Multilateral Context for EU-Australia Economic Cooperation

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Abstract

Following the GFC, growth in global trade has been sluggish with recent trade and regional tensions providing doubt as to whether these trends will change any time soon. There is, therefore considerable uncertainty about how the EU-Australian economic relationship will evolve over the next decades. This paper first uses longer-term projections of the global economy implemented in the GDyn-FS dynamic global general equilibrium model to suggest global exports could expand to reach around 35 percent of global output by 2050 from the current level of around 30 percent. Such a change would likely be accompanied by a re-orientation of trade between regions and materially influence the EU-Australia economic relationship and global trading relationships more broadly. It then draws on differences between regions in energy demand, productive capital and the distribution of real wealth to provide a wider context for EU-Australia economic cooperation over the coming decades.

JEL CLASSIFICATION C68; E17; E21; F11; F21; F43

1 Introduction

Growth in international trade and commerce in the post-World War 2 period has benefited from global institutions that have supported economic cooperation and development and domestic policies that have allowed countries to open themselves to international trade and investment. This environment has allowed mutually beneficial trade with foreign firms competing in domestic markets, domestic firms growing through exports and the transfer of technology and ways of working between countries and regions. Broader economic development supported by the supply of energy and technological advances, and the accumulation of capital has also seen dramatic increases in income and living standards.

The positive effects of global trade liberalization and domestic reform have seen the share of trade in global value added increase from around 12 percent in 1960 to 30 percent pre-GFC. Despite the signing of the WTO Bali Package in 2013, the expansion of the Information Technology Agreement in 2015 and the continued formation of bilateral and regional preferential trading agreements since the GFC, growth in trade has barely kept pace with growth in global output.

Trade growth in Europe was accelerated by the formation and expansion of the Common Market and the European Union while trade growth in Australia has been accelerated by domestic economic reform, the formation of the Asia-Pacific Economic Cooperation pact and rapid growth in neighbouring economies in the Asia-Pacific region. Both Europe and

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[2] This paper provides the basis of two policy notes on the multilateral context for European and Australian economic cooperation which can be found at https://ces.cass.anu.edu.au/sites/default/files/docs/2022/12/CES_-_Policy_notes_CoE_Gretton.pdf and https://www.niesr.ac.uk/publications/multilateral-context-european-and-australian-economic-cooperation?type=global-economic-outlook-box-analysis, respectively.

Australia have benefited from the global opening of trade and commerce which has seen the global average border protection, measured as the mean of applied tariffs, decline from 15 percent in 1990 to 5 percent in 2017 (World Bank 2022a). Reflecting a leaning towards trade in merchandise with lower border protection, global average border protection measured as the mean of tariffs weighted by product import shares declined from 6.8 percent in 1990 to 2.6 percent in 2017.

Within this global setting there has been enduring commercial ties between EU countries and Australia. Recent data indicates that EU countries investment in Australia in 2021 amounted to about AU$763 billion or 18 percent of total inward foreign investment (ABS 2022), while Australian investment in the EU amounted to AU$369 billion in 2021 or about 11 percent of Australian investment abroad (ABS 2022). Of this investment, EU FDI in Australia amounted to about AU$120 billion while Australia's FDI in the EU was about AU$57 billion. Imports to EU countries from Australia totalled AU$12 billion in 2019-20 while exports from EU countries to Australia totalled $AU47 billion in the same year (DFAT 2022). Exports from EU countries to Australia have been weighted towards manufactured products particularly machinery and equipment, while exports to EU countries from Australia have been weighted towards agricultural and mineral products.

The future of the EU-Australia trade relationship will be shaped by domestic economic developments in each region together with broader developments in the global economy. This paper explores the changing centre of gravity of global trade, resource and energy constraints and the implications of capital deepening in emerging markets as it may affect the EU-Australia economic relationship. It concludes by considering what these developments may mean for the progress of globalization and the evolution of EU-Australia economic cooperation.

After the GFC, growth in global trade has been sluggish with recent trade tensions, the effects of the COVID-19 pandemic, tensions in Eastern Europe, competition for the supply of scarce energy and natural resources and scarcity of capital, providing doubt as to whether this trend will change any time soon. The trade disputes between the United States and China, and the development of regional trade blocs have led some commentators including the IMF (Georgieva et al, 2022) to suggest that we are seeing an increase in global fragmentation.

Longer-term projections of the global economy showing the connectedness of regions through trade and finance provide a means to trace the progress of globalization with the assumed rates of saving within regions, import tolerance and permitted trade balances. The central case considered in this paper suggests global exports could expand to reach around 35 percent of global output by 2050 from the current level of around 30 percent. Such an increase is consistent with an estimated global trade to income elasticity of about 1.2, which compares to an average over the period 1950 to 2017 of about 1.5. Stronger assumptions about the trade potential of regions and scope for lowering trade costs could lead to higher projected proportions, approaching 40 percent or above of global output. On the other hand, trade tensions and increases in trade costs could be associated with continuation or erosion of the current proportion. At the regional level, the projections are modelled to reflect a gradual convergence of trade shares for China to the neighbourhood of those for Japan and the United States and convergence of trade shares for other countries of the globe (referred to in this paper as the multi-country rest-of-the-world area (ROW) towards Europe-28 shares. The potential for change is most stark for small to medium sized trade-exposed countries such as Australia, for which a re-orientation in connectedness from China and Japan towards the faster growing ROW region is modelled. The relative connectedness between countries *within* the faster growing multi-country ROW area is projected to increase.

Economic development is dependent on the use of energy to power industrial and commercial processes, transport and communication, and consumption. In per capita terms, non-OECD economies consumed about one-third of the energy consumed by OECD economies. If non-OECD economies, through their own economic development, ultimately reached a level of per capita primary energy consumption on a par with the OECD group, non-OECD regions consumption would be about three times current levels. Even continued high energy use by OECD economies and a gradual closing of the gap (from low to middle income and from middle income to high income) would place additional pressure on fossil and other fuel reserves, land on which to locate energy harvesting activities such as solar and wind, and the energy and materials needed to build the supporting facilities and infrastructure. It would also test the boundaries of technological innovation and ways of working to economize on the use of natural and environmental resources, and dispose of decommissioned facilities, while keeping pace with economic development.

There is also a substantial gap in productive capital between OECD and non-OECD economies. Progressive closing of the gap will have to compete for domestic and foreign savings to fund new capital formation. Closing the gap will also generate competition for resource and produced inputs (including energy, metals and minerals) required to produce investment goods and services. The pressures will extend beyond the building-catch up phase to the operational phase.

These multilateral influences will be important in setting the context of EU-Australia economic cooperation into the foreseeable future, as well as trade and development opportunities in the respective regions.

The modelling of trends in global output and trade is undertaken using the GDyn-FS dynamic general equilibrium model of the global economy (Ianchovichina and McDougall 2012, Gretton 2021a). The GDyn-FS model has a number of novel features that help provide meaningful longer-run dynamic general equilibrium projections of trade and growth. It extends the depth of analysis possible of the evolution of trading relations between countries and regions into the future. The model: (i) embodies a capability to project a stable long-run base line with non-convex adjustment costs; (ii) includes a rate of return rule for the allocation of saving between regions (capital-finance flows); (iii) relaxes the assumption of fixed shares (the Cobb-Douglas assumption) in the consumption-saving decisions of national households; and (iv) provides for the inclusion of exogenously determined national consumption-saving choices and target trade intensities (Gretton 2021b). The application underpinning this paper also includes procedures to compare projected trade shares in a target year (2050 in the case of this study) with shares in a benchmark year (in this case the pre-COVID year of 2020).

Section 2 elaborates the simulation approach for tracing the evolution of the global economy. Section 3 then reports on the projected changes in economic gravity between regions and what this may mean for the EU-Australia economic relationship followed in sections 4 and 5, by projections of the sector composition of EU and Australian trade and the changing face of regional trading profiles. Section 6 then draws on data about energy consumption and supply to note longer-term pressures on energy systems that are likely to affect the EU-Australia economic relationship, followed by sections 7 and 8 which look at capital intensities across regions and the global distribution of real wealth, respectively. Section 9 concludes the paper with some implications of the analysis for the evolution of the EU-Australia economic relationship.

