial barriers to investment in those economies. Hong Kong, China, which has the lowest initial barriers to investment, experiences the smallest increase in foreign investment flows.

The direct effect of the increase in the level of investment over the simulation period is to increase the capital stock of developing economies considerably by 2020 relative to the outcome with trade liberalisation only (figure 57). This increase in the capital stock increases the productive capacity of the developing economies undertaking investment liberalisation. Consequently, trade and investment liberalisation implemented together is estimated to increase GDP in developing economies at 2020 by significantly more than in the case with trade liberalisation alone (figure 58).

A more indirect effect of investment liberalisation on an economy's GDP is through its impact on the current account of the balance of payments. Increased investment following liberalisation leads to an increase in capital account surpluses. This is because the increase in foreign demand for equity in developing economies resulting from investment liberalisation leads to

56 **Change in investment in developing and newly industrialised economies, 2020** Relative to trade liberalisation only

57 **Change in capital stocks in developing and newly industrialised economies, 2020** Relative to trade liberalisation only
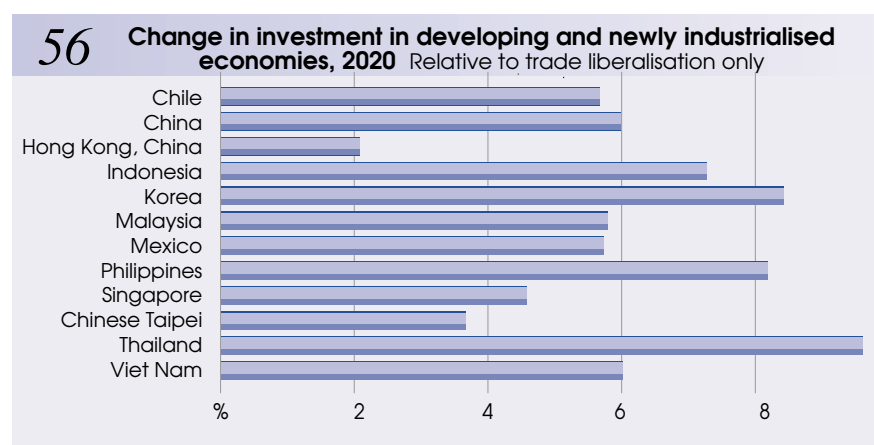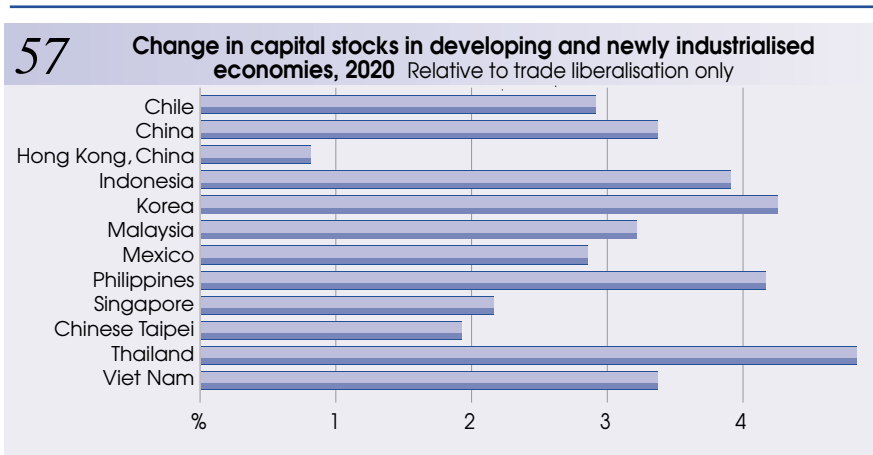
an increase in demand for the developing economies' currencies. This induces a currency appreciation in most developing economies relative to the case with trade liberalisation only. The effect in developing economies is increased net imports and increased deficits on their current accounts (figure 59). This process keeps the balance of payments in equilibrium. The worsening in current account positions partially offsets the gains to GDP from investment liberalisation. This is reflected in the earlier figure.

Implications for the energy sector

When investment regimes are liberalised concurrently with trade regimes, energy consumption increases significantly by 2020 relative to trade liber-

58 **Change in GDP in developing and newly industrialised economies, 2020** Relative to trade liberalisation only

59 **Percentage point change in current account to GDP ratio in developing and newly industrialised economies, 2020** Relative to trade liberalisation only
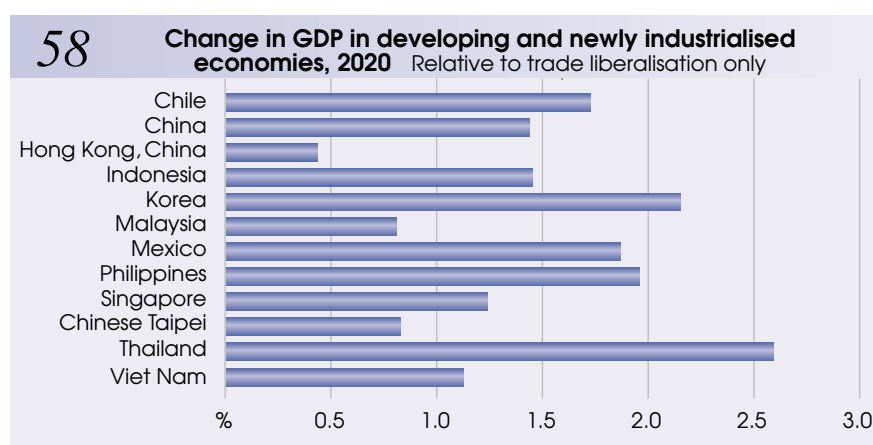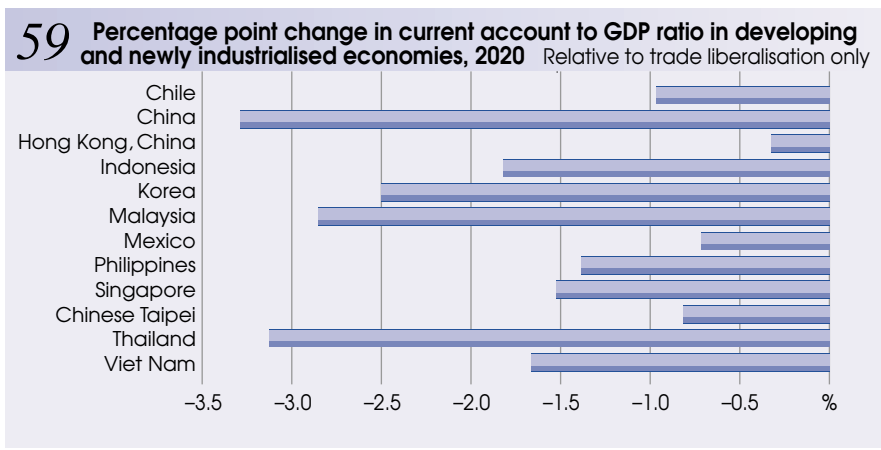
alisation only. The change in energy consumption in developing economies closely reflects the increase in GDP for these regions.

