

Achieving current account balance in long-run projections of the global economy using a dynamic multi-region/multisector global CGE model

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Paul Gretton

East Asia Bureau of Economic Research, Crawford School and

Centre of European Studies

The Australian National University

(Includes preliminary projections; Not for quotation or circulation; Comments welcome)

Abstract

A dynamic version of the GTAP model characterised by a stable long-run baseline became available in 2021. This dynamic model, known as GDyn-FS, builds on the earlier GDyn model released in 2012 to, amongst other things, project a stable long-run baseline with non-convex adjustment costs. In a longer-term dynamic environment, however, without explicit modelling, current account balances across regions as a proportion of GDP can deviate from initial values without bounds. Such deviations are contrary to commonly regarded policy bounds on such balances of between 2 and 5 percent of GDP. This paper further develops the GDyn-FS model to ensure that current account balances as a proportion of GDP remain within predetermined target values across projection periods reaching as far as 2100 and beyond, while ensuring capital inflows are matched at a global level by capital outflows in each year. For this modelling, the reference (or target) values for current account balances across regions may be drawn from historical experience or postulated on the basis of expectations regarding the course of economic development across countries or regions. The development provides a viable and policy focused method for the projection of long-run baselines inclusive of conventional foreign account constraints and the analysis of the progression of regional economies and trade and investment between regions through time. Some key areas for further research are identified.

Broad theme

Accelerating economic transformation and diversification in the global economy can be accompanied by the build-up of current account imbalances. This potential is of policy and economic importance to discussions of how countries and regions may evolve to reach their longer-term growth potential while satisfying external balance constraints, and how effective trading and financial relations may evolve between countries and regions with differing social, legal and commercial traditions. This matter is of heightened importance as the balance of global economic gravity evolves.

Structure of presentation

- Overview of GDyn-FS, applications and extension to this study
- Focus and basic framework
- Modelling approach
- Historical data and modelling scenarios
- Some key results
- What achieved, some policy implications and further investigations

Overview of the GDyn-FS model

- Multi-region, multi-sector *dynamic* global general equilibrium model in GTAP family
- Novel features of FS variant
 - Projects a stable long-run base line with non-convex adjustment costs
 - Includes a rate of return rule for the allocation of saving between regions
 - Relaxes the assumption of fixed shares for consumption-saving decisions
 - Exhibits imperfect mobility of factors across activities within regions
 - Relaxes Leontief technology in intermediate input use
 - Includes exogenous national consumption-saving choices and trade intensities
 - Can compare projected saving/trade intensities in a target year (eg 2050) with shares in a benchmark year (eg pre-COVID year of 2020)

Policy-related applications of GDyn-FS

- Effects of a decline in desirability of investing in Australia (2021) at: <https://onlinelibrary.wiley.com/doi/10.1111/1467-8462.12441>
- How vulnerable is Europe to severe climate-related natural disasters abroad? (2022) at: <https://ageconsearch.umn.edu/record/333438/?v=pdf>
- The multilateral context of EU-Australia economic cooperation (2023) at: <https://www.niesr.ac.uk/publications/multilateral-context-european-and-australian-economic-cooperation?type=global-economic-outlook-box-analysis>
- Potential impacts of lower air transport prices in Australia (2023) at: <https://eaber.org/wp-content/uploads/2023/12/Modelling-the-potential-impacts-of-lower-air-transport-prices-in-Australia.pdf>
- Prospective Impacts of Brexit presentation to NIESR (2023) based on 'Towards a Framework for Trade and Investment Policy in post-Brexit United Kingdom' presentation based on: <https://cepr.org/brexit-and-trade-choices-papers-and-slides>
- Projecting the long-run impact of an economic reform: the case of the Indonesian Omnibus Law (2024) at: <https://onlinelibrary.wiley.com/doi/10.1111/apel.12428>

This study

- Extends the targeting of the saving/GDP and Trade/GDP (Gretton 2021, 2023)
 - To allow targeting of CAB/GDP via either the saving rate or investment
- Anchors firmly to WDI/SNA definitions and data
- Adopts a lagged adjustment process
- Uses a scenario approach to provides targeted projections of CAB/GDP to 2100
- Referenced to 2011 base year with: (i) historical projections 2012 to 2021; (ii) medium-term projections 2022 to 2028; (iii) forward long-run projections to 2100