2 Simulating the evolution of the global economy

This paper uses a global dynamic computable general equilibrium model to explore the progress of globalization. The model used is the GDyn-FS model which is an intertemporal

variant of the widely used GTAP modelling framework (Ianchovichina and McDougall 2012, Gretton 2021a). The model combines the economies of individual regions through multilateral trade, associated transport services and capital-finance flows. Producers in each region are divided into industries that are assumed to minimize costs, while the representative household in each region receives income generated from labour services and the ownership of capital, land and natural resources. Income from product and factor taxes also accrue to the regional household. With this income households maximize utility through private consumption, government consumption and savings. As noted, the GDyn-FS model includes a number of novel features that help provide meaningful longer-run dynamic general equilibrium projections of trade and growth. It: (i) builds a capability to project a stable long-run base line with non-convex adjustment costs (Gretton 2018, 2021a); (ii) introduces a rate of return rule for the allocation of saving between regions (capital-finance flows) (Gretton 2018, 2021a); relaxes the assumption of fixed shares (the Cobb-Douglas assumption) in the consumption-saving decisions of national households (Gretton 2021b); and (iv) provides for the inclusion of exogenously determined national consumption-saving choices and trade intensities through a process that: (a) targets saving and trade intensities over an historical period; and then (b) gradually adjusts to longer-run target values based on historical trends and theoretical projections (Gretton 2021b). The model has been further enhanced for this study through the inclusion of procedures to compare projected trade shares in a target year with shares in a benchmark year. The focus of this analysis is then on the evolving trade relations between countries. As a 'real-economy' model, GDyn-FS does not include money or bonds, and assumes that all real changes are accommodated by broader monetary policies. While the model separately delineates government consumption and taxes on products and primary factors, it does not model the net fiscal position of governments and associated impacts on bond markets.

The simulations use a database with 6 diverse regions — Australia, China, Japan, the United States, Europe-28 and the Rest-of-the-World (ROW) — and 13 industry sectors — two agriculture, one mining, four manufacturing, five services plus ownership of dwellings. Five primary factor inputs are modelled — land, natural resources, skilled labour, unskilled labour and (produced) physical capital. The database reference year is 2011. The illustrative application is reported to 2050.

For the study, the model data base is projected from 2011 to 2021 using estimates of GDP growth, population and skilled and unskilled labour drawn from World Bank World Development Indicators and ILO labour market data. Over the forward period, projections are drawn from IMF World Economic Outlook (to 2027) (IMF 2022), ILO labour market projections (to 2022) (ILO 2020) together with long-run projections that follow the medium growth scenario of Shared Socioeconomic Pathway projections (SSP2) (Dellink *et al.* 2017) as annualized by van der Mensbrugge (2013) and aggregated according to Aguiar (2019) and spliced with ILO labour market data (Gretton 2021b). The SSP2 growth scenario adopted assumes medium growth across the global TFP frontier, gradual convergence of economies toward that frontier, transition to openness, population, labour force, human capital and fossil fuel resource use and prices.

Under the SSP2 growth assumptions, global population is projected to reach 8.3 billion in 2030 and 9.3 billion in 2050, broadly in line with UNDESA projections of 8.5 and 9.7 persons in 2030 and 2050, respectively (UNDESA 2022). Population and population growth to 2050 (and beyond) is projected to be concentrated in ROW regions (Figure 1, top left panel). With low birth rates and population ageing, the populations of China and Japan are projected decline over the period, while the populations of the United States and Europe-28 are projected to remain relatively flat. These population trends are reflected in trends in employment

(Figure 1, top right panel). The projections to 2050 also reflect an expectation that GDP growth in China and the regions covered by the ROW group will continue at rates above those for Australia, Japan, the United States, and the Europe-28 economies, although projected growth for China and Japan, in particular, is projected to taper off (Figure 1, bottom left panel).

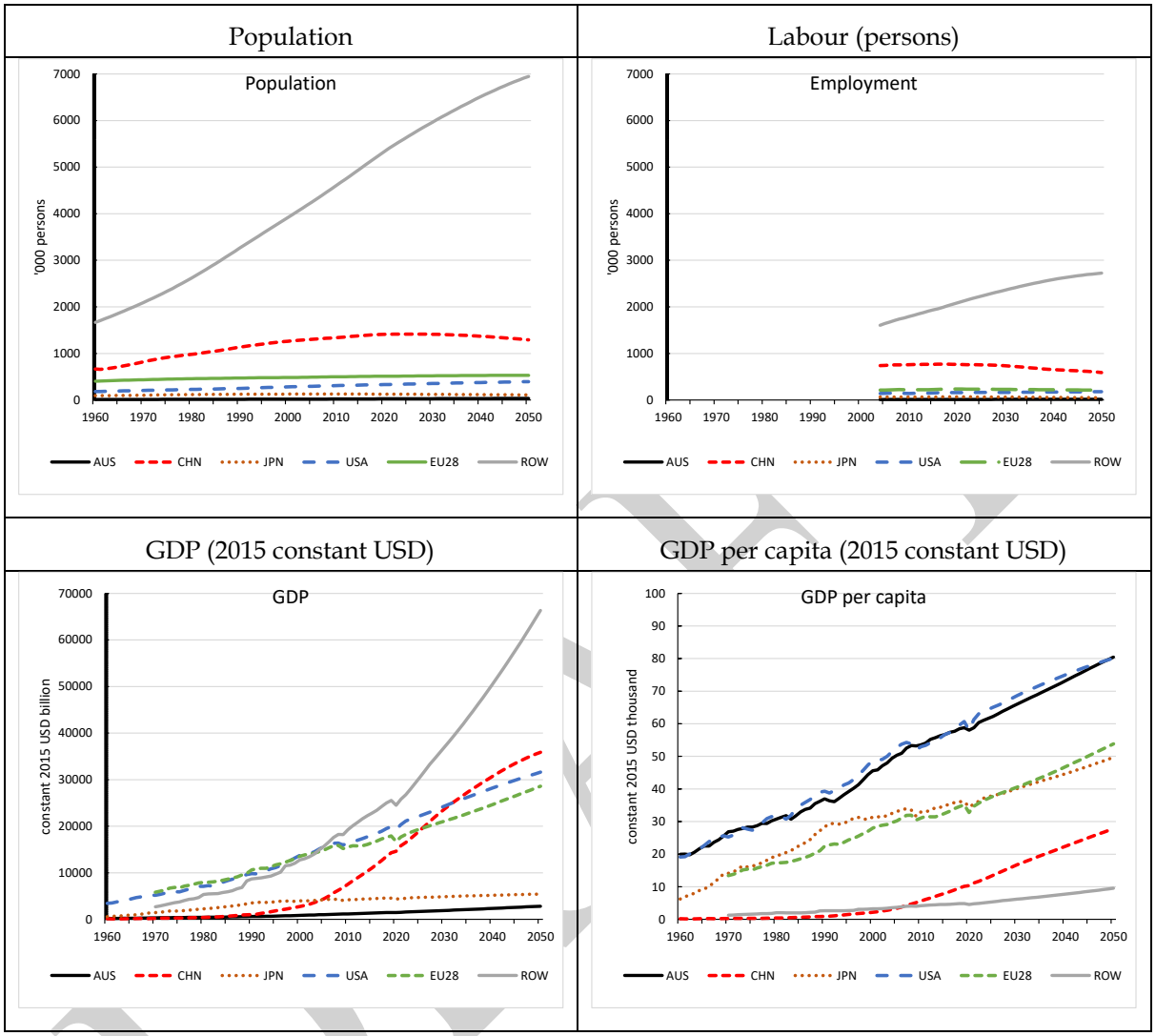

Figure 1: Historical estimates and baseline projections of population, labour, GDP and GDP per capita by region, 1960 to 2050, percentage change

Sources: World Bank (2022b), IMF (2022), ILO (2020), Dellink et al. (2017), Author estimates based on GDyn-FS projections.

By 2050, there could then be a substantial change in economic gravity across the globe. In terms of population, the proportion of the global population located in ROW regions could rise from around 70 to 75 percent and with a higher proportion of younger people entering the work age cohort (15 to 65 years of age), the share of the global workforce located in ROW regions could increase from around 63 percent in 2020 to 72 percent in 2050. Accompanying these increases and combined with rising output per employed person, the share of global product, referenced to 2015 market prices, contributed by ROW regions could rise from around 30 percent to around 40 percent in 2050. The contribution of China to global output is also projected to edge higher over the next 30 years to exceed 20 percent of global output by 2050 while eclipsing the United States as the largest economy in the 2030s. After 2050, ongoing population and economic growth across ROW regions is projected to be accompanied by a further expansion of the footprint of those regions in the global economy. The share of China,

the United States and Europe in global output could then decline to around 15 percent or below, in each case, by 2100 (the end year in SSP2 projections) while that of ROW regions could account for between 50 and 60 percent of global output, and nearly 80 person of global population and employment.

Labour productivity growth, measured as output per person employed achieved through capital deepening and technological advance for the ROW regions is assumed to exceed that of Australia, Japan, and the Europe-28 area, but lag that of China. But even with higher workforce participation growth, from an increase in the share of working age population in the total population, a substantial gap is projected to remain between average output per capita across ROW regions and the Australia, Japan, USA and Europe-28 group (Figure 1, bottom right panel). A substantial gap is also projected to remain between China and these regions.

