

Historical validation of saving and trade intensities using the GDyn-FS model and historically informed baseline projections

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(Not for quotation or circulation; Comments welcome)

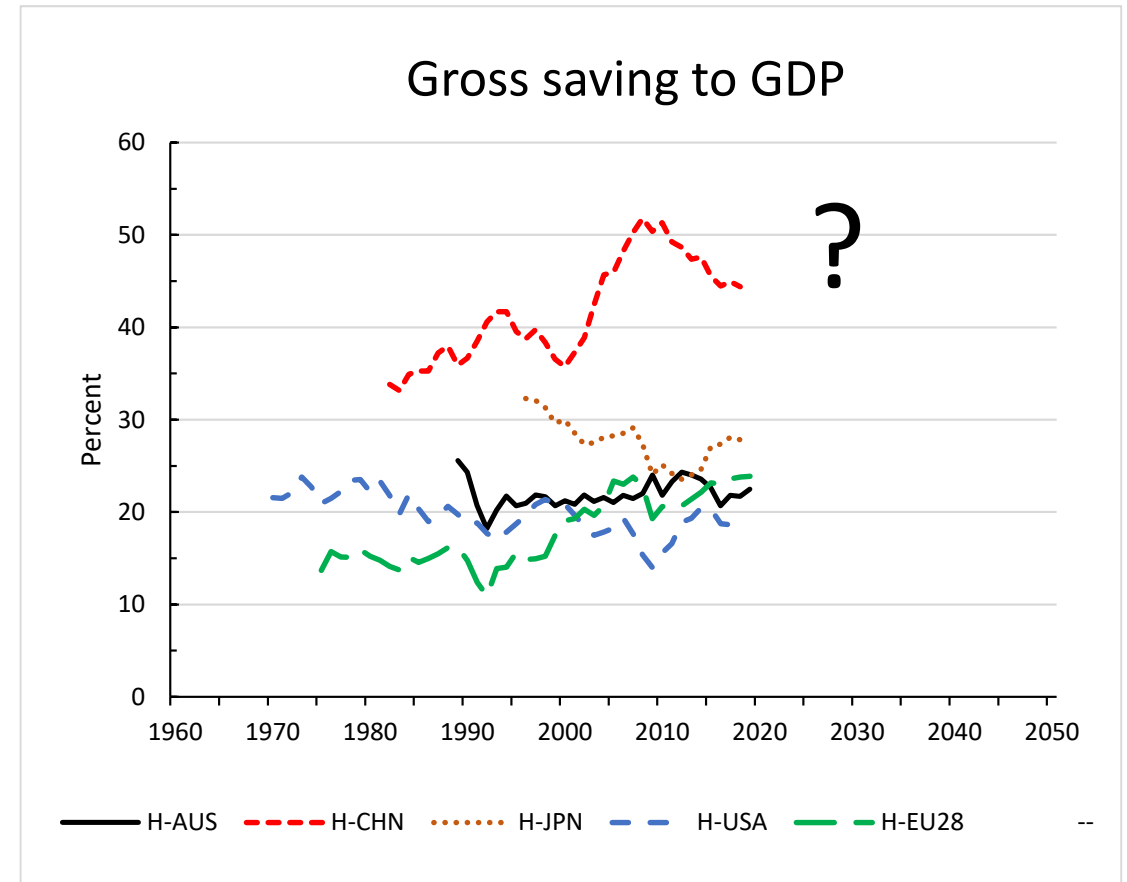
Abstract

Following the GFC growth in global trade has been sluggish with recent trade tension providing doubt as to whether these trends will change any time soon. This paper looks at possible alternative future trade growth scenarios and what these may mean for trade policy formation at the national, regional and global levels. To support the formation of the baseline for this analysis, the capabilities of the dynamic GDyn-FS model are enhanced to: (i) target saving and trade intensities over the historical period; and (ii) gradually adjust to longer-run target values based on historical trends and theoretical projections. The projections suggest 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 trade to income elasticity of nearly 1.2. Projections of the Brown-Kojima-Drysdale regional trade intensity indexes indicate a potential for substantial re-orientation of the trading relationship between regions. Effective domestic reform and non-discriminatory trading protocols are likely to be most beneficial for realizing potential trade and associated income growth.

Structure of presentation

- Background
- Targeting saving rate and trade shares of regions
- From historical validation to forward projections 2012-2100
 - Projections trace the progress of globalization with the assumed rates of saving within regions, import tolerance and permitted trade balances
- How the trade intensities of regions' are projected to change
- Conclusion and implications for policy

Uncertain future – Recent trade growth flat, China's saving rate well above average



Previous enhancements to GDyn-FS to model progress of globalization

- Extended partial adjustment rules for accumulation to: (i) provide LR model stability; (ii) allow for regional differences in institutions and risk
- Elemental treatment of adjustment costs in capital accumulation and use
- CET/CES theory for modelling mobility of capital between regions
- CES theory for modelling regional household consumption-saving choices
- Twist variables for modelling changes in behaviour/short-run adjustment

Extended capabilities achieved model stability and greater flexibility to model economic change

- Papers available at:

https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=5484

https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=5741

New enhancements to focus on evolving saving and trade intensities

- Target saving and trade intensities over historical period – 2012 to 2019
 - Saving adjusted from GTAP to System of National Accounts basis
- Project gradual adjustment to baseline target values
 - 2020 to 2100 adopted as baseline projection period
- Project Brown-Kojima-Drysdale trade intensity indexes by region to 2050 and beyond
- Supporting data
 - Historical data from World Bank World Development Indicators, ILO labour market data
 - Forward data from (i) IMF World Economic Outlook, ILO projections (ii) Shared Socioeconomic Pathways medium growth scenario (SSP2)

A summary database used – 2011 reference year (GTAP9a)

6 regions

Australia (AUS)
China (CHN)
Japan (JPN)
United States (USA)
European Union (EU28)
Rest of the World (ROW)