Focus on national economic identities

$$\begin{aligned} GDP &= C + I + X - M \\ &= GNDY - CR - T \end{aligned} \quad (1)$$

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

$$C + GS = GNDY \quad (3) \quad \text{where } GS = S + D$$

$$BOT = X - M = CAB - CR - T \quad (4)$$

$$CAB = S - I = NL \quad (5)$$

A flexible dynamic lagged adjustment process adopted to target policy coefficients

- **Required Growth to align Actual with Target **value** by region**

Gap closed through lagged adjustment process

Gap targeted in annual simulation

(or endogenous RTARG)

Test: IF $FLAG_r = 1$

Test: IF $FLAG_r = 0$

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

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

$0 < \lambda_r < 1$ is the **partial adjustment factor or scale of convergence**

Implicit $\lambda_r = 1$

- Implement in percentage change form for all targeted variables

- $RRG_{R_r} = 100 * \lambda_r * \ln \left(\frac{RTARG_r}{R_r} \right)$

Integration of dynamic adjustment process into GDyn-FS

- Base-year reference (target) rates need to be conjectured and added to database
 - Rates in 2011 base-year database calibrated to WDI estimates
 - Update in each simulation year: 2012 to 2021 based on WDI data; 2022 to 2100 based on long-run target value mediated by scenario-specific targeting rules
- Need to
 - Complete database accounting of CAB – through addition of transfers
 - Translate target Gross saving rates to Net basis – to reconcile WDI benchmark information with GDyn-FS theory
 - Index Saving, BoT & CAB to unity – to avoid fatal divide by negative number errors

Model database

6 regions

Australia (AUS)
China (CHN)
Japan (JPN)
United States (USA)
European Union +1 (EU28)
Rest of the World (ROW)

13 industry sectors

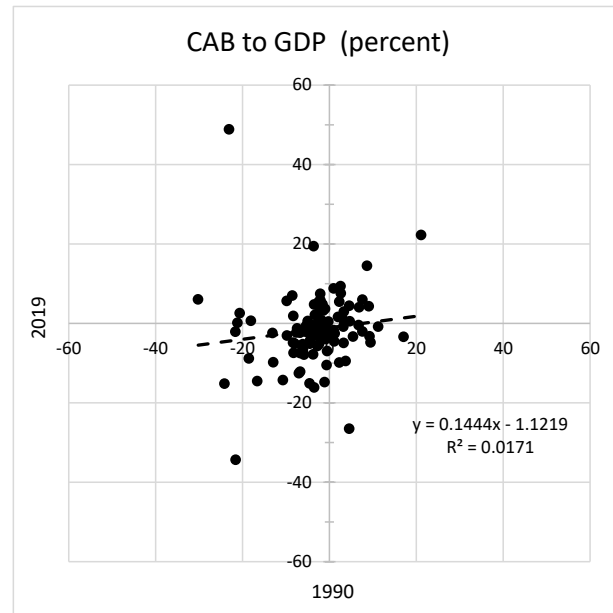
Grains, Crops, Forestry
Livestock, fishing
Mining
Processed food
Textiles and clothing
Light manufacturing
Heavy manufacturing
Utilities
Construction
Transport and communication
Financial services
Other services
Ownership of dwellings