3 The balance of economic gravity in trade is changing

Against the background of these projections, there remains considerable uncertainty surrounding how global trade may evolve. This uncertainty is heightened by the COVID-19 global pandemic and interruption of supply chains, global trade tensions, regional conflicts affecting critical energy supplies and higher trade costs through tariff and non-tariff barriers. Trade tensions and increases in trade costs could be associated with continuation or erosion of the current proportion of trade as a share of global product of around 30 percent. On the other hand, strong assumptions about import tolerance and the lowering of trade costs could see the momentum of trade growth return to pre-GFC rates with trade approaching 40 percent or higher of global output by 2050 (Figure 2).

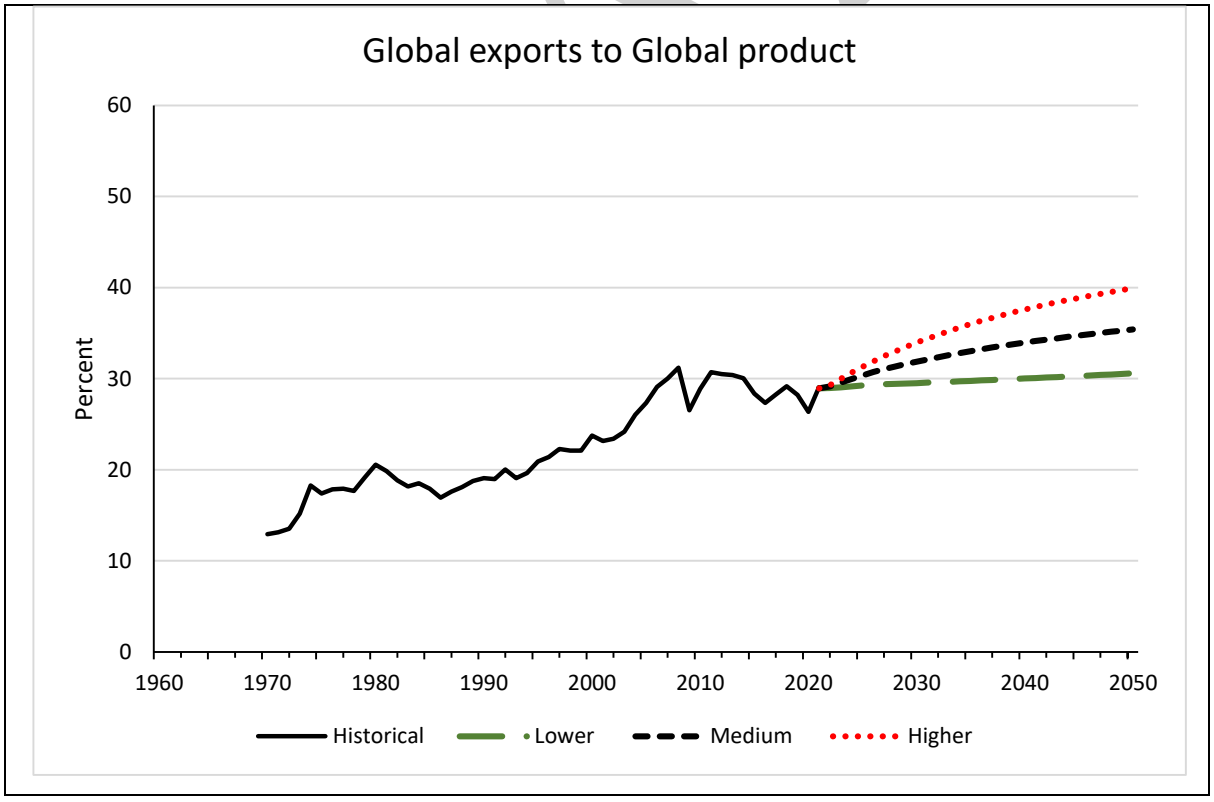

Figure 2: Historical estimates and baseline projections of global exports to global product, 1960 to 2050, percent

Source: World Bank (2022b); Author estimates based on GDyn-FS projections.

Recognising the considerable uncertainty surrounding import tolerance, the international trading environment and the progress of globalization, a middle-ground perspective whereby trade may reach around 35 percent of global output by 2050 provides a meaningful context in which to consider the evolution of the EU-Australia trade relationship (see Box 1 for trade growth assumptions). Such an increase is consistent with an estimated global trade to income elasticity of about 1.2, which compares to an average over the period 1950 to 2017 of 1.54 and a projection over the period 2011 to 2040 of 1.1 (Bekkers et al. 2020).

Box 1: An illustrative scenario for regional trade growth

How the EU-Australia economic relationship evolves will be influenced by existing trading ties and also how those ties may evolve into the future. A perspective on this can be given by forward projections that allow for: (i) the value of trade as a share of GDP for Australia, Japan, the USA, and the Europe-28 area to be uplifted by 10 percent from 2019 (pre-Covid) levels; (ii) a convergence of trade shares for China to the levels in the neighbourhood of forward views for Japan and the USA; (iii) the value of trade as a share of GDP for other regions (combined) to converge towards the share for the multi-country Europe-28 area; and (iv) the balance of trade as a share of GDP to approach rates based on historical experience of regions. Gross saving as a share of GDP for China is also projected to converge from historically high levels of around **45** percent to a level in the neighbourhood of other regions of **27** percent. Collectively, this perspective projects an increase in the global share of trade to GDP from around 30 percent in 2019 to around 35 percent by 2050. Stronger assumptions about trade growth in the OECD area and convergence of the extent of trade relative to output in the non-OECD area would yield higher projected increases in trade as a share of global output.

Source: Author specifications based on Gretton (2021b).

Importantly, this relationship is likely to evolve in an environment in which the trade footprint of the potentially faster growing ROW (mainly non-OECD economies) area is expanding, possibly substantially so (Figure 3). In all likelihood, this will be combined with an increase in trade connectedness between economies within the ROW area. And while the footprint of China expanded rapidly following its accession to the WTO, domestic policies focused on greater self-sufficiency and a further emergence of consumption demand by households, either directly through private final consumption or indirectly through government service provision could see a gradual lowering of China's share of global trade.

Large disruptions to the existing regional order of trade are likely to occur.

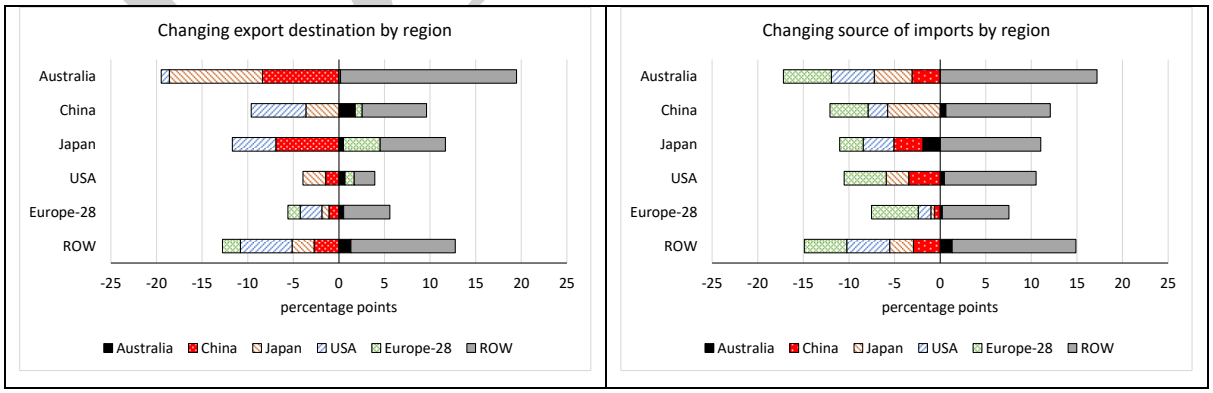

Figure 3: Projected changes in regional orientation of trade (medium trade-potential scenario), 2020 to 2050, percentage points

Source: Author estimates based on GDyn-FS projections.

Simultaneously, the footprint of the slower growing OECD (Australia, Japan, the United States and Europe-28) group could decline, and for the Europe-28 area, substantially so. In this environment, it is most likely that both the EU and Australia, as well as China, Japan and the USA, will find a larger share of their exports absorbed by ROW countries Figure 3 (left hand panel) and a larger share of imports sourced to this area Figure 3 (right hand panel). Similarly, the ROW countries are likely to increase in importance as a source of imports to the EU and Australia as well as China, Japan and the USA.

4 The sectoral composition of trade now and into the future

Exports

The projections suggest that exports from Europe-28 countries would remain manufacturing-product oriented while exports from Australia would remain mining-product oriented (figure 4). Nevertheless, the projections also suggest the potential for some structural adjustment in the balance of exports between product groups away from the main product categories. – heavy manufacturing in Europe-28 and Mining in Australia – could occur. For the Europe-28 group, about four percentage points is projected to be taken up in relatively small increments in other product groups, including in primary products, textiles and clothing and light manufactures as well as the export of services.