13 industry sectors

Grains, Crops, Forestry
Livestock, fishing
Mining
Processed food
Textiles and clothing
Light manufacturing
Heavy manufacturing
Utilities
Construction
Transport and communication
Financial services
Other services
Ownership of dwellings

5 primary factor inputs

Land
Natural resources
Skilled labour
Unskilled labour
Capital

Lagged adjustment approach to target
regional saving rates and trade shares

Target: Gross saving, Exports, Imports and the BoT as a share of GDP

- Key national accounting identities

$$GDP = C + I + X - M = GNDY - R \quad (1)$$

$$C + S = GNDY \quad (2)$$

$$C + NS = NNDY \quad (3) \quad \text{where } NS = S - D$$

$$\begin{aligned} BOT &= X - M = NL - CR - KT \\ &= S - I - CR - KT \end{aligned} \quad (4)$$

- Issues
 - Saving/GDP targeted indirectly via 3
 - Negative value problem (Saving, BoT) – need to index shares to 1
 - Saving definition problem – need to convert GTAP saving to SNA basis
 - Selection of slack (endogenous) variables
 - Have ‘Own-target’ and ‘Interaction’ (CGE) effects

Adopt a **flexible** partial adjustment process

- Required **G**rowth in Actual rate to align Actual with Target **value** by region

Gap closed gradually through partial adjustment process

Test: *IF* $FLAG_r = 1$

$$RG_{-}R_r = \left(\frac{RTARG_r}{R_r} \right)^{\lambda_r}$$

Gap closed in single year (or endogenous RTARG)

Test: *IF* $FLAG_r = 0$

$$RG_{-}R_r = \left(\frac{RTARG_r}{R_r} \right)$$

$0 < \lambda_r < 1$ is the **partial adjustment factor**

Implicit $\lambda_r = 1$

- Target rate/shares ($RTARG$)
 - In base year, determined from data and added to base-year database
 - Updated in each baseline year: Up to 2019 updates based on actual data; Post-2019 based on projected (long-run) values
- Actual rates/shares (R)
 - Simulated over historical and forward projection periods
- Slack variable must be selected to close the model

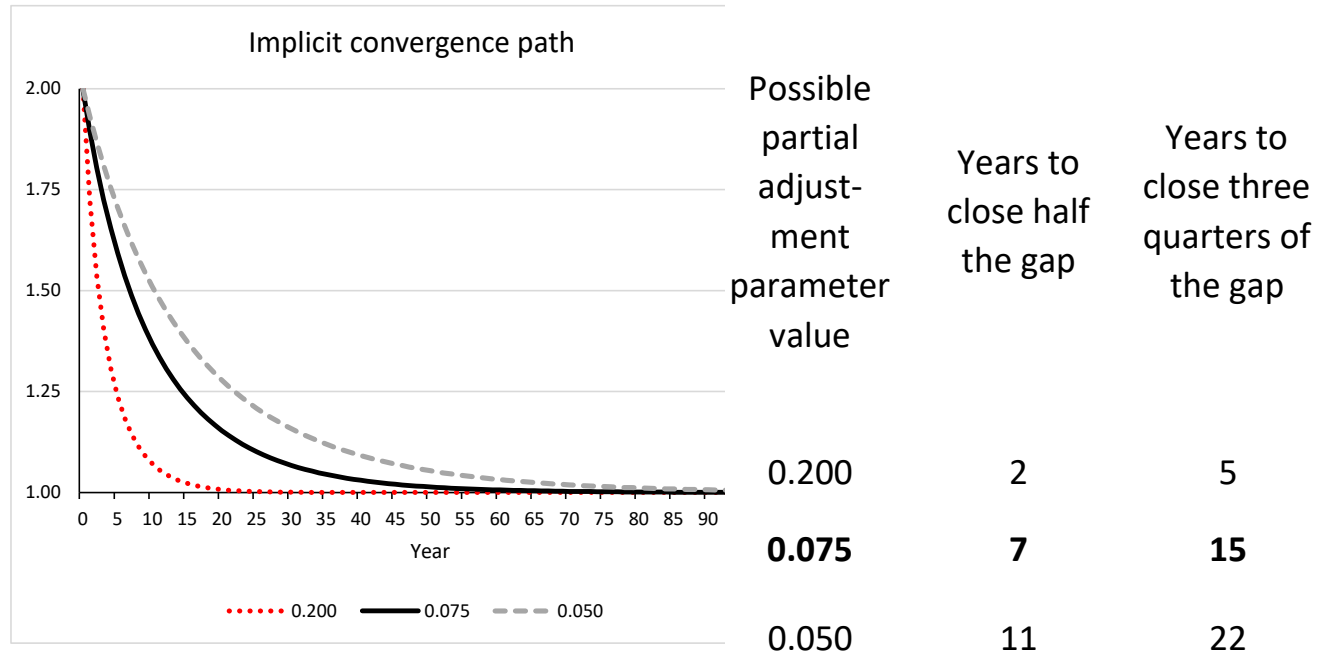
Closing the model: from historical validation to forward projections

- *Saving behaviour* (r regions) [Historical **TARGETED** | Forward: **TARGETED**]
 - *Required change in Saving to GDP share determined*
 - *Slack variable: Regional consumption-saving twist variable - twistcs(r)*
- *Import tolerance* (r regions) [Historical **TARGETED** | Forward: **TARGETED**]
 - *Required change in Imports to GDP share determined*
 - *Slack variable: Import augmenting technical change variable - ams_ir(r)*

Permitted trade balance

- *Export intensity* (r-1 regions) [Historical **TARGETED** | Forward: **SLACK**]
 - *Required change in Exports to GDP share determined*
 - *Slack variable: Regional h'hold foreign-domestic financial holdings twist variable - twistft(r) (proxy for Net Lending)*
- *Balance of trade* (r-1 regions) [Historical **SLACK** | Forward: **TARGETED**]
 - *Required change in BoT to GDP share determined*