5 primary factor inputs

Land
Natural resources
Skilled labour
Unskilled labour
Capital

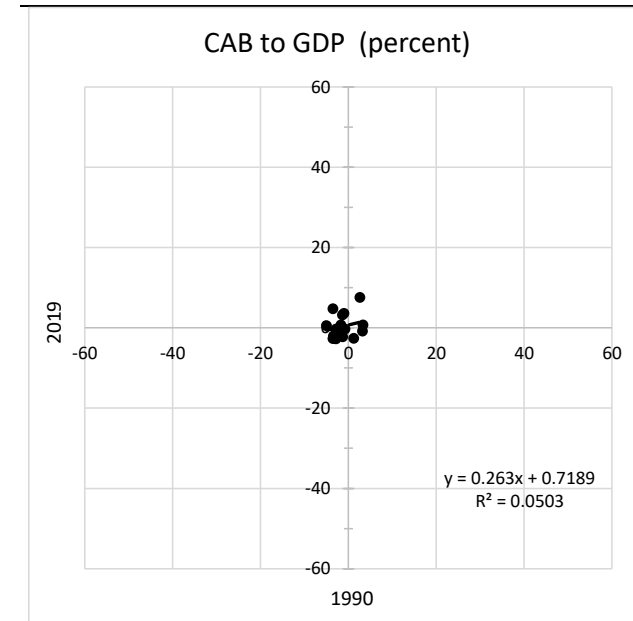
Considerable variation in country experience

CAB to GDP dispersed across countries



(no. of observations 115 of a population of 271)

Systemically important G20 economies relatively concentrated



(no. of observations 16 of a population of 19 countries)^a

Some observations from the literature

- Policy and empirical literature separates evolution of CABs in times of economic crisis from the business-as-usual case.
- It is not prescriptive about the level of a current account balance as a share of GDP
 - Other than a prevailing balance or trend that does not in itself, lead to economic crisis.
- Literature is also not prescriptive as to an appropriate balance that may be displayed by an economy over time
 - Although it does suggest that current account positions are likely to be moderately persistent or slow moving over time
 - Actual levels determined by country characteristics

Scenarios approach adopted to illustrate possible trajectories of CAB to GDP

Scenario 1 : Passive BoT and CAB policies

- Historical (WDI,ILO)
- Medium-term projections (IMF,ILO)
- LR growth GDP, pop, labour (SSP2)
- Conjectured LR Gross Saving to GDP rate
- BoT & CAB to GDP slack

Scenario 2: Active BoT and passive CAB policies

- Scenario 1 plus
- Trade growth scenario equivalent to global trade to income elasticity of ~ 1.2 from 2022 to 2050
- Regional BoT to GDP targeted based on historical averages
- CAB to GDP slack

Scenarios with active CAB to GDP policies

Scenarios 3 – Active CAB policies via Saving rate

- Scenario 2 with trade scenario relaxed at 2050
- From 2051
 - BoT to GDP slack for r regions
 - Regional CAB to GDP targeted based on historical averages ($r-1$ regions)
 - Gross saving rate (SAVEG/GDP) slack

Scenarios 4 – Active CAB policies via Attractiveness to invest

- Scenario 3
- From 2051
 - Required return on capital (RoR) slack

Historical relativities inform hypothetical longer-run region-specific target rates

... Regions fall into categories of net lender or borrower

Scenario approach used to assess: (i) how CAB to GDP may evolve and (ii) whether active policies can draw projected to target values