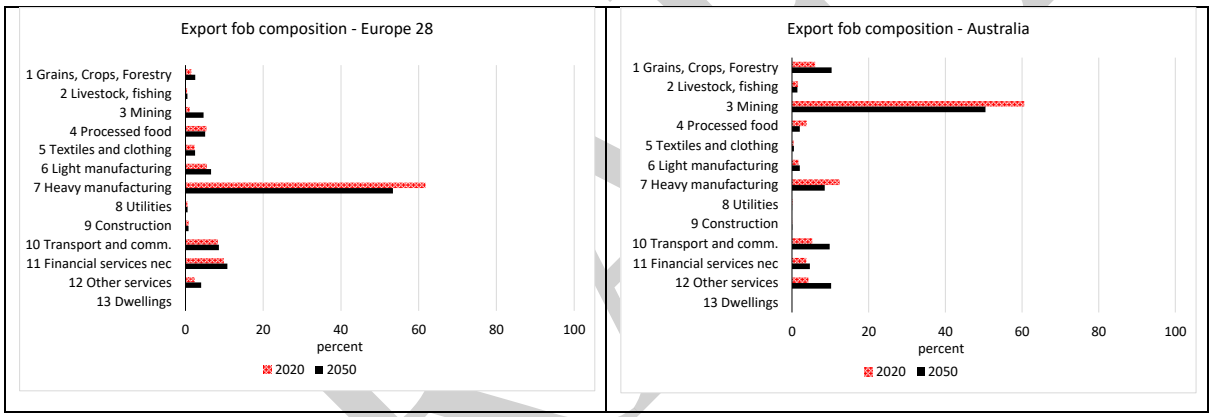

Figure 4: Estimated sectoral composition of exports from Europe 28 and Australia, 2020 and 2050, proportions of regional exports (fob basis)

Source: Author estimates based on: GTAP 10 data Aguiar *et al.*2019; GDyn-FS projections.

Imports

The projections suggest that imports to Europe-28 countries and to Australia would also remain manufacturing-product oriented (Figure 5). But again, some change in relative proportions across the broad categories could arise. With the expansion of manufacturing capabilities in other economies, the imports of manufactures are projected to increase in importance relative to other products in the Europe 28 area. This is less so in the case of Australia for which the relative increase is projected to be most pronounced for processed food products and light manufactures. The projections also suggest that while imports of heavy manufactures dominate imports, there could be a re-weighting towards other categories of manufacture.

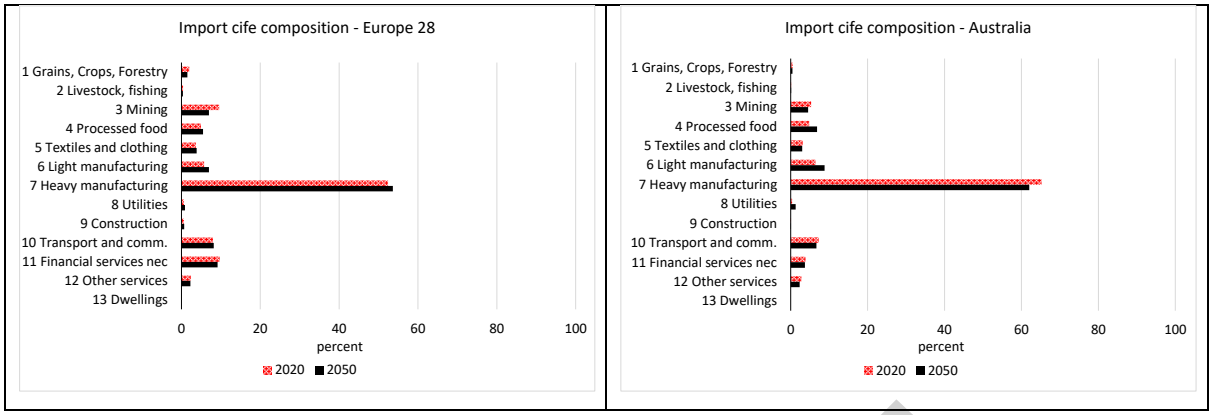

Figure 5: Estimated sectoral composition of imports to Europe 28 and Australia, 2020 and 2050, proportion of regional imports (cif basis)

Source: Author estimates based on: GTAP 10 data (Aguiar *et al.* 2019); GDyn-FS projections.

5 The changing face of regional trading profiles

With economic activity in the wider global economy projected to grow ahead of the European economy over the coming decades, the changing face of Europe's trading profile across product groups is projected to be mainly between the Europe-28 and ROW regions (Table 1). With growth in activity in Australia and Europe broadly aligned, the profile of Europe's trade with Australia is not projected to change greatly over the coming decades. Proportionally more of Europe-28's exports are absorbed by the faster growing countries in the ROW region while intra-regional exports are projected to be of declining importance. This tendency is projected across most product groups. For the heavy manufacturing product group, Europe-28's largest export category, export trade is projected to re-orient away from economies in the home region group as well as China, Japan and the USA towards ROW economies. The potential for re-orientation at the product level, nevertheless, is projected to be largest for primary commodities for which output per unit of the fixed factors of land and natural resources is recorded as higher in Europe-28 than the ROW affording it a comparative advantage in a pivot towards satisfying demand in the faster growing economies of the ROW region.

On the side of imports, the projections suggest more nuanced possibilities. For primary products, Europe-28 is projected to source a lesser proportion of its imports from the faster growing ROW region as that area absorbs more of the available supplies to meet within-region intermediate and final demand. The gap in primary-product supplies is mainly filled through within-Europe trade which further adds to the demand for local produce created by the projected tilt towards exporting, noted above. For manufacturing and most service activities, higher domestic growth in ROW economies, the flexibility to achieve a surplus for export and enter into global value chains, is accompanied by a projected increase in their share of cross-border supplies entering into European production as intermediate inputs and as final consumption. Imports of other services (including education, health and tourism and personal services) is projected to go against this trend. This reflects rising domestic absorption with rising incomes in ROW economies, reducing the relative surplus available for international trade, including to the European economies. Reflecting the assumption that China would transition from export-led growth to channel a larger proportion of its production to local consumption and investment, the proportion of manufactures and other products entering Europe-28 economies from China is projected to decline.

Table 1: Changing face of Europe-28's trading profile by product group,[a] 2020 to 2050, percentage points change[a]

Exports from Europe-28

	1 AUS	2 CHN	3 JPN	4 USA	5 EU28	6 ROW
1 Grains, crops, forestry	0.22	0.42	-0.08	-0.08	-22.43	21.95
2 Livestock, fishing	0.44	0.03	-0.12	-0.25	-10.93	10.83
3 Mining	0.09	-0.48	-0.08	-0.83	-20.89	22.20
4 Processed food	1.14	-0.40	-0.55	-1.42	5.99	-4.76
5 Textiles and clothing	0.52	-0.31	-0.36	-0.73	-2.55	3.42
6 Light manufacturing	1.13	-0.59	-0.72	-1.79	1.70	0.26
7 Heavy manufacturing	0.53	-1.55	-0.64	-2.33	0.90	3.09
8 Utilities	1.32	-0.05	-0.01	-0.39	2.41	-3.28
9 Construction	0.06	-1.50	-4.84	-0.74	1.01	6.01
10 Transport and comm.	0.78	-0.10	-1.22	-2.72	-1.07	4.32
11 Financial services nec	0.36	0.17	-1.04	-3.61	-4.12	8.25
12 Other services	0.92	0.26	-0.51	-4.01	-9.78	13.11
13 Dwellings	assumed non-traded					
All products	0.52	-1.10	-0.77	-2.37	-1.34	5.07

Imports to Europe-28

	1 AUS	2 CHN	3 JPN	4 USA	5 EU28	6 ROW
1 Grains, crops, forestry	0.44	-1.13	-0.01	-1.43	22.68	-20.54
2 Livestock, fishing	0.05	-1.85	-0.04	-0.94	8.99	-6.21
3 Mining	-0.42	0.00	0.01	0.73	20.54	-20.86
4 Processed food	-0.01	-0.18	-0.03	-0.60	-10.69	11.50
5 Textiles and clothing	0.04	-9.25	-0.05	-0.47	-4.65	14.37
6 Light manufacturing	0.14	-4.88	-0.02	-0.99	-3.40	9.16
7 Heavy manufacturing	0.00	0.06	-1.20	-2.36	-13.61	17.10
8 Utilities	-0.14	-0.20	-0.01	-0.89	-15.69	16.93
9 Construction	0.04	-1.34	8.20	-0.26	-9.49	2.85
10 Transport and comm.	1.74	-1.41	2.18	-0.55	-4.13	2.18
11 Financial services nec	0.50	-0.98	-0.06	2.11	-0.29	-1.29
12 Other services	4.20	-1.94	0.28	-7.15	16.41	-11.80
13 Dwellings	assumed non-traded					
All products	0.23	-0.65	-0.37	-1.38	-5.14	7.31

a Measured as the percentage points difference between the percentage share of product trade absorbed by a regional commodity group in 2020 and 2050, respectively. The underlying value of exports and imports is evaluated at border prices, that is, exports are evaluated on a fob basis while imports are evaluated on a cif basis.