While overall energy consumption increases, there is a structural shift in the composition of the energy sector and energy use. This is because lower capital prices give the capital intensive extraction industries, oil and gas, a competitive advantage over coal in end use. In the electricity sector, however, oil and gas fired power generation is less capital intensive than coal. The increase in capital availability and lower capital prices favor coal fired powered generation. On balance these factors, in combination with the increase in GDP for developing economies relative to the trade liberalisation only scenario, ensure increased use of all fossil fuels in the developing and newly industrialised economies following investment liberalisation (figure 60).

60 **Change in energy consumption in developing and newly industrialised economies, 2020** Relative to trade liberalisation only

9
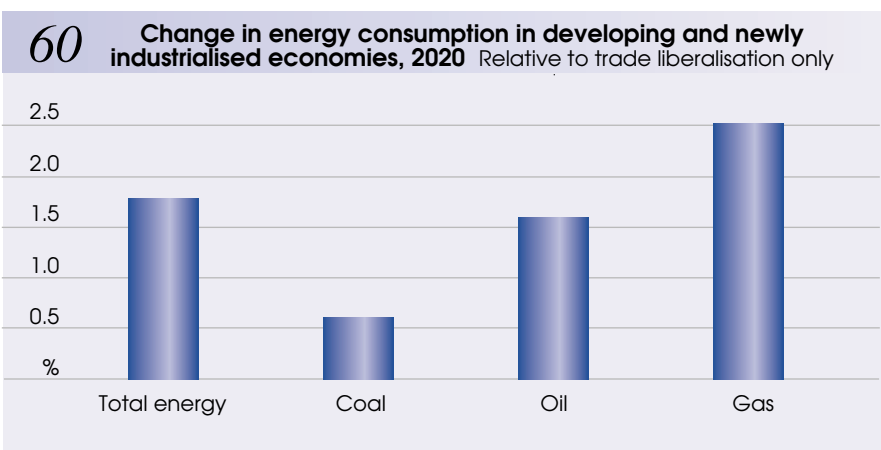
Conclusions

The findings of this study indicate that the implementation of APEC's Bogor program of trade and investment liberalisation will have a number of important effects at both the economywide and the energy sector levels. Most of the changes in economic and energy sector outcomes will occur in the developing and newly industrialised economies.

Following the implementation of trade liberalisation, the developing APEC economies could experience increases in GDP of up to 5 per cent in 2020 relative to the reference case. These constitute very significant increases in economic output. Newly industrialised and developed APEC economies will, on average, experience smaller increases (0.7 per cent and 0.25 per cent) relative to the reference case mainly because, with some exceptions, they have relatively lower levels of trade protection. The net effect at the APEC-wide level is an increase in GDP in 2020 of 0.75 per cent relative to reference case levels. While apparently modest, this is nevertheless a significant number. It is equivalent to additional economic output in the region in 2020 of approximately US$225 billion (in 1995 dollars) — larger than the current Indonesian economy and approaching the size of the current economy of Chinese Taipei. If the additional benefits from enhanced productivity following liberalisation are also included in the analysis, the impacts on APEC GDP could approach US$345 billion by 2020.

Analysis was also undertaken on the effects of both increasing and slowing the rate at which developing and newly industrialised member economies implement the Bogor program. This is important because of the voluntary nature of the Bogor agenda and because of the many factors that will influence how rapidly an economy will meet its liberalisation commitments. The results indicate that if the developing and newly industrialised economies meet their trade liberalisation objectives by 2010 they will obtain higher real output growth than under the Bogor timetable. These increased benefits occur because economies capture the efficiency gains from unilateral liberalisation earlier than under the alternative scenario. They also reap the benefits of wider market access as all economies liberalise their trade barriers within the same timeframe. In contrast, if the developing and newly industrialised economies do not commence trade liberalisation until 2010, their economic output by 2020 will be lower than if they commence liberalisation from 2000.

The energy sector impacts of trade liberalisation result from a combination of the economic output effects described above and intersectoral effects. That is, as economies grow and their economic structure changes there will be implications for the level and pattern of energy demand and supply.

Largely in line with the pattern of GDP effects, there are some quite significant changes in energy consumption relative to the reference case in many member economies, particularly in the developing and newly industrialised economies. The stronger impact in the developing and newly industrialised economies mainly reflects their stronger economic growth following the removal of relatively high levels of protection. In most of the developed economies, starting point protection levels tend to be lower and the structural shifts induced by trade liberalisation favor less energy intensive sectors. This results in slightly lower energy consumption by 2020 in these economies relative to the reference case. On balance, however, total energy consumption in APEC in 2020 is higher than it would be in the absence of trade liberalisation.

There are also substantial impacts on the demand for different fuels, especially in the developing and newly industrialised economies. Oil consumption rises relative to the reference case across APEC and particularly in the newly industrialised economies. This is mainly because demand for transport services (including international transport for trade), which accounts for the largest share of oil consumption, increases relative to the reference case as a result of increased per person incomes and increased trade flows among economies. There is significantly higher demand for coal and gas in industry and power generation in the developing and newly industrialised economies. This is partly offset by reduced demand in the developed economies relative to the reference case.

Fossil fuel trade in the APEC region increases significantly relative to the reference case as a result of trade liberalisation, mainly owing to the balance of the consumption and production impacts of liberalisation. Coal trade changes more than trade in other fuels. The majority of the increased demand for imported coal in APEC occurs in the region's key import markets — Japan, Korea and Chinese Taipei — as their economies grow with liberalisation. APEC's major coal exporters, including Australia, Canada and the United States, meet most of this increased demand.