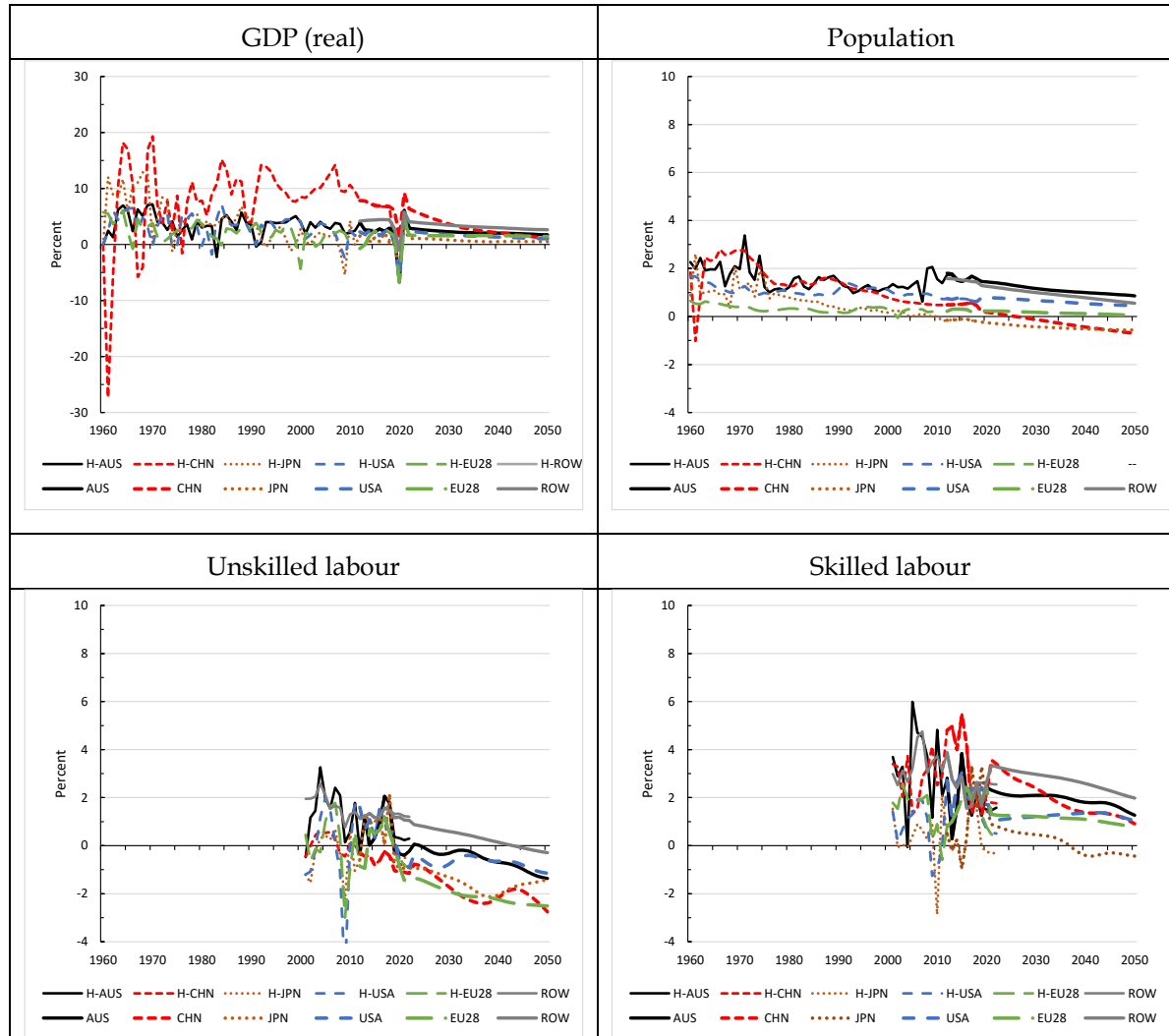
Adjustment parameter λ setting



- Parameter of 0.075 adopted
- Broadly consistent with CHN trend post peak of ~50%
- Does not explain how data point was reached
- Comparisons:
B&S-i-M – 0.05
GDyn RoR – 0.2

From historical to forward
baseline projections
2012 to 2100

*Labour productivity and population growth given by data, historical to 2019, projections 2020 forward