Source: Author estimates based GDyn-FS projections.

Turning to the Australian perspective, the increased weight, or economic gravity, of areas beyond the China-Japan-USA-Europe-28 group is projected to raise the importance of export trade with the ROW regional group across all product categories (Table 2). With economic activity in the wider global economy projected to grow ahead of the European economy over the coming decades, as noted above, Europe's trading profile is projected to be mainly focused on the Europe-28 and ROW regions. Overall, the prospective impact on the share of Australia's exports absorbed by Europe-28 economies is mainly modest, although with the projected increase in the share of Australian other service exports (health, education, tourism)

to ROW regions, the share absorbed by the Europe-28 economies is projected to decline by more than 5 percentage points. The rise in prominence of ROW-regions, is likely to have a substantial impact on the regional composition of Australia's mining activities (Australia's most important source of export income). For this product group, the proportion of mining exports going to ROW-regions is projected to increase by nearly 30 percentage points, accompanied by a decline in prominence of China and Japan and a slight decline in the prominence of Europe-28 economies as export destinations for mining products.

Table 2: Changing face of Australia's trading profile, 2020 to 2050, percentage points change[a]

Export from Australia

	1 AUS	2 CHN	3 JPN	4 USA	5 EU28	6 ROW
1 Grains, crops, forestry	0.00	-0.13	-3.54	-0.14	-2.89	**6.70**
2 Livestock, fishing	0.00	**-7.62**	-1.68	-0.19	-1.74	**11.24**
3 Mining	0.00	**-12.27**	**-13.71**	-0.35	-2.04	**28.37**
4 Processed food	0.02	-0.50	-2.57	-2.33	2.92	**2.45**
5 Textiles and clothing	0.02	-1.34	-1.14	-1.53	-1.06	**5.04**
6 Light manufacturing	0.03	-1.78	-4.86	-4.28	1.67	**9.25**
7 Heavy manufacturing	0.00	-3.58	-2.85	-2.40	0.33	**8.49**
8 Utilities	0.00	-2.15	-0.18	-2.63	4.08	**0.29**
9 Construction	0.00	-0.33	**-15.59**	0.11	2.18	**13.63**
10 Transport and comm.	0.00	-0.07	-2.24	**-5.03**	0.09	**7.25**
11 Financial services nec	0.00	0.39	-4.36	**-5.49**	-2.19	**11.63**
12 Other services	0.00	2.35	-0.73	**-5.89**	**-6.29**	**10.57**
13 Dwellings	assumed non-traded					
All products	0.00	-8.38	-10.21	-0.89	0.17	**19.30**

Imports to Australia

	1 AUS	2 CHN	3 JPN	4 USA	5 EU28	6 ROW
1 Grains, crops, forestry	0.03	-4.00	0.20	2.44	**13.05**	**-11.69**
2 Livestock, fishing	0.00	-2.12	-0.13	-2.21	**10.54**	**-6.10**
3 Mining	0.00	0.22	0.40	0.57	1.90	**-3.09**
4 Processed food	0.00	-2.52	-0.38	-4.78	**-7.95**	**15.63**
5 Textiles and clothing	0.00	**-22.33**	0.02	-1.56	1.03	**22.82**
6 Light manufacturing	0.00	**-12.48**	-0.11	-1.99	-1.15	**15.73**
7 Heavy manufacturing	0.00	-2.10	**-6.47**	**-6.21**	**-7.99**	**22.78**
8 Utilities	0.00	-1.77	-0.07	**-9.38**	**-4.48**	**15.70**
9 Construction	0.00	-1.85	5.22	-0.04	**-5.19**	**2.39**
10 Transport and comm.	0.00	-2.09	2.25	-0.84	-2.64	**3.31**
11 Financial services nec	0.00	-1.91	-0.04	2.93	0.48	**-1.47**
12 Other services	0.00	-4.16	1.72	-6.16	**19.31**	**-10.72**
13 Dwellings	assumed non-traded					
All products	0.00	-3.09	-4.13	-4.71	**-5.26**	**17.19**

a Measured as the percentage points difference between the percentage share of total trade absorbed by a regional commodity group in 2020 and 2050, respectively. The underlying value of exports and imports is evaluated at border prices, that is, exports are evaluated on a fob basis while imports are evaluated on a cif basis.

Source: Author estimates based GDyn-FS projections.

With the further emergence of manufacturing capabilities across economies of the ROW bloc, Europe-28 economies along with China, Japan and the USA are projected to decline in relative terms as a source of manufactured imports into Australia (Table 2). This is particularly so for heavy manufacturing products – the main category of export by Europe-28 economies and import to Australia (Figures 4 and 5, above). Against this broad tendency, as final demand for other-services products (inclusive of tourism, government and personal services) increases across ROW economies, the relative importance of ROW economies as a source of imports to Australia of these products could decline. To fill the gap and a gap left by a more domestically focused Chinese economy, imports into Australia of other services from Europe-28 economies is projected to increase in relative importance under these projections.

6 Energy

Economic development is dependent on the use of energy to power industrial and commercial processes, transport and communication, and consumption. Globally, there was a three and a half fold increase in recorded primary energy consumption world-wide from 1965 to 2019 (Figure 6). Consumption by OECD economies increased two fold while consumption by non-OECD economies increased by over seven fold, albeit from a lower base. By 2019, the non-OECD group accounted for 60 percent of global energy consumption up from the 1965 share of 30 percent, at which time the OECD group was the predominate users of primary energy.

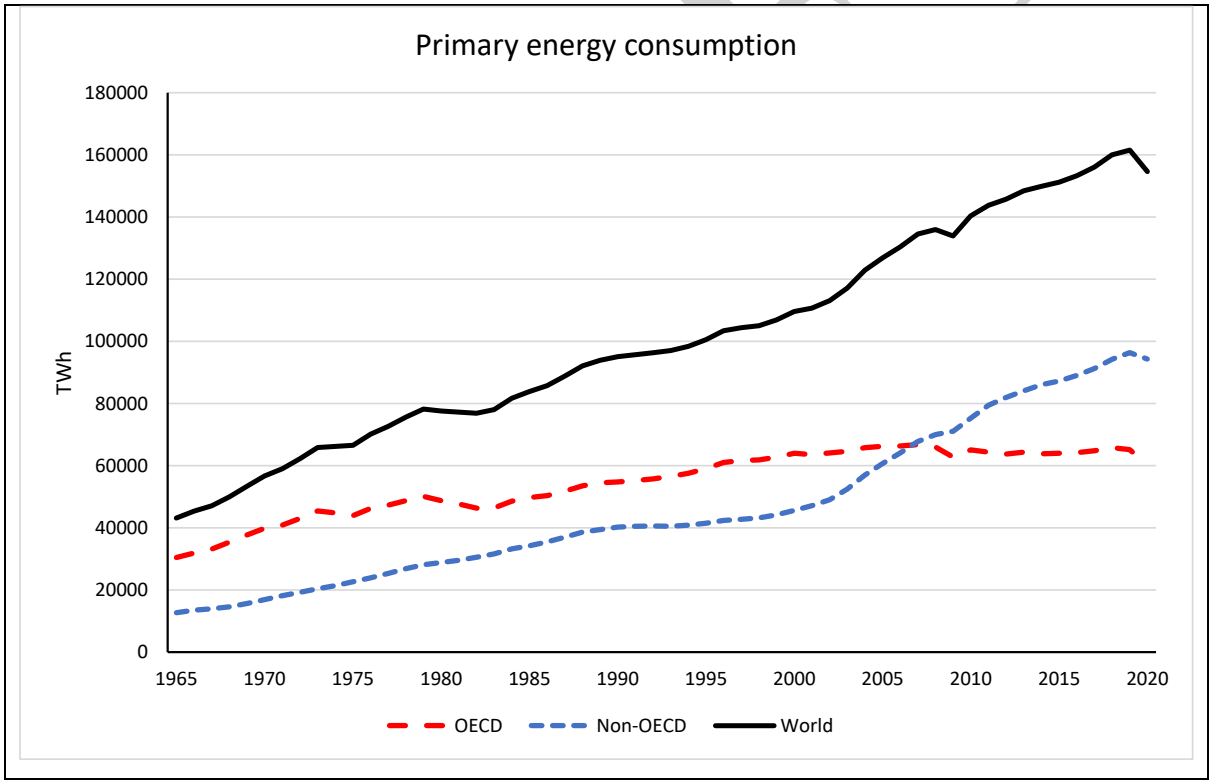

Figure 6: Primary energy consumption for OECD and non-OECD regions, 1965 to 2019, TWh

Source: Author aggregations based on "energy" data in Ritchie, Roser and Rosado (2020).