Changing the timing of liberalisation will have similar energy sector effects to those on GDP noted above. If the developing and newly industrialised

economies complete trade liberalisation by 2010 rather than 2020, demand for energy in these economies will be notably higher. In contrast, if they do not commence trade liberalisation until 2010, their demand for energy is lower than if they commence liberalisation from 2000.

Removing barriers to investment concurrently with trade barriers in the developing and newly industrialised economies reinforces the gains from trade liberalisation. This occurs because these economies are able to increase their levels of investment and hence their productive capital stock. As a result, the increases in GDP and in APEC energy consumption that arise from trade liberalisation are significantly larger when investment is liberalised concurrently, as are the energy supply responses that follow. However, some economies gain more than others from the increase in capital mobility that results from the more liberal treatment of foreign investment.

It can be concluded that member economy adoption of policies to implement APEC's Bogor program of trade and investment liberalisation will produce economic benefits for APEC as a whole, but particularly for developing and newly industrialised economies. Indeed, because a number of barriers or aspects of liberalisation could not be modeled, the actual impacts will in general be greater than the results reported in this study.

The study also highlights some important implications for APEC energy policy makers. The size and structure of member economy energy sectors will be altered by the implementation of the Bogor program. Changes will be experienced in energy consumption, production and trade. Again, these impacts will be greatest in the developing and newly industrialised economies. While most of these changes will result from the energy sector impacts of removing protection in other sectors, changes will occur in some economies from the removal of specific energy sector protection measures. The removal of production subsidies that could not be quantified and evaluated in this study can be expected to produce additional benefits.

The study results show that for most member economies, growth in electricity sector investment will be necessary if the benefits of the Bogor liberalisation program are to be realised. This is particularly true for the developing and newly industrialised economies. The enhanced role for natural gas in these economies will also require additional investment in both gas supply infrastructure and end use equipment. These findings reinforce the priority that the APEC Energy Working Group has given to the development of policy

frameworks that will facilitate investment, including business sector investment, in the energy sectors of member economies.

The study also demonstrates that trade and investment liberalisation will contribute to meeting some of the key energy policy principles endorsed by APEC Energy Ministers. These include the development of more efficient production, distribution and consumption of energy; the pursuit of open energy markets; the progressive reduction of energy subsidies; and the promotion of capital flows. Indeed, open and undistorted trade and investment regimes are likely to enhance the benefits of other market liberalising initiatives that are being pursued in the APEC energy sector.

Estimated trade barriers at 2000

	Australia	Canada	Chile	China	Hong Kong, China	Indonesia
	%	%	%	%	%	%
Import tariffs						
Paddy rice	1.2	0	10.2	0	0	4.6
Unprocessed crops	4.5	4.9	4	54.1	0	5.1
Unprocessed livestock	0	0	10.6	12.5	0	3
Processed rice	1.2	0	0	114	0	0
Processed crops	4.3	8.9	11.1	17.6	0	8
Processed livestock	0.2	18.8	7.1	45.9	0	30
Fisheries and forestry	0	0	9.9	1.4	0	1.4
Coal	0	0	11	5	0	5
Oil	0	0	11	1.5	0	2.5
Gas	0	0	11	6	0	5
Other manufacturing	0.4	0	8.4	1.7	0	3.5
Textiles, apparel and leather	16	10.8	10.4	54.5	0	14
Manufacturing	6.7	0.9	10.3	22.7	0	5.4
Petroleum and coal products	0.1	0.2	8.6	7.7	0	4.3
Iron and steel	5.4	2.2	10.1	11	0	6.2
Nonferrous metals	2.5	0.5	9.3	13.6	0	3.8
Electricity	0	0	0	1	0	0
Other services	0.3	0	0	1.4	0	0
Nonmetallic minerals	9.3	1.4	10.1	33.5	0	5.7
Chemicals, rubber and plastics	5.7	1.1	9.9	19.7	0	6.3
Fabricated metal products	12	1.8	10.2	37.3	0	13.9
Motor vehicles	15.6	0.8	10.7	57.9	0	22.4
Export subsidies						
Paddy rice	1.2	0	0	0	0	12.2
Unprocessed crops	1	0.2	0	0	0	0
Unprocessed livestock	0	2.2	0	0	0	0
Processed rice	0.5	0	0	0	0	0
Processed crops	0.8	0	0	5.4	0	0
Processed livestock	0	11.6	0	0	0	0
Fisheries and forestry	0	0	0	0	0	0
Coal	0	0	0	4.3	0	0
Oil	0	0	0	0	0	0
Gas	0	0	0	0	0	0
Other manufacturing	0	0	0	1	0	0

Continued ⇨

	Australia	Canada	Chile	China	Hong Kong, China	Indonesia
	%	%	%	%	%	%
Export subsidies (continued)						
Textiles, apparel and leather	0	0	0	2.8	0	0
Manufacturing	0	0	0	0	0	0
Petroleum and coal products	0	0	0	0	0	0
Iron and steel	0	0	0	4.1	0	0
Nonferrous metals	0	0	0	11.3	0	0
Electricity	0	0	0	10.5	0	0
Other services	0	0	0	0	0	0
Nonmetallic minerals	0	0	0	22.4	0	0
Chemicals, rubber and plastics	0	0	0	11.9	0	0
Fabricated metal products	0	0	0	9.9	0	0
Motor vehicles	0	0	0	0	0	0
Production subsidies						
Paddy rice	4.6	0	0	0	0	0
Unprocessed crops	4.6	0	0	0	0	0
Unprocessed livestock	2.7	7.8	0	0	0	0
Processed rice	4.9	12.1	0	0	0	0
Processed crops	0	0	0	0	0	0
Processed livestock	0	0	0	0	0	0
Fisheries and forestry	0	0	0	0	0	0
Coal	0	0	0	0	0	0
Oil	0.2	0	0	0	0	0
Gas	0	0	0	0	0	0
Other manufacturing	0	0	0	0	0	0
Textiles, apparel and leather	0.6	0	0	0	0	0
Manufacturing	0	0	0	0	0	0
Petroleum and coal products	0	0	0	0	0	0
Iron and steel	0	0	0	0	0	0
Nonferrous metals	0.3	0	0	0	0	0
Electricity	0.1	0	0	0	0	0
Other services	0	0	0	0	0	0
Nonmetallic minerals	0	0	0	0	0	0
Chemicals, rubber and plastics	0.2	0	0	0	0	9.3
Fabricated metal products	0	0	0	0	0	0
Motor vehicles	0.3	0	0	0	0	0