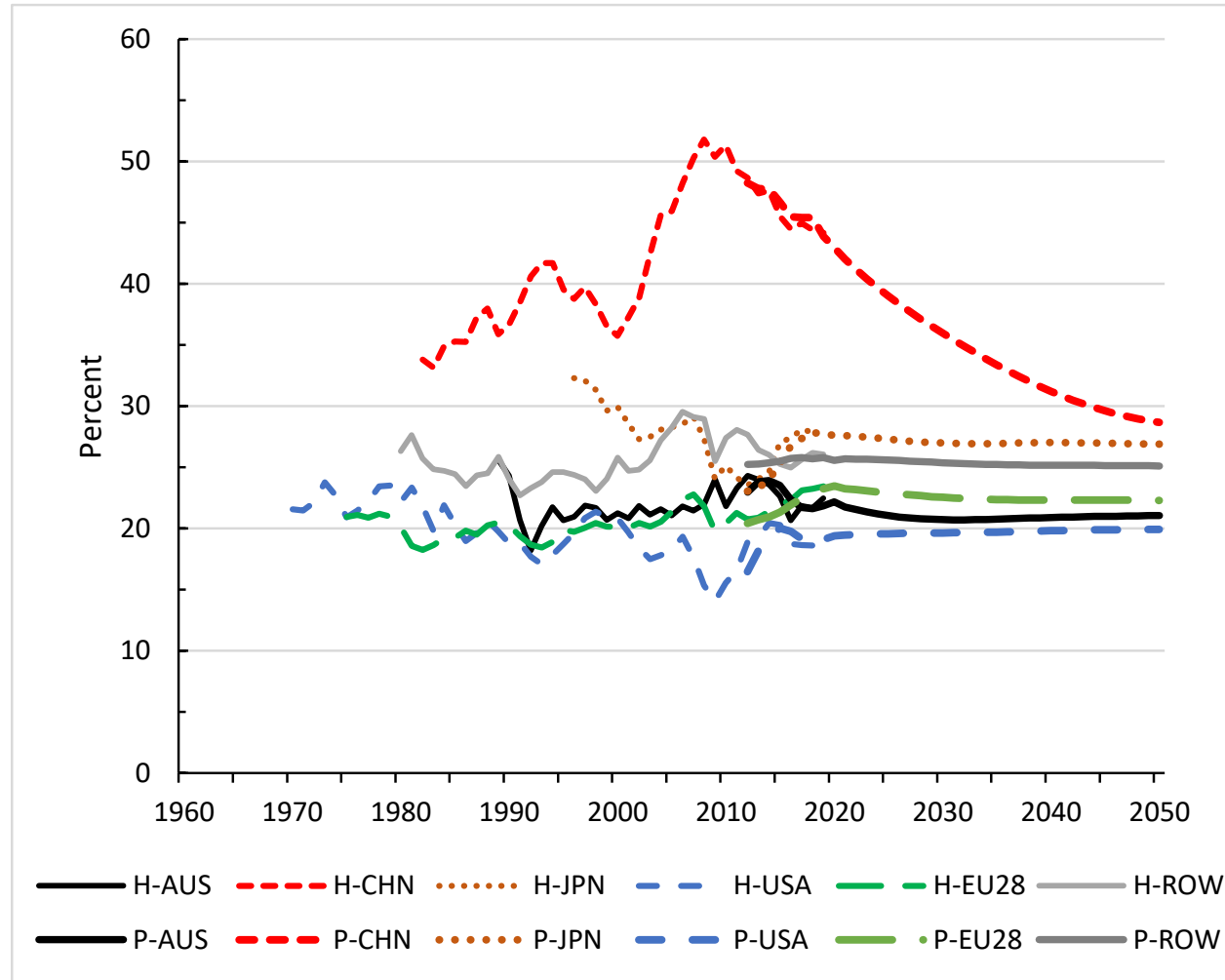
- Key points

- GDP growth for China high but declining; ROW above average over period
- Population growth low and declining across regions
- Skilled-biased labour input growth projected across regions
- High yr-to-yr variability in historical data
- SSP2 projections used for LR baseline, others possible

Sources: WDI, ILO, IMF, SSP2 (LR projections), Author estimates.

Gross saving to GDP, 1960 to 2050

- China projected to converge towards average



- Historical validation 2013 to 2019
- Forward projections 2020 to 2100 (2050 shown)
- All regions targeted
- Calibrated to reach target ~2050
- Slack variable: Consumption-Saving Twist (twistcs)

Sources: WDI, Author estimates/projections.

Potential increase in trade openness more complicated – three tops-down scenarios considered

- **Scenario 1: Medium increase – central case**

- Export shares in GDP
 - Common criteria except China and ROW: 2019 value *uplifted by 10%*
 - China: Export share the average of Japan and the USA
 - ROW: the 2019 value *uplifted by 10* percent PLUS close half projected gap with EU28
- BoT shares in GDP: Average across data years (circa)1960 to 2019
- Import share: Target Export share *less* target LR BoT share