Growth in energy consumption was most rapid in the faster growing emerging and transition economies (figure 7). For example, over the period 1985 to 2019 recorded primary energy consumption in China increased over six fold with the expansion particularly marked from 2001 following China's accession to the WTO and heightened engagement in industrial production and international trade. Consumption by fast-growing ASEAN economies also collectively increased around seven fold, albeit from lower base-levels than China. On the

other hand, recorded energy consumption in slower growing Latin American and Sub Saharan African economies expanded only two fold from 1985 to 2019.

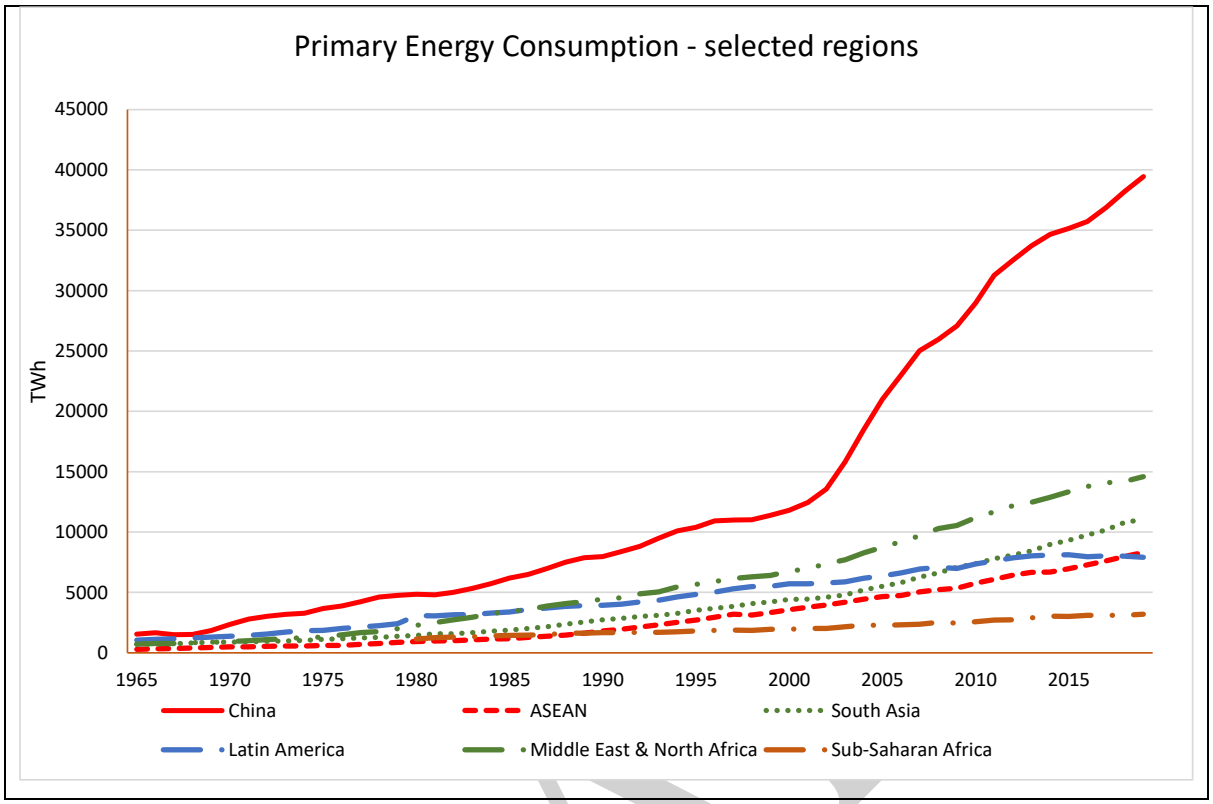

Figure 7: Primary energy consumption by selected regions, 1965-2019, TWh

Source: Author aggregations based on "energy" data in Ritchie, Roser and Rosado (2020).

The largest proportion of energy used globally is accounted for by naturally occurring minerals: oil (33 percent in 2019) followed by coal (27 percent) and natural gas (24 percent) (Figure 8). A further 4.3 percent is accounted for by nuclear fission. The mineral-based energy sources are complemented by energy harvested from natural systems, particularly hydro-power (6.5 percent in 2019) and less so wind, solar and other power sources (2.2, 1.1 and 0.4 percent, respectively in 2019).

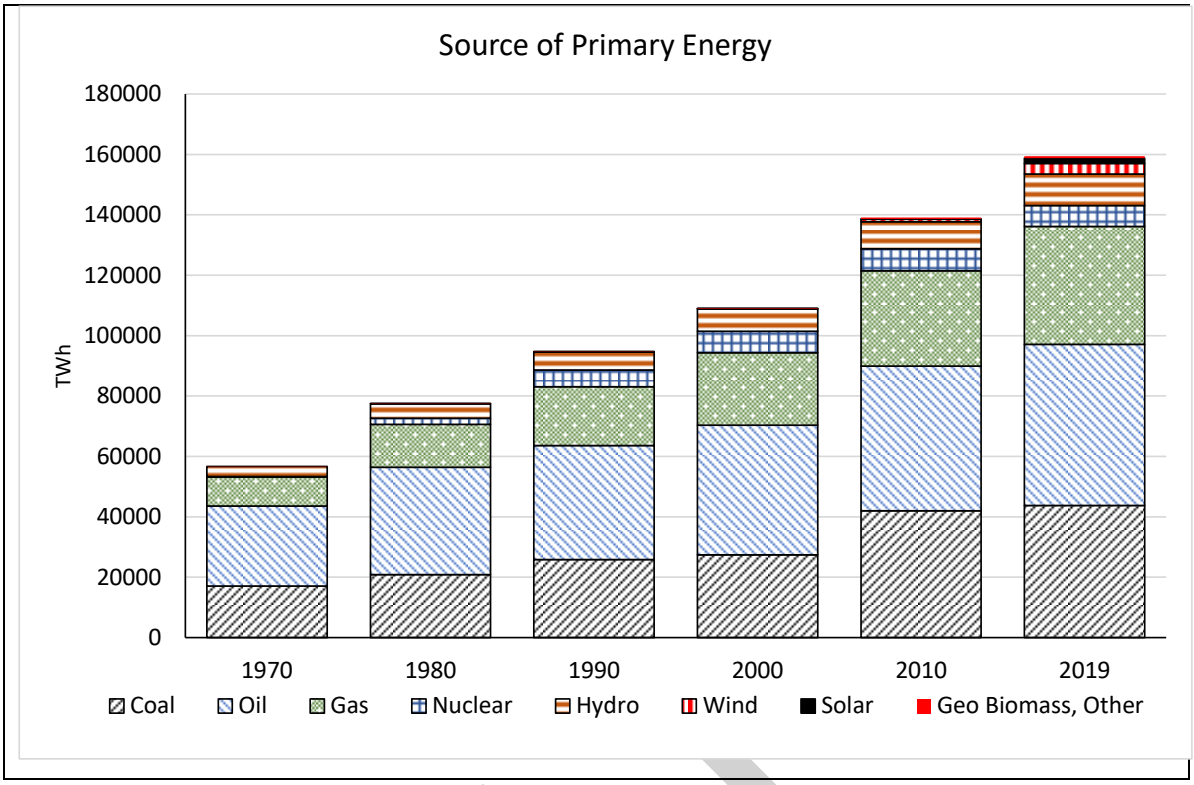

Figure 8: Source of primary energy, 1970 to 2019, TWh

Sources: Author aggregations based on "primary-energy-source-bar" data in Ritchie, Roser and Rosado (2020).

In per capita terms, non-OECD economies consumed about one-third of energy consumed by OECD economies. The actual energy consumption per capital though would be somewhat higher because of unrecorded energy sourced to household use of fire wood, animal dung and other informal-sector fuels by households. If non-OECD economies, through their own economic development, ultimately reached a level of per capita primary energy consumption on a par with the OECD group, non-OECD regions consumption would be about three times current levels (Figure 9). In global terms, use of energy would be over 2 times above current levels. Admittedly, such a convergence may take many years if not millennia to occur. Nevertheless, even a gradual closing of the gap (from low to middle income and from middle income to high income) would place additional pressure on fossil fuel reserves, land on which to locate energy harvesting activities such as solar and wind, and the energy and materials needed to build the supporting facilities and infrastructure. It would also test the boundaries of technological innovation and ways of working to economize on the use of natural and environmental resources, and dispose of decommissioned facilities, while keeping pace with economic development. The emergence of China as a major energy user in the global economy illustrates the scope for the balance and scale of energy use to increase rapidly as an economy converges towards the global production frontier with domestic policy changes and accommodating changes in international trade diplomacy.