	Japan	Korea	Malaysia	Mexico	New Zealand	Philippines
	%	%	%	%	%	%
Import tariffs						
Paddy rice	390	25.6	0	0	0	25
Unprocessed crops	39.7	66.8	52.7	0	0.1	22.4
Unprocessed livestock	117	5	2	0	0	6.3
Processed rice	390	111	127	0	0	50
Processed crops	8.3	19.3	27.7	5.8	2.8	44.4
Processed livestock	44	35.9	0	0	16.3	30
Fisheries and forestry	1.5	4.4	6.2	4.3	1.3	4.9
Coal	0	1	0	0	0	10
Oil	0.7	5	2.5	10	0	3
Gas	0	1.8	5	0	0	10
Other manufacturing	0	1.8	1.7	1.6	0.4	4.8
Textiles, apparel and leather	6.8	6.9	17.4	3.4	7.5	23
Manufacturing	0.7	7.4	5	3.2	4.2	21
Petroleum and coal products	3	3.4	1.3	0.7	0.2	9.5
Iron and steel	1.6	6	6	4.1	0.8	13.7
Nonferrous metals	0.4	5	4.9	1.5	1.5	18.5
Electricity	8.2	0	0	0	0	0
Other services	3.2	0.1	0	0	0	0
Nonmetallic minerals	1.3	7.4	12.7	5	4.2	26.6
Chemicals, rubber and plastics	2.1	7.1	6.5	2.6	1.5	18.4
Fabricated metal products	1	8	12.6	2.7	5.1	29
Motor vehicles	1.4	5.9	14.4	3.3	7.7	16.2
Export subsidies						
Paddy rice	0.5	43.5	43.3	0	0	0
Unprocessed crops	0	0	0	0	0	0
Unprocessed livestock	0.3	0	0	0	11.2	0
Processed rice	2.8	55.9	11.8	0	0	55.9
Processed crops	0	0	0	0	0	0
Processed livestock	0	0.5	40	0	1.8	3.2
Fisheries and forestry	0	0	0	0	0	0
Coal	0	0	0	0	0	0
Oil	0	0	0	0	0	0
Gas	0	0	0	0	0	0
Other manufacturing	0	0	0	0	0	0
Textiles, apparel and leather	0	0	0	0	0	0
Manufacturing	0.1	0.1	0	0	0	0
Petroleum and coal products	0	0	0	0	0	0
Iron and steel	0	0	0	0	0	0
Nonferrous metals	0	0	0	0	0	0
Electricity	0	0	0	0	0	0

Continued ⇨

	Japan	Korea	Malaysia	Mexico	New Zealand	Philippines
	%	%	%	%	%	%
Export subsidies *(continued)*						
Other services	0	0	0	0	0	0
Nonmetallic minerals	0	0	0	0	0	0
Chemicals, rubber and plastics	0	0	0	0	0	0
Fabricated metal products	0	0	0	0	0	0
Motor vehicles	0	0	0	0	0	0.1
Production subsidies						
Paddy rice	15.7	0	132.0	17.5	0	0.3
Unprocessed crops	15.6	0	0	7.3	0	0
Unprocessed livestock	0	0	0	5.1	0	0
Processed rice	6.1	0	0	0.5	1.6	0
Processed crops	0	0.2	0	0	0	0
Processed livestock	0	0	0	0	0	0
Fisheries and forestry	0	0	0	0	0	0
Coal	0	0	0	0	0	0
Oil	0	0	0	0	0	0
Gas	0	0	0	0	0	0.8
Other manufacturing	0	0	0	0	0	0
Textiles, apparel and leather	0	0	0	0	0	0
Manufacturing	0	0	0	0	0	0
Petroleum and coal products	0	0	0	0	0	0
Iron and steel	0	0	0	1.6	0	0
Nonferrous metals	0	0	0	0	0	0
Electricity	0	0	0	25.4	0	1
Other services	0	0	0	0	0	0
Nonmetallic minerals	0	0	0	0	0	0
Chemicals, rubber and plastics	0	0	0	0	0	0
Fabricated metal products	0	0	0	0	0	0
Motor vehicles	0	0	0	0	0	0

	Singapore	Chinese Taipei	Thailand	United States	Viet Nam
	%	%	%	%	%
Import tariffs					
Paddy rice	0	41.5	25.2	3	0
Unprocessed crops	0	68	25	43.9	8.7
Unprocessed livestock	0	0.6	10.6	0.1	5.6
Processed rice	0	132.1	52	3	81.3
Processed crops	0	27.9	37.2	8	72.5
Processed livestock	0	33.5	22.9	18.2	36.2
Fisheries and forestry	0	7.8	21.7	0	6.7
Coal	0	0	1.5	0	0.9
Oil	0	7.5	0	0.2	1
Gas	0	5	0	0	0.8
Other manufacturing	0	0.7	1.6	0.1	1.7
Textiles, apparel and leather	0	7	24.1	9.9	28.1
Manufacturing	0	5.3	10.7	1.8	8
Petroleum and coal products	0	8.7	8	0.8	33.5
Iron and steel	0	6.3	9.2	2.8	2.8
Nonferrous metals	0	3.2	9.1	0.7	0.5
Electricity	0	0	0	0	0
Other services	0	0	0	0	0
Nonmetallic minerals	0	7	15.9	5	22
Chemicals, rubber and plastics	0	4.2	16.4	2.9	4.8
Fabricated metal products	0	9.5	22.9	2.6	12.6
Motor vehicles	0	15.7	41.8	1.4	32.5
Export subsidies					
Paddy rice	0	56	0.4	0.3	0
Unprocessed crops	0	3	0	0	0
Unprocessed livestock	0	0	0	1.6	0
Processed rice	0	56.8	0.3	0.1	0
Processed crops	0	0	0	0	0
Processed livestock	0	1.4	0	5.4	0
Fisheries and forestry	0	0	0	0	0
Coal	0	0	5.2	0	0
Oil	0	0	0	0	0
Gas	0	0	0	0	0
Other manufacturing	0	0	0	0	0
Textiles, apparel and leather	0	0	0	0	0
Manufacturing	0	0	0	0	0
Petroleum and coal products	0	0	0	0	0
Iron and steel	0	0	0	0	0
Nonferrous metals	0	0	0	0	0
Electricity	0	0	0	0	0