- **Scenario 2: Lower potential**

- Scenario 1 with Uplift of 2.5%; ROW does not close gap with EU28

- **Scenario 3: Higher potential**

- Scenario 1 with Uplift of 20%; ROW closes 75% of gap with EU28

Global exports to product, 1960 to 2050

- Scenarios give difference growth paths

Implied trade to income elasticities

Trade potential	Average 2020-50
Low	1.00
Medium	1.16
High	1.29

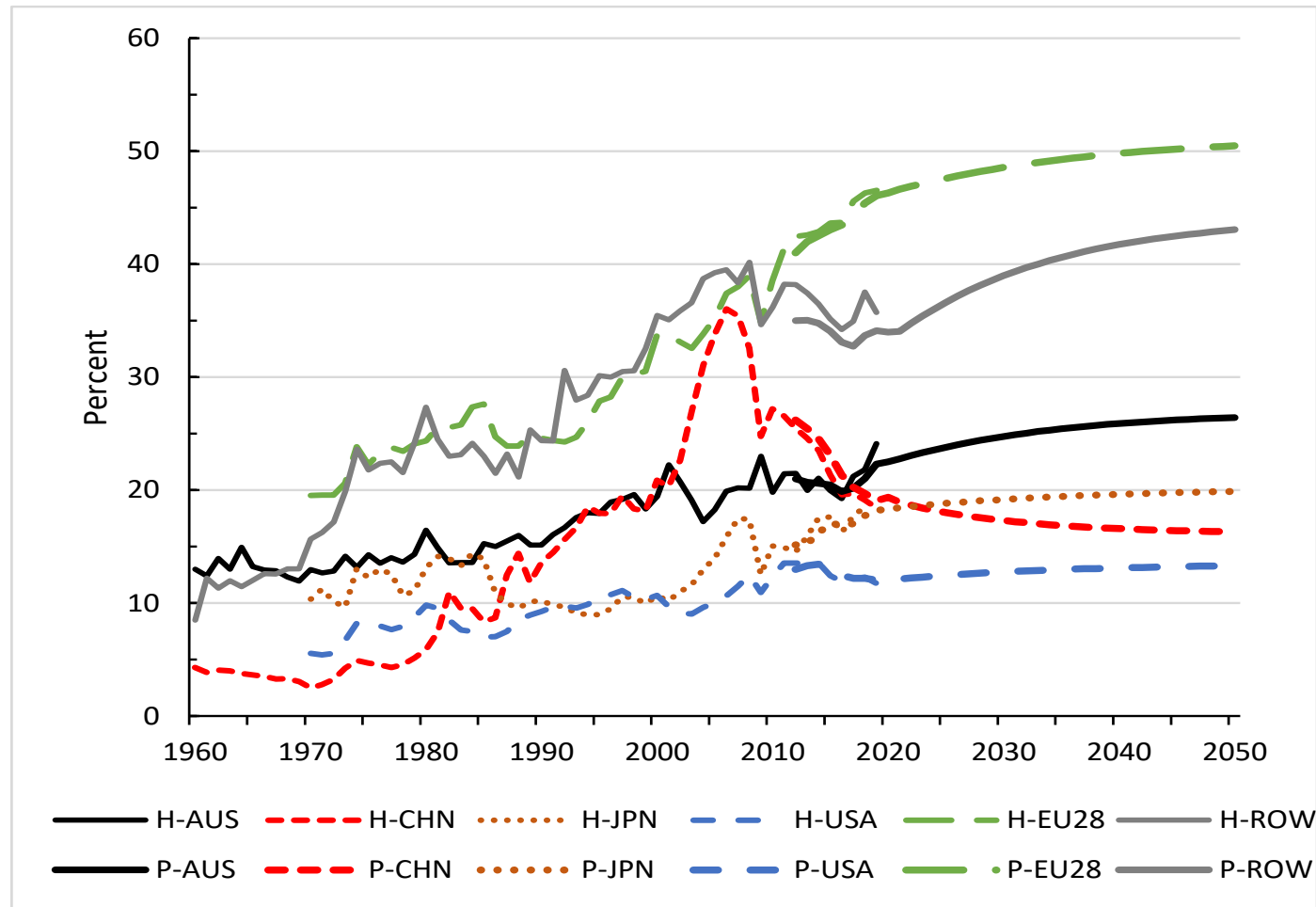
Calibrated to reach target
~2050

Compares to 1.29 for yrs
2011 to 2040 in Bekkers et
al. (2020:308) using
bottoms-up method



Sources: WDI, Author projections.

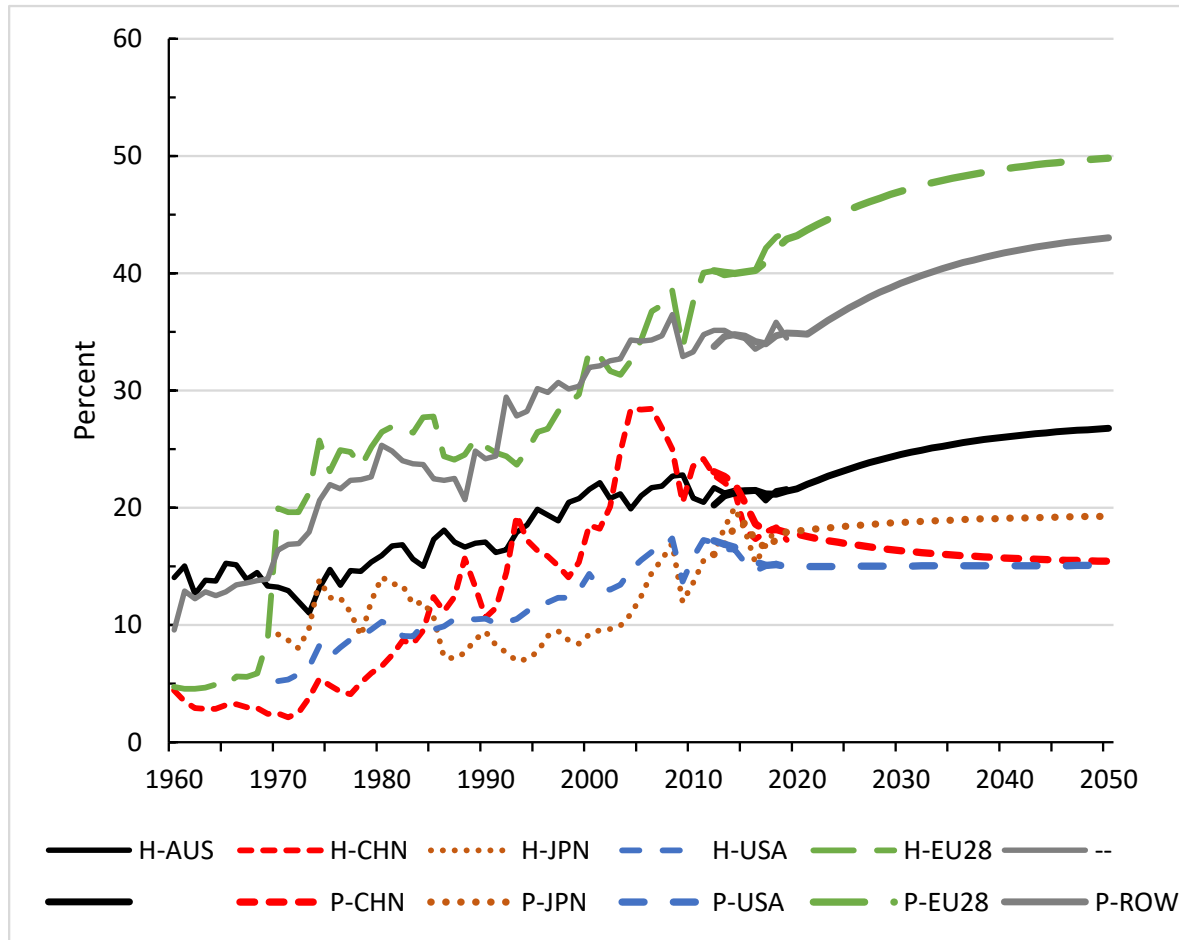
A regional perspective on **Export** growth potential – medium-potential scenario



- n-1 regions targeted (ROW slack)
- Exports targeted directly 2012 to 2019
- Targeted indirectly via BoT 2020 to 2100
- Slack variable: Regional household firm-trust twist (twistft) – a proxy for net lending