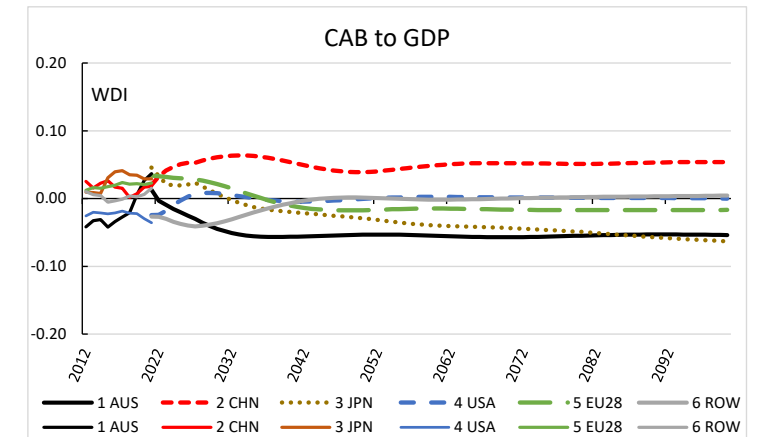
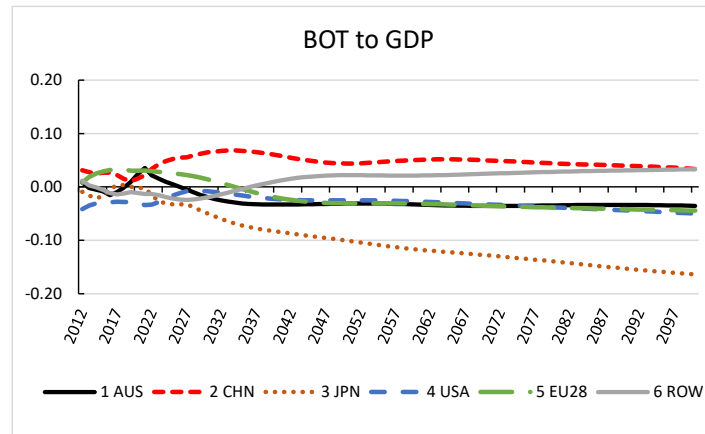
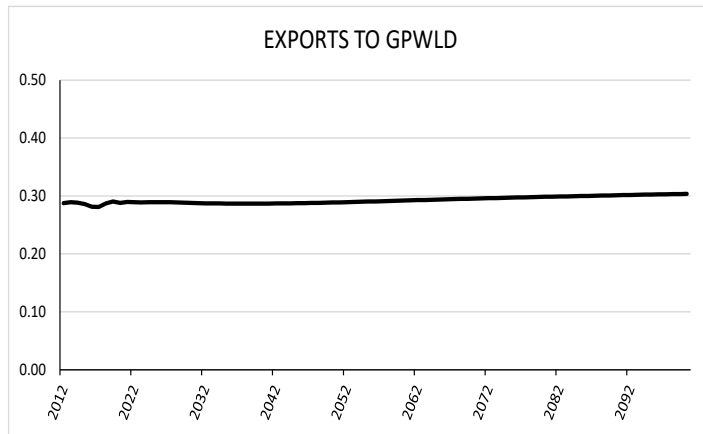
	WDI benchmark data				2100 conjecture
	1980 to 2019	2004 to 2019	2011	2019	Based on historical average 1980- 2019)
1 AUS	-4.17	-4.14	-3.18	0.55	-4.17
2 CHN	2.17	3.78	1.80	0.72	2.17
3 JPN	2.79	2.99	2.08	3.45	2.79
4 USA	-2.52	-3.27	-2.92	-2.21	-2.52
5 EU28	0.22	0.84	0.46	2.19	0.22
6 ROW	0.19	1.33	1.44	0.30	0.19

Sources: World Bank World Development Indicators (accessed December 2022); Author conjectures.