	Singapore	Chinese Taipei	Thailand	United States	Viet Nam
	%	%	%	%	%
Export subsidies *(continued)*					
Other services	0	0	0	0	0
Nonmetallic minerals	0	0	0	0	0
Chemicals, rubber and plastics	0	0	0	0	0
Fabricated metal products	0	0	0	0	0
Motor vehicles	0	0	0	0	0
Production subsidies					
Paddy rice	0	0	12.4	28.7	0
Unprocessed crops	0	0	0	28.6	3.8
Unprocessed livestock	0	0	0	4.1	31.8
Processed rice	0	0	0	4.4	10.6
Processed crops	0	0	0	0	0.5
Processed livestock	0	0	0	0	0
Fisheries and forestry	0	0	0	0	0.4
Coal	0	0	0	0	0
Oil	0	0	0	0	0
Gas	0	0	0	0	0
Other manufacturing	0	0	0	0	0
Textiles, apparel and leather	0	0	0	0	0
Manufacturing	0	0	0	0	0
Petroleum and coal products	0	0	0	0	0
Iron and steel	0	0	0	0	0
Nonferrous metals	0	0	0	0	0
Electricity	0	0	0	0	0
Other services	0	0	0	0	0
Nonmetallic minerals	0	0	0	0	0
Chemicals, rubber and plastics	0	0	0	0	0
Fabricated metal products	0	0	0	0	0
Motor vehicles	0	0	0	0	0

Foreign direct investment restrictiveness indexes for selected APEC economies and sectors

	Australia	Canada	China	Hong Kong, China	Indonesia	Japan	Korea
Business	0.183	0.225	0.360	0.015	0.560	0.062	0.565
Communications	0.443	0.514	0.819	0.350	0.644	0.350	0.685
Construction	0.175	0.200	0.400	0.000	0.525	0.050	0.750
Distribution	0.175	0.200	0.275	0.050	0.525	0.050	0.625
Education	0.175	0.200	0.525	0.000	0.525	0.200	0.550
Environmental	0.175	0.200	0.275	0.000	0.525	0.117	0.700
Financial	0.450	0.375	0.450	0.233	0.550	0.358	0.875
Health	0.175	0.200	0.275	0.000	0.525	0.050	0.550
Tourism	0.175	0.200	0.283	0.000	0.525	0.050	0.617
Recreational	0.175	0.200	0.275	0.000	0.525	0.050	0.550
Transport	0.204	0.235	0.455	0.093	0.525	0.114	0.573

	Malaysia	Mexico	New Zealand	Philip-pines	Singa-pore	Thailand	United States
Business	0.316	0.289	0.086	0.479	0.261	0.775	0.005
Communications	0.416	0.739	0.434	0.758	0.518	0.838	0.345
Construction	0.775	0.450	0.075	0.475	0.250	0.775	0.000
Distribution	0.075	0.325	0.075	0.475	0.250	0.775	0.000
Education	0.075	0.450	0.075	0.475	0.250	0.775	0.000
Environmental	0.075	0.075	0.075	0.475	0.250	0.775	0.000
Financial	0.608	0.554	0.200	0.954	0.378	0.875	0.200
Health	0.317	0.408	0.075	0.475	0.250	0.775	0.000
Tourism	0.542	0.275	0.075	0.808	0.317	0.775	0.000
Recreational	0.175	0.075	0.075	0.475	0.250	0.775	0.000
Transport	0.122	0.283	0.131	0.975	0.250	0.780	0.025

Source: Industry Commission (1997).

C Appendix

The Global Trade and Environment Model

GTEM is a multiregion, multisector, dynamic general equilibrium model of the world economy. It is derived from the GTAP model (Hertel 1997) and the MEGABARE model (ABARE 1996). The starting point for the GTEM database is the GTAP 4E database (McDougall, Elbehri and Truong 1998).

GTEM was developed at ABARE to analyse global change issues and has been used in assessments of international climate change policies and domestic and international trade policies. It is highly suited to analysis of policies that involve complex interactions between sectors and between regions. A detailed description of the model, together with some working papers that illustrate further model developments, can be found on ABARE's web site (www.abareconomics.com).

Key features of GTEM are described below.

Dynamics

GTEM is a dynamic model that includes relationships between variables at different points in time. This is in contrast to comparative static models, which compare two equilibriums, one before a policy change and one following. As a dynamic model, GTEM requires a reference case against which to compare the results of policy simulations. The reference case provides projections of growth in labor and capital in each economy or region, and the associated growth throughout the rest of the economy in the absence of any policy measures. The results of policy simulations are then interpreted as deviations from the reference case.

Factors of production

The four primary factors of production in GTEM are capital, land, labor and natural resources. The capital stock in each region accumulates by investment less depreciation in each period. Both capital and labor are mobile between industries and, to a lesser extent, across regions through international capital flows and labor migration. Land is used only in agriculture and is fixed in each region.

GTEM explicitly models natural resource inputs as a factor of production in resource based sectors (coal mining, oil and gas extraction, other minerals, forestry and fishing). For example, the coal mining industry uses three factors of production — labor, capital and a natural resource (reserves of coal). The natural resource is a factor used solely in the production of resource based commodities and is not mobile between sectors or regions. Returns to the natural resource adjust to maintain its full employment. If, for example, the demand for coal declines, returns to the natural resource (its price) fall, leading to a reduction in the supply price of coal.

Population and labor supply for each region are determined endogenously (within the model) over time. GTEM contains an elaborate description of population dynamics, which captures the idea that as economies move along the economic development path, with increasing per person incomes, changes in fertility and mortality rates follow a well defined path. The model uses estimates of the dependence of fertility and mortality rates on income and an exogenously imposed migratory pattern to predict age and gender specific population changes.

Natural rate of unemployment

It is assumed that the imposition of any policy change does not raise unemployment above the so-called natural rate of unemployment for any economy. Any downward shifts in the demand for labor are assumed to be offset by reductions in real wages growth sufficient to prevent the emergence of unemployment above the natural levels. This assumption is often known as the 'full employment assumption' and its use is justified in cases where policy changes are introduced progressively, allowing time for wages to adjust to new market conditions.