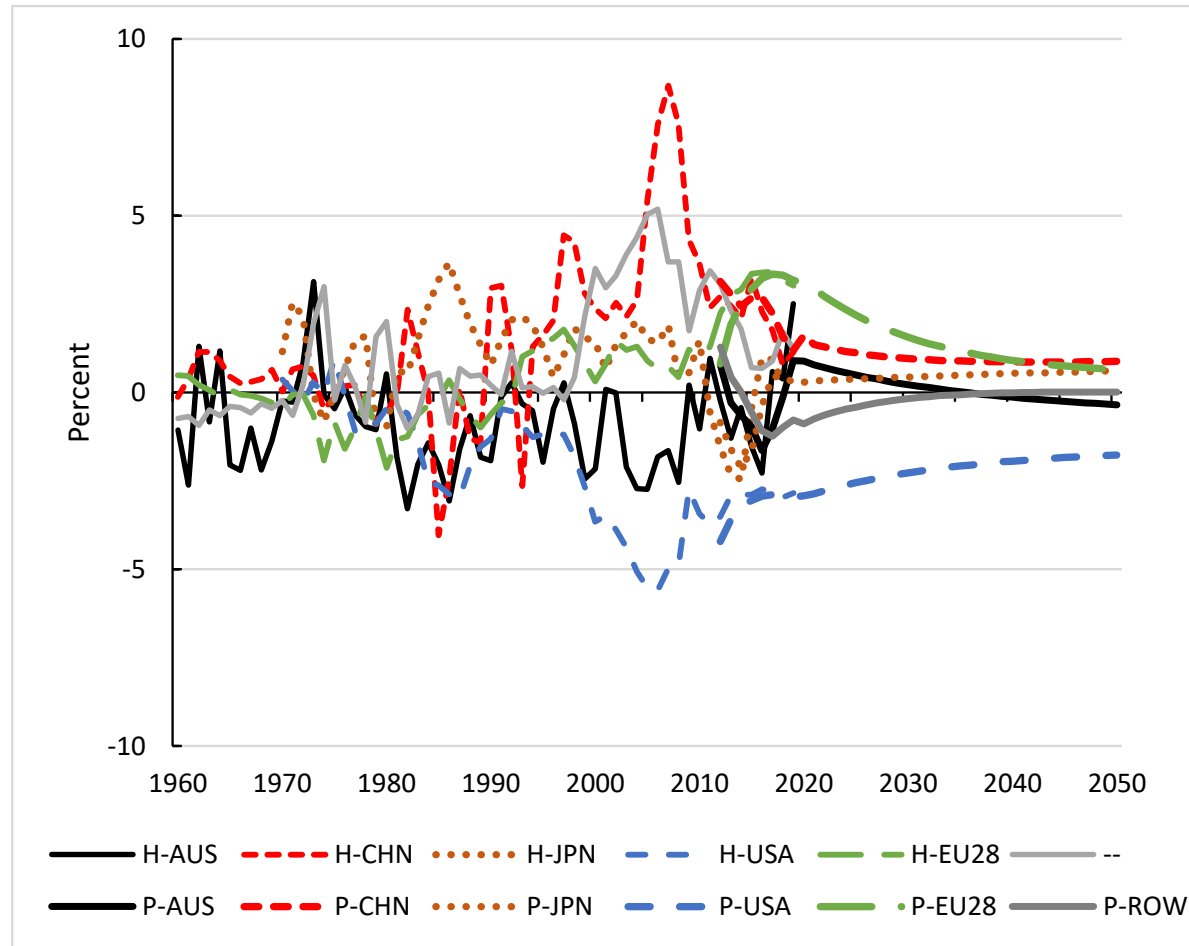
* A regional perspective on regional **Import** growth potential – medium growth scenario

- All regions targeted
- Slack variable: Import augmenting technical change (ams_ir)



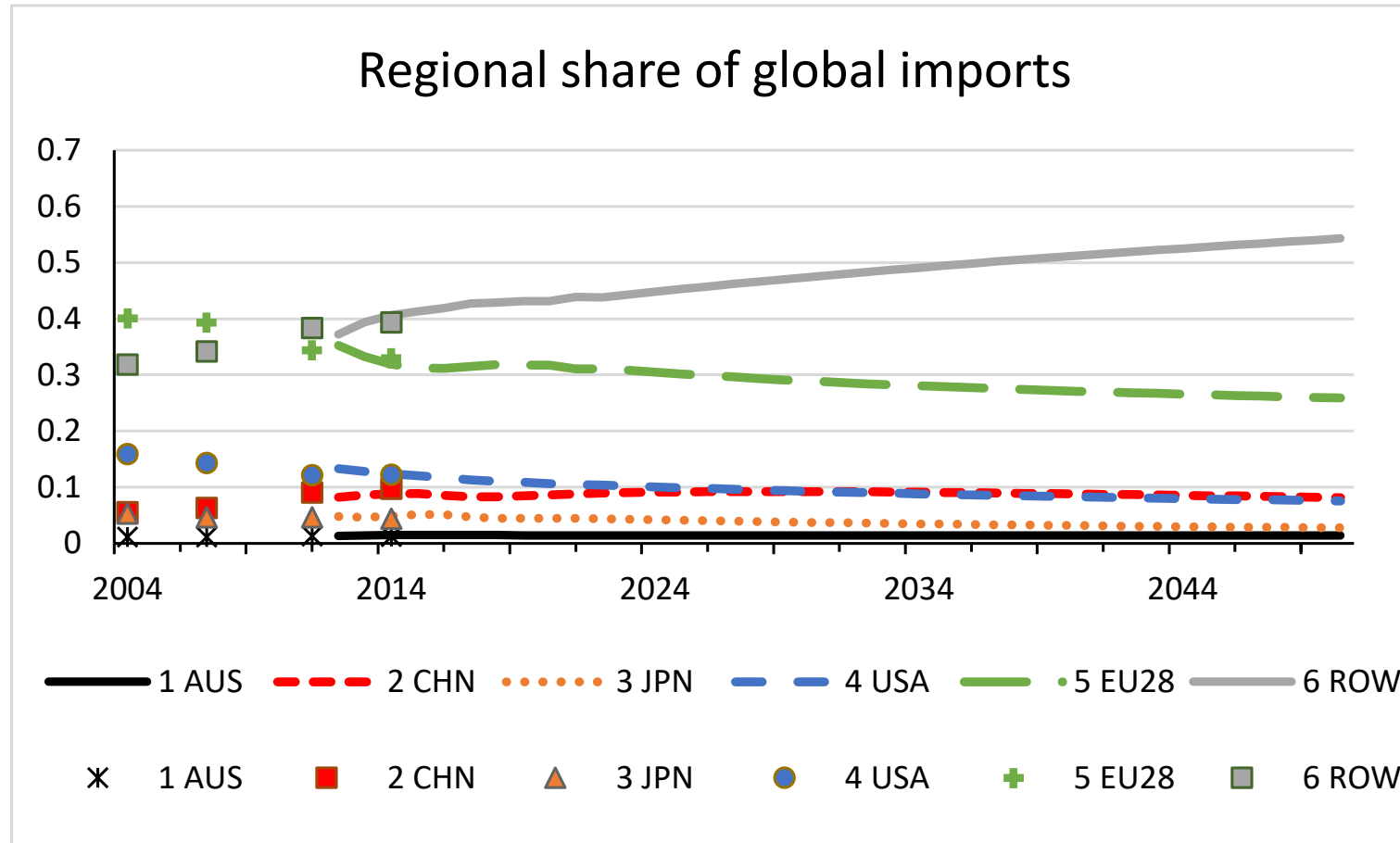
Source: WDI; Author projections.