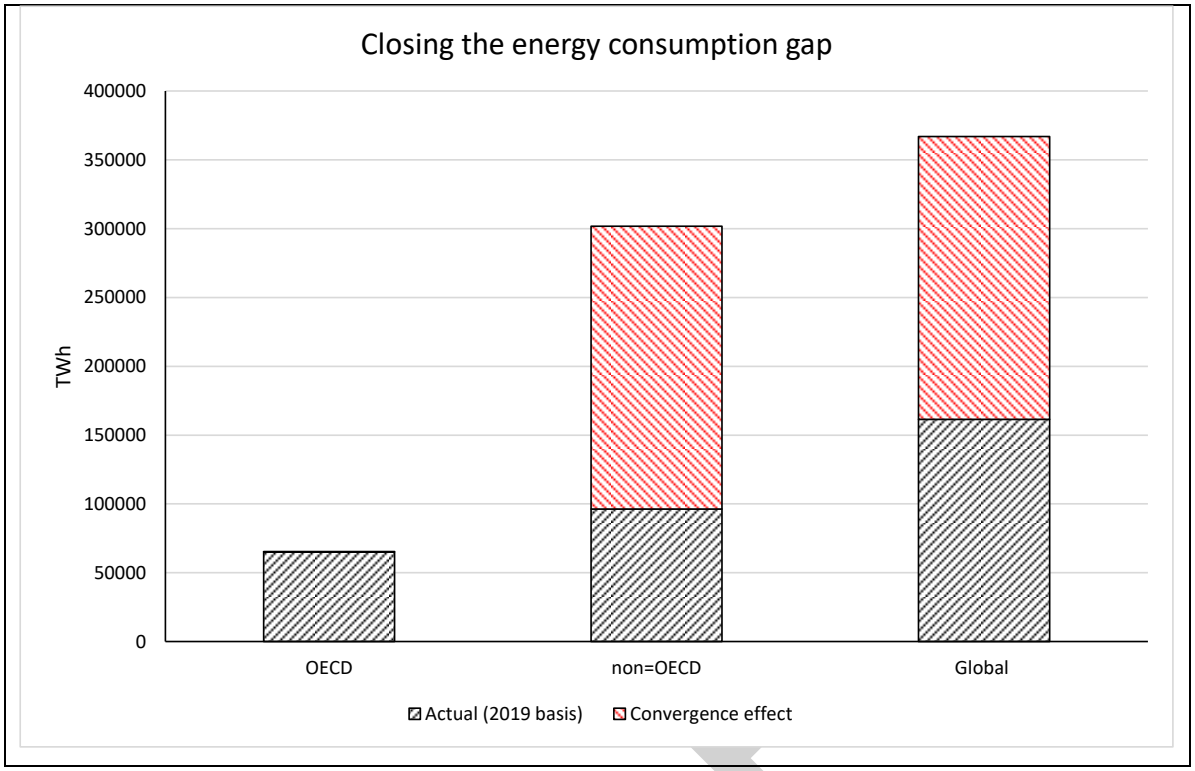

Figure 9 Closing the primary energy consumption gap, 2019 basis, TWhs

Sources: Author estimates based on "energy" data in Ritchie, Roser and Rosado (2020); World Bank (2022c).

Progressive convergence in energy use across regions would also take place against the backdrop of global efforts to lower reliance on scarce fossil fuels and reduce carbon emissions from anthropogenic activities across the globe. Drawing the link between carbon emissions from anthropogenic activity and climatic variability, the UNEP Emissions Gap Report 2022 indicated that carbon emissions would need to be reduced by around 43 percent (25 $GtCO_2e$) of projected 2030 levels based on the SSP2 growth scenario (that is also adopted in this paper) and with current policies, to keep global warming to 1.5°C — consistent with the Paris Agreement to achieve net zero emissions in the second half of the century. The report noted that if only Nationally Determined Commitments for net carbon reduction were fully realized, global carbon emissions could *decline* to be about 6 percent (10 $GtCO_2e$) in 2030 in the current policy case — leaving an implementation gap of around 33 $GtCO_2e$ from the 1.5°C reference case. While the path to transition to low carbon technologies is far from sure, transitions of the scale reported will challenge the frontiers of technology and ways of working in the supply and use of energy. It will also create added demand for finance and resources.

To maintain and improve living standards across all countries, there is a clear need for the introduction of new general purpose technologies for the supply and use of energy, while meeting the stringent demands for lowering of carbon emissions. The EU and Australia, being regions at the frontiers of energy supply and use, jointly have an important role in this broad process. There will be opportunities to deepen research partnerships in frontier research, lower barriers to the transition from the research and development phases to the implementation phase, cooperate on standards for the decommissioning and disposal of spent fuels and facilities, and raise the level of educational achievement consistent with new technologies. As with information and communications technologies (ICTs) and other new general purpose technologies, the greatest social benefit will come from the use of new sources of energy supply. Impediments to efficient research and restrictions on the mobilization of new general purpose technologies through trade barriers and protectionist Intellectual

Property laws would slow the progress of technological change and the introduction of new ways of working. Measures to protect local firms in the supply and use of new general purpose technologies through exclusivity agreements would also be harmful.

7 Capital deepening in the developing world will compete for funding and resources

Despite a near 100 fold increase in fixed capital in China and substantial increases in capital in other non-OECD economies particularly in the Asia-Pacific region over the 55-year period 1960 to 2015, there is a substantial, but variable, gap between fixed capital per person in China and ROW economies and the OECD economies of Japan, USA, the Europe-28 group and Australia (Figure 10).

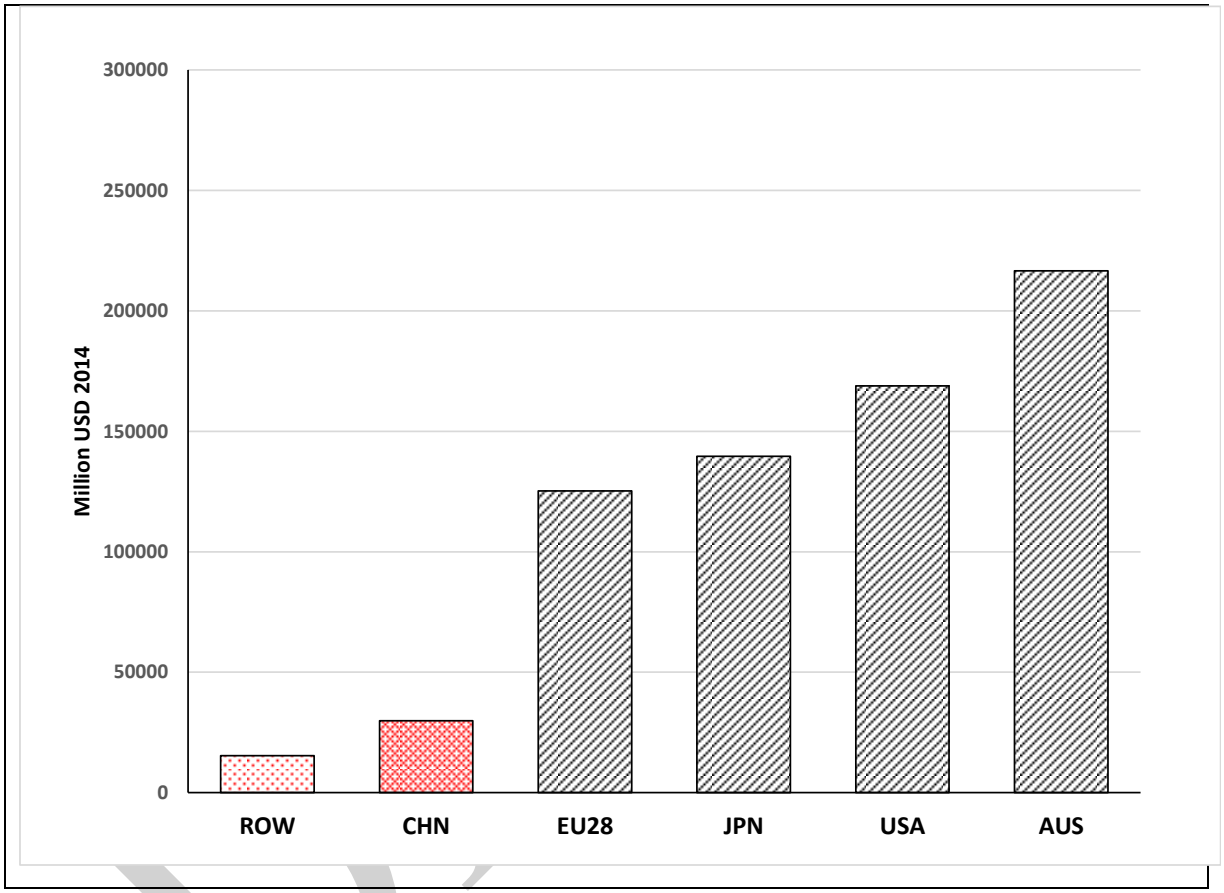

Figure 10: Comparison of fixed capital per person, 2014 (million USD)

Source: Author compilation based on GTAP 10 data (Aguiar *et al.* 2019).