In practice, however, it could be expected that changes in patterns of production caused by trade and investment liberalisation could lead to the emergence of some unemployment, especially if liberalisation has negative impacts in sectors where the skills of the labor force are not easily transferable. Relaxing this assumption may therefore lead to increased estimates of the economic costs of trade and investment liberalisation policies.

Prices

For each commodity and primary factor, taxes on production, sales, exports and imports are accounted for separately. As a result, the supply price, market

price, domestic user prices and the export price (including export taxes) for a commodity in the producing region and the import price (including international freight), duty paid market price and user prices in the importing region of a given commodity are clearly distinguished. In the standard model closure used in this study, prices adjust fully to equate the supplies of and demands for all factors and commodities in each region in each period. All prices in the model are determined relative to the price of savings – the numeraire price.

Producer behavior

Producers in GTEM are assumed to operate in perfectly competitive markets using constant returns to scale technologies. Under these assumptions, prices will be set to cover costs and GTEM industries earn zero profits at all times, with all returns paid to primary factors of production. Thus, changes in output prices are determined by changes in input prices of materials and primary factors.

National income, savings and consumption

In GTEM, a representative household in each region owns all factors of production and receives all payments made to the factors, all tax revenues and all net interregional income transfers. The representative household allocates its net income across private and public consumption and savings. National savings are assumed to move in line with national income.

Total consumption expenditure is calculated as the difference between current household income and savings, with the ratio of private consumption to government consumption assumed to be constant. Given total private consumption, the representative consumer maximises current period utility by choosing consumption levels for each of the commodities in the database, from both domestic and imported sources.

Trade

A key feature of GTEM is that it takes account of and models the impacts of policies on bilateral trade flows of all commodities between all regions. Consumers in a given region can substitute goods produced in that region with the same goods produced in different regions. However, an 'Armington' preference structure is adopted which ensures that a good produced in one region is an imperfect substitute for goods produced by the same industry

in other regions (Armington 1969a,b). In other words, the same commodity from different sources can trade at different prices.

For any given consumption activity, demand for a commodity is allocated between a domestic product and a composite imported product according to a constant elasticity of substitution (CES) function. The demand by a region for each composite imported commodity is then allocated between sources of imports according to a further CES function. Substitution between domestic and imported commodities and between imported commodities from different sources will depend on movements in relative prices and the specified elasticity of substitution — the Armington elasticity.

The Armington elasticities in GTEM vary between commodities and are derived from current literature and from empirical work undertaken by Jomini et al. (1991) in the construction of the SALTER world trade model. As with all parameters in a global computable general equilibrium model, there is uncertainty about the appropriate size and relativities of the Armington elasticities for various commodities. These elasticities are important determinants of the model results in this report as they affect the estimated trade impacts on energy and energy intensive commodities resulting from trade and investment liberalisation.

In equilibrium, the exports of a good from one region to the rest of the world are equal to the import demand for that good in the remaining regions. GTEM does not require the current account to be in balance every year. It allows the capital account to move in a compensatory direction to maintain the balance of payments.

Goods are transported between regions by an international transport industry. This industry takes prices as given and minimises the cost of obtaining transport services from each region. The cost of international transport is added to the cost of imports to each region.

International capital mobility

In GTEM, international capital mobility refers to the mobility of investment funds across regions in response to changing rates of return rather than the mobility of physical capital such as plant and machinery. In other words, region A may provide (lend) investment funds to region B provided sufficient incentives exist, but physical capital that is installed in region A cannot be relocated to region B irrespective of any rate of return differentials. In

addition, capital owners in region A do not directly own or operate physical capital in region B. They do, however, buy or sell bonds denominated in global currency units that are traded internationally to facilitate the flow of investment funds.

Investment funds are supplied by regional savings that depend on regional income. Savings from each region are pooled, as if given to a global banker, to be lent to investors. The demand for investment funds in a region depends on the prevailing economic conditions that determine the desired stock of capital. It is assumed that regional investors bid for the funds to finance their planned investment by offering higher rates of (expected) return on bonds issued to the global banker, who in turn sells these bonds to the regional savers. The global market for investment funds is in equilibrium when the supply of investment funds equals demand. The net borrowing thus determined by the gap between investment and savings of each region adds to the regional indebtedness.

The international flow of investment funds modeled in GTEM is similar to foreign direct investment as these funds are then used to invest in physical capital. GTEM does not, however, account for bilateral investment flows. For example, investment by Japanese residents in the Indonesian coal sector is not explicitly modeled. Rather, Japanese savers own a bond that returns the global average rate of return paid by Indonesian investors.

At the regional level, however, rates of return may differ. These differences reflect region specific risk premiums and restrictions on foreign investment that drive a wedge between the rate of return in a particular region and the global rate of return. For example, investors tend to place a higher risk premium on investing in developing economies in GTEM to reflect the greater uncertainty of investing in these regions. The equilibrium rates of return in developing economies are therefore higher than in developed economies.

Capital market restrictions also contribute to differentials between regional rates of return and the global rate of return. These restrictions can increase or decrease the wedge between regional rates of return and the global rate of return. For example, capital will be relatively more scarce in a region that restricts capital inflows. All things being equal, a scarcity of capital will increase the rate of return in that region compared with the global average. On the other hand, a region that restricts capital outflows will overinvest at home, lowering returns relative to the global average.

Exchange rates

The exchange rate in GTEM is the price of converting local currency into global currency. It is the price that adjusts to keep the balance of payments in equilibrium. For example, if trade liberalisation leads to a significant decline in export earnings from a particular region this will, other things being equal, result in an exchange rate depreciation for that region. The depreciation in the exchange rate will improve the competitiveness of exporters and import competing producers in that region. Exports will increase and imports decline, restoring balance of payments equilibrium.

A change in the exchange rate will also influence international transfers associated with foreign debt or lending. For example, a region that has borrowed from international capital markets in GTEM that experiences an exchange rate depreciation will have a greater level of debt denominated in foreign currency. The debt servicing requirement (interest paid) will increase in domestic currency terms. On the other hand, a region holding foreign assets through international lending will earn more interest income in domestic currency if their exchange rate depreciates.