A regional perspective on regional BoT



- n-1 regions targeted (ROW slack)
- Targeted indirectly via Exports 2012 to 2019
- Targeted directly 2020 to 2100

Regional share of global imports (TII index denominator) – medium trade-potential scenario



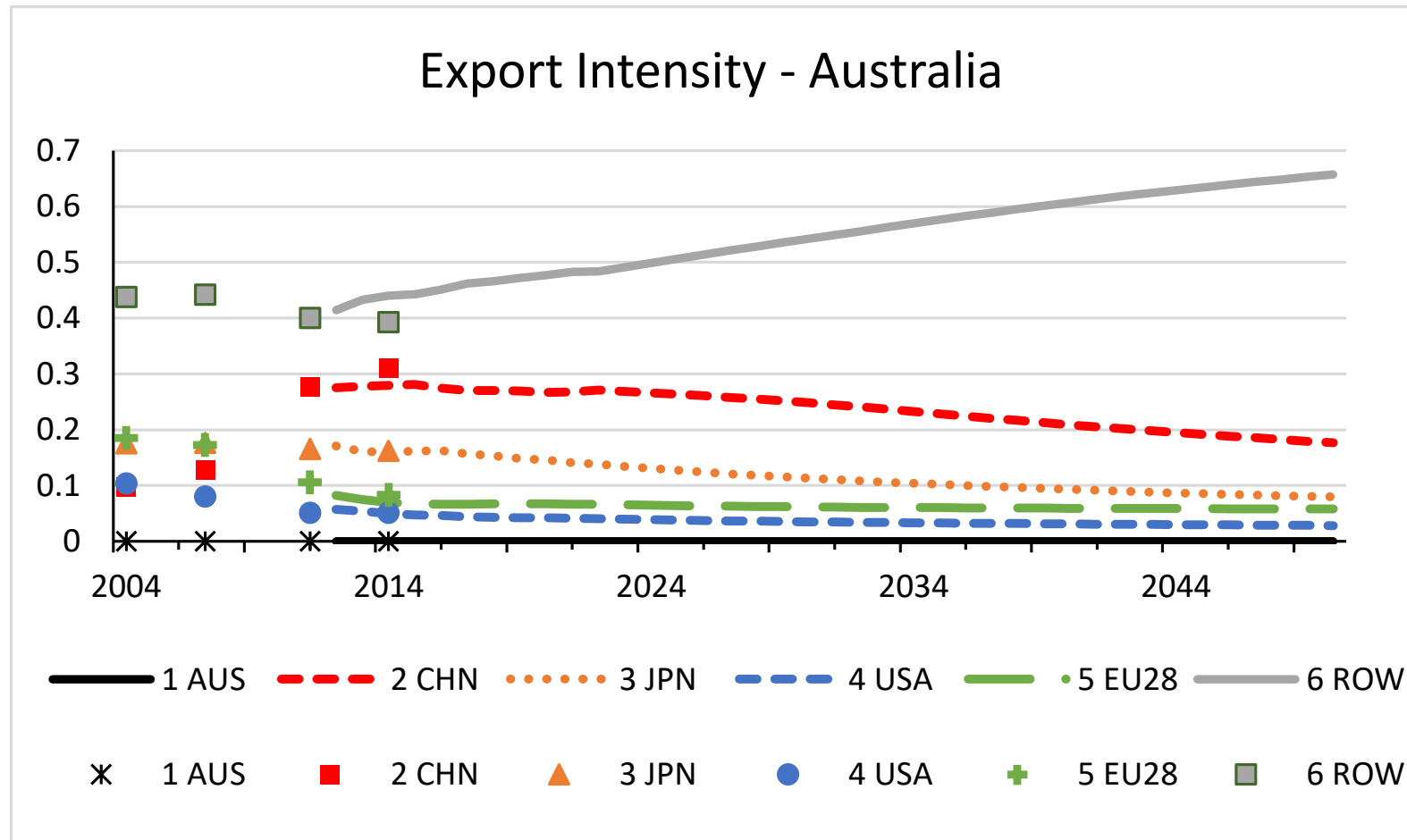
- ROW projected to expand share
- Reflects
 - relatively high GDP growth (raising import demand)
 - higher import intensity including via high level of intraregional trade
- Europe footprint declines - relatively