Progressive closing of the gap will have to compete for domestic and foreign savings to fund new capital formation. Closing the gap will also generate competition for resource and produced inputs (including energy, metals and minerals) required to produce investment goods and services. The pressures will extend beyond the building-catch up phase to the operational phase when installed capacity is deployed to provide new goods and services to consumers and maintain and further expand installed capacity. A sense of the scale of future activity on the capital account can be given by a comparison of the hypothetical capital stock and annual investment, if capital per person in non-OECD were to converge to OECD levels. In this hypothetical case, the level of capital in the non-OECD area could be about seven times the current level. In global terms, installed capital would be over four times the current level.

Again, such a parity will take many years to reach and some countries will reach their own parity conditioned by local circumstances, quicker than others. Nevertheless, the convergence

and maintenance process will put competitive pressure on domestic institutions to maintain an attractive local investment environment and international institutions to facilitate the orderly movement of capital between regions. On-going economic growth and capital deepening in both OECD and non-OECD economies would also further raise the level of installed capital relative to current levels and elevate these pressures. At the firm level, business people will confront decisions on whether to invest locally or abroad, including in the EU and Australia as they move up the productivity and scale ladder. With the inevitable increase in scale in two-way direct, portfolio and other investment between regions, payments balances and the monetary system are likely to achieve even greater focus as are international standards for intellectual property and guidelines for cross-border taxation and business conduct.

8 The changing balance of real wealth across regions

Real wealth of regional households comprises holdings in local and foreign fixed capital. The majority of real wealth of regional households is typically held in local fixed capital, although actual proportions vary according to regional circumstances. Using real wealth holdings as an indicator of the footprint of regions in global capital markets, the share of the OECD economies Australia, Japan, the USA and Europe-28 is projected to gradually decline while the relative importance of the non-OECD group is projected to rise (Figure 11). Under the growth assumptions adopted, the footprint of this group in global wealth would rise from around 50 percent in 2020 to nearly 60 percent by 2050. This rise reflects the forward looking assumption that non-OECD countries in the ROW will continue to achieve real output and income growth on average higher than OECD countries.

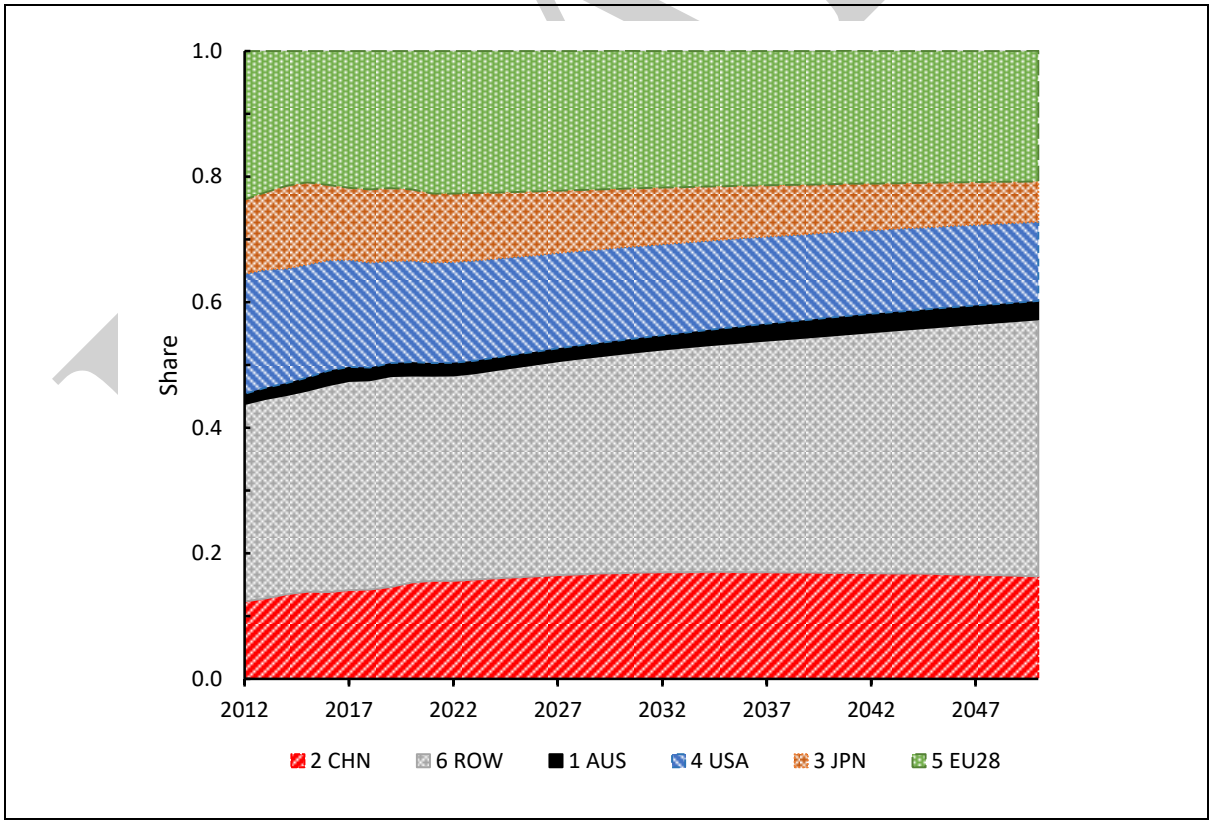

Figure 11: Balance of real wealth holdings across regions, 2012 to 2050, shares

Source: Author estimates based on GDyn-FS projections.

Projections of the relative contribution between regions, however, is sensitive to the growth assumptions adopted, particularly between China and the ROW regions, but less so between these regions and the OECD regions Europe 28, Japan and Australia. For example, forward projections of growth for China vary. Foure et al. 2010 and Fontagene et al. 2021 in a medium growth scenario estimate GDP growth for China would converge towards between 2.65 and 3.35 percent in 2050 while Au-Yeung et al. (2013) estimated average annual growth for China over the decade 2040 to 2050 of 2 percent per annum. These estimates compare with 1.11 percent based on the medium growth scenario in Dellinck et al. (2017) and adopted in this paper. A higher growth rate than assumed Dellinck et al. (2017), would likely raise the contribution of China to global real wealth and the combined share of China and ROW regions. More broadly, progressive convergence of developing economies towards per capita income and wealth levels in developed economies would raise the share of global wealth held by developing economies towards the share of those economies in global population. With the current global population distribution, full convergence would be accompanied by China and the ROW regions holding around 80 percent of global wealth. The share of real wealth holdings could be even higher based on forward population projections and well above the forward projections shown above.

9 Some implications for the evolution of EU-Australia economic cooperation

EU-Australia economic cooperation in the foreseeable future is likely to evolve in an environment in which the economic gravity between regions is changing and potentially substantially so. Projections presented in this paper suggest the footprint of Europe-28 economies in global trade will decline and that Australia's trade focus will be drawn away from Europe and other 'traditional' markets towards wider global markets while the Europe-28 regional group may be indirectly drawn closer to Australia, but not vice-versa. Nevertheless, common elements of high regulatory standards and similar stages of economic development will remain and are likely to naturally support a closer broader economic relationship through exchanges of technology and ways of working, educational achievement, and international decision making. While benefits should accrue from trade and commerce between the regions, they are likely to be most evident and rewarding through wider cooperation that encourages all countries to reach their productive potential both domestically and through international trade and commerce. In this setting, there will be a premium on non-discriminatory multi-lateral, plurilateral and open regional institutions that promote cooperation and a non-discriminatory order globally.

Preparedness in the Europe-28 economies, Australia and more broadly for future shifts in economic gravity places a policy premium on domestically-led behind the border reform favouring policies that: (i) increase the competitiveness of domestic firms in existing and new global markets; (ii) lower the cost of trade in a non-discriminatory manner across markets (including through lowering remaining MFN tariffs and NTBs); and (iii) avoid undue impediments to trade (such as bilateral and regional trade tensions and protectionism, regional conflicts, and preferential rules of origin on goods and services). It also places a premium on non-discriminatory multi-lateral, plurilateral and open regional institutions that promote cooperation and a non-discriminatory order at the global level versus institutions that focus on preferential bilateral and regional arrangements that may divert resources from their most productive use and contribute sticking points for wider cooperation.

Efficient development and exchange of new technologies and ways of working will be important in satisfying growing energy needs of economic development not just within global resource constraints but also without causing undue damage to the environment through emissions, pollutants, expansion of the built environment and waste. Preparedness for future

trade and capital deepening across the globe will place a premium on monetary and payments systems that effectively support international trade and commerce across a broadening base.

These multilateral influences will be important in setting the context of EU-Australia economic cooperation into the foreseeable future, as well as development opportunities in the respective regions.

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