Technology bundle

In the standard general equilibrium modeling approach, industries produce a commodity by combining primary factors and intermediate inputs in fixed proportions. Substitution is only possible between primary factors. In GTEM, electricity and iron and steel production are modeled using the 'technology bundle' approach. With this approach, different production techniques are used to generate a homogeneous output from each industry. Electricity can be generated from coal, petroleum, gas, nuclear, hydro or renewable based technologies, while iron and steel can be produced using blast furnace or electric arc technologies. Industries are able to substitute between technologies in response to changes in their relative costs.

By modeling energy intensive industries in this way, GTEM restricts substitution to known technologies, thereby preventing technically infeasible combinations of inputs being chosen as model solutions.

Production and interfuel substitution

For industries other than those characterised by the 'technology bundle', production in each region is assumed to use only one technology. This

technology requires fixed proportions of intermediate inputs, with the exception of energy inputs and primary factors.

Non technology bundle industries obtain a least cost combination of four energy commodities (coal, gas, petroleum and coal products, and electricity) to produce an energy composite and a least cost combination of the three primary factors to produce a primary factor composite. The industry then forms a least cost combination of these two composites to obtain an energy–factor composite. Allowing for interfuel substitution and substitution between fuel and primary factors in this way means that industries can alter their production input structure in response to price changes by substituting between energy and primary factors or by changing the energy mix.

Database

The GTEM database draws on the GTAP 4E database that contains 50 commodities and 45 regions. The GTAP 4E database consists of input–output tables for each region and bilateral trade flows for each commodity between each pair of regions. The GTAP database required substantial alteration to form the GTEM database, particularly in the energy sector, and additional data (principally energy sector and population data) were collected.

For example, the data underpinning the representation of two major fossil fuel using industries (electricity and iron and steel) were enhanced to reflect input–output relationships in the range of known technologies. In addition, the contribution of each technology to total electricity and iron and steel production has been derived to reflect external data (International Energy Agency 1998a,b; International Iron and Steel Institute 1996).

Also, significant demographic detail is required in GTEM to model population and labor force growth over time. Underpinning the demographic module are historical data showing the age and gender composition of the population in each region in one year cohorts from age 0 to 100. These are sourced from United Nations (1998).

Estimating the productivity gains from trade liberalisation

In the standard GTEM framework it is possible to evaluate the resource allocation benefits of trade liberalisation. That is, as trade barriers are removed and the relative prices of factor inputs and intermediate and final goods and services change, an economy's resources will shift to those areas in which they have the greatest comparative advantage. This leads to a more efficient allocation of resources and higher real GDP. However, there are additional productivity benefits for an economy that are generated by the liberalisation process that are not captured in this modeling framework, although these can be significant.

These productivity enhancements are derived from a number of sources including improved technology, the increased ability to capture economies of scale and improved production efficiencies. For example, imported goods often embody technologies that are unavailable locally. By lowering tariffs and other barriers to trade, domestic firms are able to obtain more competitively priced technologies that can lead to productivity improvements in production processes. In addition, when barriers to trade fall, firms in small economies are better able to capture economies of scale by expanding their potential market, which enables goods to be made at lower cost. Finally, removing trade barriers exposes domestic industry to increased international competition. The pressure of competition can provide a strong incentive to increase efficiency in both managerial and technical processes, including a positive inducement to technological innovation.

To illustrate the potential impacts on GDP of such productivity improvements a sensitivity analysis has been undertaken based on information in the economic literature. This relates the size of the reduction in trade barriers implicit in the trade liberalisation scenario to productivity improvements. For example, a number of cross-industry studies have attempted to estimate a relationship between manufacturing productivity and effective rates of protection (Kwak 1994; Okamoto 1994; Urata and Yokata 1994). In these studies the increase in productivity in the manufacturing sector that results from a one percentage point decrease in the effective rate of protection ranges from 0.01 to 0.024 per cent. Other work estimates that a 1 per cent cut in nominal tariffs will increase manufacturing productivity by between 0.18 and 0.56 per cent (Chand 1999; McKibbin 1999).

This analysis is incorporated into GTEM by exogenously increasing manufacturing productivity by 0.01 per cent for every percentage point fall in the effective rate of protection to represent the lower bound of the potential productivity gains. The upper bound of the potential productivity gains is modeled by increasing manufacturing productivity by 0.024 per cent for every percentage point fall in the effective rate of protection. The changes in the effective rates of protection that are implied in the Bogor trade liberalisation scenario are calculated for the manufacturing industries in each APEC region using methodology described in Hertel (1997).

9 Change in APEC GDP, 2020 – Bogor trade liberalisation, relative to the reference case

	Excluding productivity improvements	Including productivity improvements	
		Lower estimate	Upper estimate
	1995 US$	1995 US$	1995 US$
China	105	123	150
Other developing	42	57	76
Newly industrialised	24	36	53
Developed	55	59	66
Total APEC	226	275	345

The results indicate that if the productivity benefits of trade liberalisation in the manufacturing sector are included, the impact on APEC economic output of the Bogor trade liberalisation program could be more than 50 per cent higher than that estimated when productivity gains are not taken into account. That is, the increase in APEC GDP in 2020 relative to the reference case could be equal (in 1995 prices) to around US$345 billion (table 9). This is a conservative estimate of the potential GDP gains because the analysis is restricted to the manufacturing sector only. Following the implementation of an economywide trade liberalisation program such as that pursued under APEC, it can be expected that productivity benefits would accrue in all sectors of the economy. The productivity impacts on GDP could be considerably higher than those reported here.

References

ABARE 1996, *The MEGABARE Model: Interim Documentation*, Canberra.

APEC 1993, *APEC Leaders' Economic Vision Statement*, Blake Island, Seattle, United States, 20 November.

—— 1994, *APEC Economic Leaders' Declaration of Common Resolve*, Bogor, Indonesia, 15 November.

—— 1995, *The Osaka Action Agenda: Implementation of the Bogor Declaration*, Osaka, Japan, 19 November.

—— 1996a, *APEC Economic Leaders' Declaration: From Vision to Action*, Subic, Philippines, 25 November.

—— 1996b, *APEC Energy Ministers' Declaration: Energy: Our Region, Our Future*, Sydney, Australia, 28–29 August.

—— 1997a, *APEC Economic Leaders' Declaration: Connecting the APEC Community*, Vancouver, Canada, 25 November.

—— 1997b, *The Impact of Trade Liberalisation in APEC*, Economic Committee, Singapore.