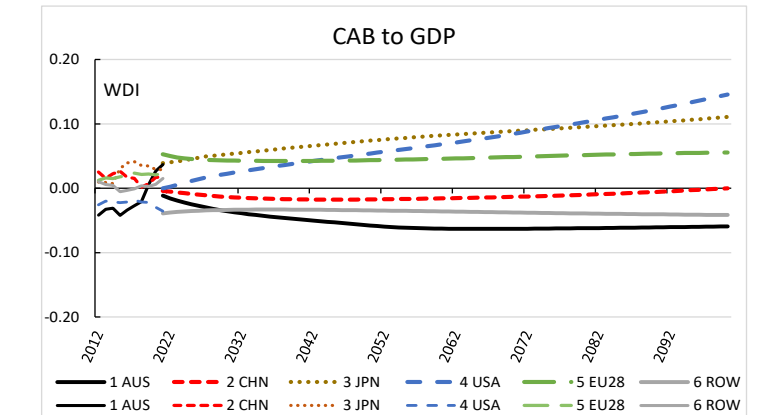
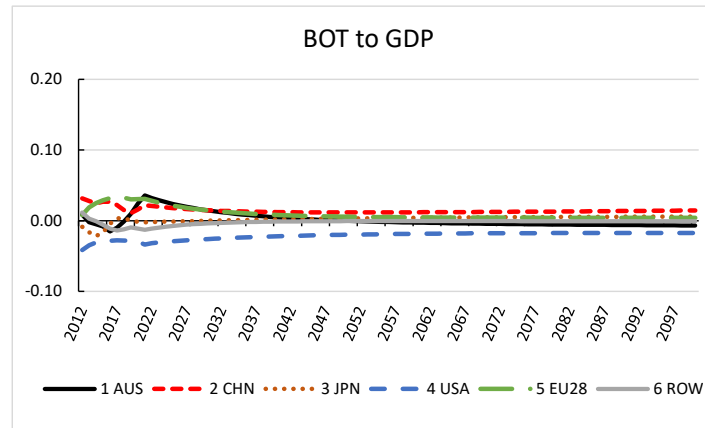
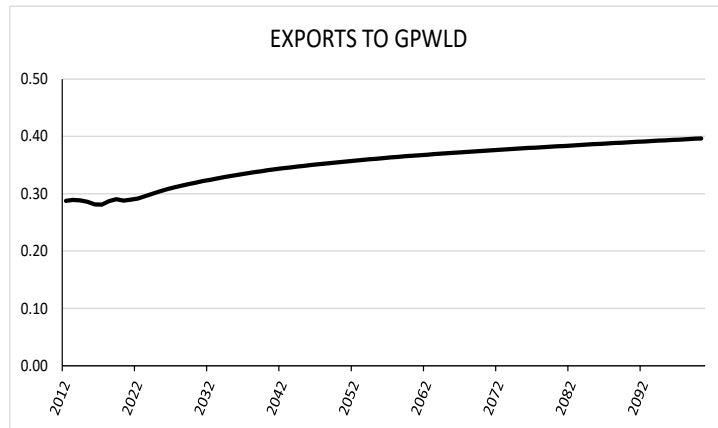
LET'S LOOK AT SOME PRELIMINARY PROJECTIONS

How might trade and the CAB/GDP evolve with passive policy towards the CAB?

S1 Passive trade growth policies

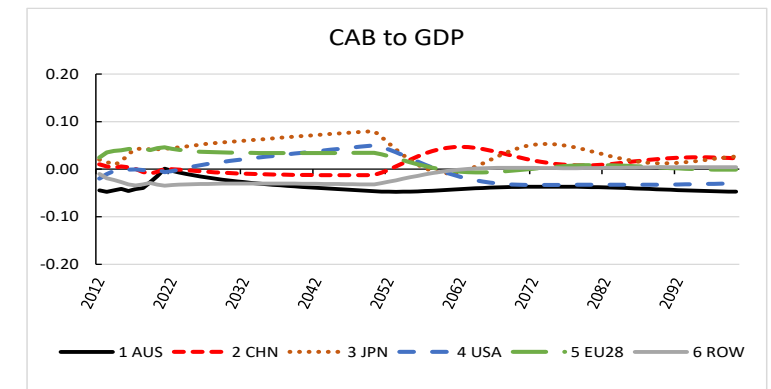
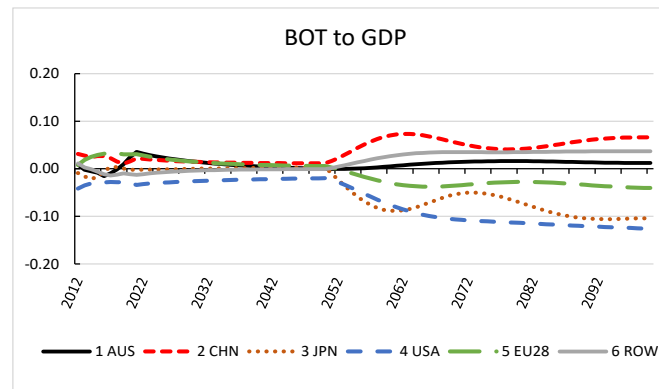
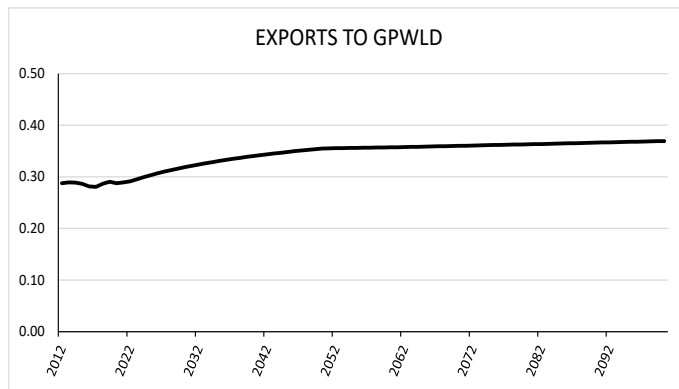