How regional trade intensities are projected
to change

*Implications for intensity of trade between regions

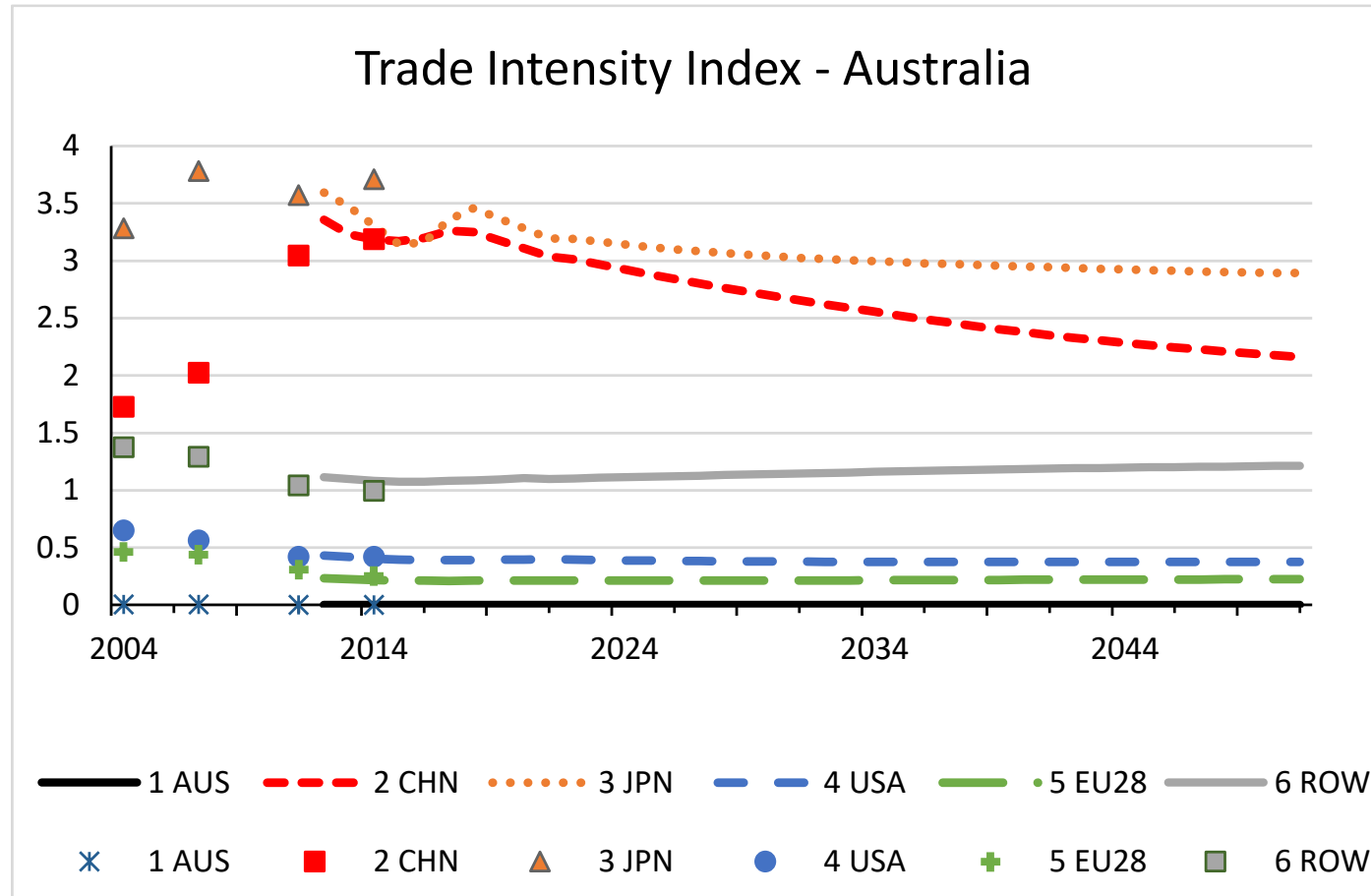
- Adopt Brown-Kojima-Drysdale index
 - Measure of the relative trade connectedness (a proxy for trade resistance)
- Defined as: $TII_{rs} = \frac{X_{r,s}}{X_r} / \frac{M_s}{M}$ between exporting region r and importing region s
- Scale
 - $TII = 0$ indicates no trade connectedness between r and s
 - $0 < TII < 1$ less than average trade connectedness
 - $TII = 1$ average trade connectedness
 - $TII > 1$ above average trade connectedness
- Novel features of application
 - Index calculated over all goods and services
 - Projected forward over baseline

*Regional share of Australian exports (index numerator) – medium-potential scenario



- Share of exports to ROW rises with higher growth & increased import demand by region
- Share of exports to CHN and JPN projected to decline, less so EU28 and USA

*Relative connectedness of Australia to China, Japan projected to decline; ROW to increase



- Exports to JPN and CHN not keeping pace with trade footprint of those partners
- Exports to faster growing ROW more than keeping pace

Concluding comments and policy implications

- Model stable for full period of longer run base lines (and beyond)
- Possible to:
 - Track year-by-year key structural ratios across historical period
 - And closely target key ratios over the forward projection period
- Provides basis for more nuanced baseline projections
- There is clear potential for a shift in economic gravity towards ROW regions
 - Places policy premium on domestic policies that: (i) increase competitiveness of local firms in existing and *new* global markets; (ii) lower the costs of trade across markets; and (iii) avoids undue impediments to trade (eg bilateral trade conflicts; RoO)
 - Highlights importance of effective non-discriminatory multilateral, plurilateral & open regional institutions vs preferential bilateral and regional arrangements