—— 1998a, *APEC Economic Leaders' Declaration: Strengthening the Foundations for Growth*, Kuala Lumpur, Malaysia, 18 November.

—— 1998b, *1998 APEC Economic Outlook*, Economic Committee, Singapore.

—— 1999a, *Guide to the Investment Regimes of the APEC Member Economies*, Committee on Trade and Investment, Singapore.

—— 1999b, Individual Action Plans, http://www.apecsec.org.sg

Armington, P.S. 1969a, 'A theory of demand for products distinguished by place of production', *IMF Staff Papers*, vol. 16, no. 2, pp. 159–78.

—— 1969b, 'The geographic pattern of trade and the effects of price changes', *IMF Staff Papers*, vol. 16, no. 2, pp. 179–201.

Barro, R.J. and Sala-i-Martin, X. 1992, 'Convergence', *Journal of Political Economy*, vol. 100, no. 2, pp. 10–58.

Baumol, W.J. 1986, 'Productivity growth, convergence and welfare: what the long-run data show', *American Economic Review*, vol. 76, no. 5, pp. 1072–85.

Bernard, A.B. and Jones, C.I. 1996, 'Comparing apples to oranges: productivity convergence and measurement across industries and countries', *American Economic Review*, vol. 85, no. 5, pp. 1216–38.

Blake Dawson Waldron and ABARE 1995, *Regional Cooperation for Power Infrastructure*, A Report to the APEC Energy Working Group, Canberra.

Chand, S. 1999, 'Trade liberalisation and productivity growth: time-series evidence from Australian manufacturing', *Economic Record*, vol. 75, no. 228, pp. 28–36.

Council for Economic Planning and Development 1998, *Statistical Data Book 1998*, Chinese Taipei.

Directorate-General of Budget, Accounting and Statistics 1998, *Chinese Taipei*, http://www.dgbasey.gov.tw/

Hertel, T. (ed.) 1997, *Global Trade Analysis: Modeling and Applications*, Cambridge University Press, Massachusetts.

Industry Commission 1996, *The Impact of APEC's Free Trade Agreement*, Staff Information Paper, Canberra, February.

—— 1997, *Services Trade and Foreign Direct Investment*, Staff Research Paper, Canberra.

International Energy Agency 1996, *World Energy Outlook 1996 Edition*, OECD, Paris.

—— 1998a, *Energy Balances of Non-OECD Countries 1995-96*, OECD, Paris.

—— 1998b, *Energy Balances of OECD Countries 1995-1996*, OECD, Paris.

—— 1999, *Looking at Energy Subsidies: Getting the Prices Right*, World Energy Outlook, Insights Series, OECD, Paris.

International Iron and Steel Institute 1996, *Steel Statistics Yearbook 1996*, Committee on Economic Studies, Brussells.

International Monetary Fund 1987, *Direction of Trade Statistics Yearbook 1987*, Washington DC.

—— 1994, *Direction of Trade Statistics Yearbook 1994*, Washington DC.

—— 1995, *Foreign Direct Investment in the World Economy*, Washington DC.

—— 1997, *World Economic Outlook, May*, Washington DC.

—— 1998, *Issues and Developments in International Trade Policy*, Washington DC.

—— 1999, *International Financial Statistics*, CD ROM, Washington DC.

Jomini, P., Zeitsch, J., McDougall, R., Welsh, A., Brown, S., Hambley, J. and Kelly, J. 1991, *SALTER: A General Equilibrium Model for the World Economy*, Industry Commission, Canberra.

Kwak, H. 1994, 'Changing trade policy and its impact on TFP in the Republic of Korea', *The Developing Economies*, vol. 32, no. 4, pp. 398–422.

McDougall, R., Elbehri, A. and Truong, T. (eds) 1998, *Global Trade, Assistance and Protection: The GTAP 4 Data Base*, Center for Global Trade Analysis, Purdue University.

McKibbin, W. 1997, *Some Global Consequences of Financial Market Liberalisation in the Asia Pacific Region*, Australian National University, Canberra.

—— 1999, Trade liberalisation in a dynamic setting, Paper presented at the Second Annual Conference on Global Economic Analysis, Denmark, 20–22 June.

Mankiw, N.G., Romer, D. and Weil, D. 1992, 'A contribution to the empirics of economic growth', *Quarterly Journal of Economics*, vol. 107, no. 2, pp. 407–38.

Okamoto, Y. 1994, 'Impact of trade and FDI liberalization policies on the Malaysian Economy', *The Developing Economies*, vol. 32, no. 4, pp. 460–78.

OECD 1998, *Open Markets Matter: The Benefits of Trade and Investment Liberalisation*, Paris.

Pacific Economic Cooperation Council 1995, *Survey of Impediments to Trade and Investment in the APEC Region*, A report by the Pacific Economic Cooperation Council for APEC, Singapore.

Roberts, I. 1997, *Advantages of Trade Reform for Australia*, ABARE Current Issues no. 5, Canberra, July.

Schneider, K., Phamduc, T., Wu Zhonghu, Liu Xiaoli, Shi Lin, Dai Lin and Zhu Yuezhong 1999, *Supplying Coal to South East China: Impacts of China's Market Liberalisation*, ABARE Research Report 99.13, Canberra.

United Nations 1998, *World Population Prospects 1950–2050* (1998 Revision), Magnetic tape, New York.

UNCTAD (United Nations Conference on Trade and Development) 1996a, *Incentives and Foreign Direct Investment*, Geneva.

—— 1996b, *World Investment Report 1996: Investment, Trade and International Policy Arrangements,* New York.

—— 1997, *World Investment Report 1997: Transnational Corporations, Market Structure and Competition Policy*, Geneva.

—— 1998, *World Investment Report 1998: Trends and Determinants*, Geneva.

—— 1999, *Trains Database*, http://www.leman.com/~kuwahara/untrains.htm.

Urata, S. and Yokota, K., 1994, 'Trade liberalization and productivity growth in Thailand', *The Developing Economies*, vol. 32, no. 4, pp. 444–59.

World Bank 1997, *Expanding the Measure of Wealth: Indicators of Environmentally Sustainable Development*, Environmentally Sustainable Development Studies and Monograph Series no. 17, Washington DC.

—— 1999, *World Development Indicators 1999*, CD ROM, Washington DC.

World Trade Organisation 1998, *Foreign Direct Investment and Economic Development*, OECD, Paris.