S2 Moderate trade growth policies, BoT/GDP targeted

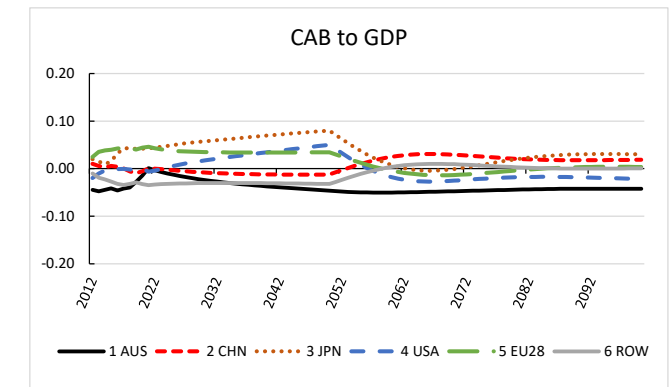
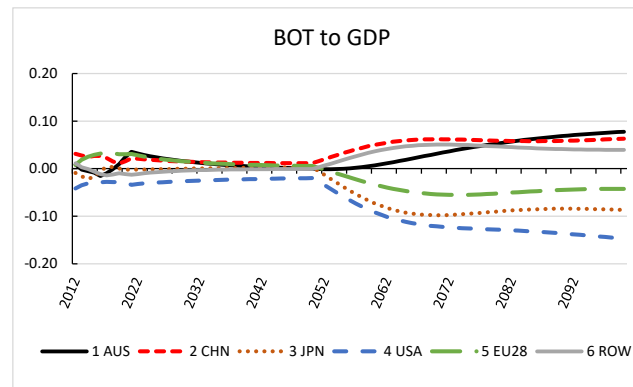
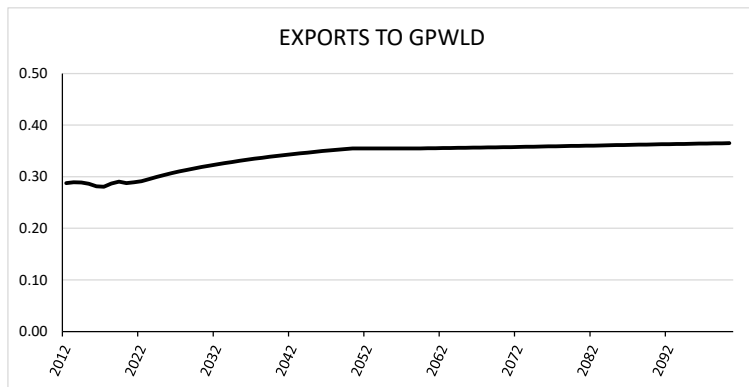


How might trade and the CAB/GDP evolve with moderate trade growth policies to 2050 and active policies towards the CAB from 2050 ?

S3 Via saving rate

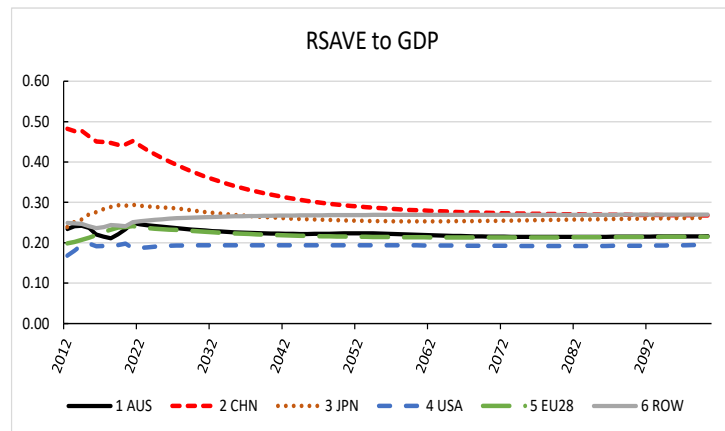


S4 Via required rate of return on capital

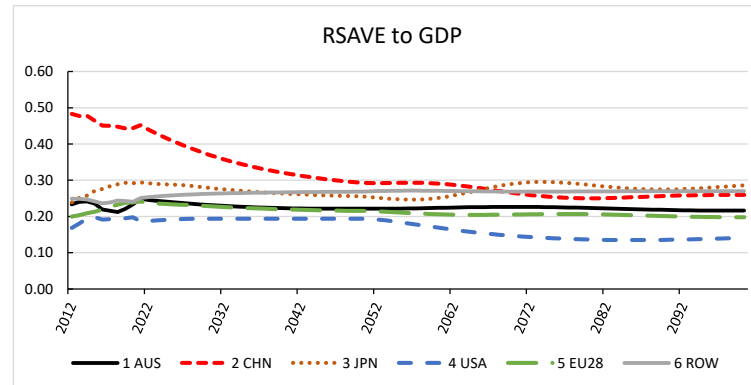


What are the likely adjustments in saving rates or capital returns under each scenario?

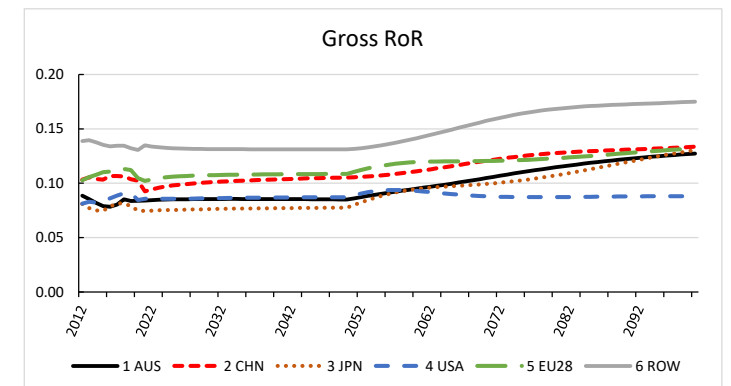
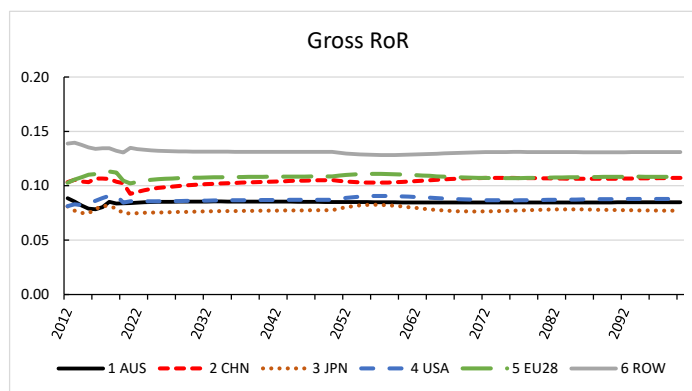
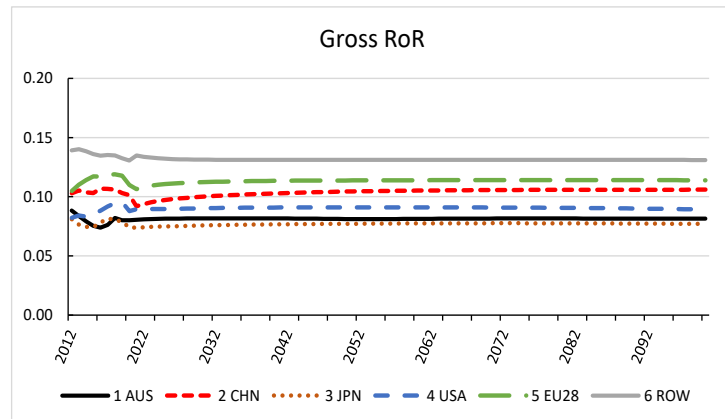
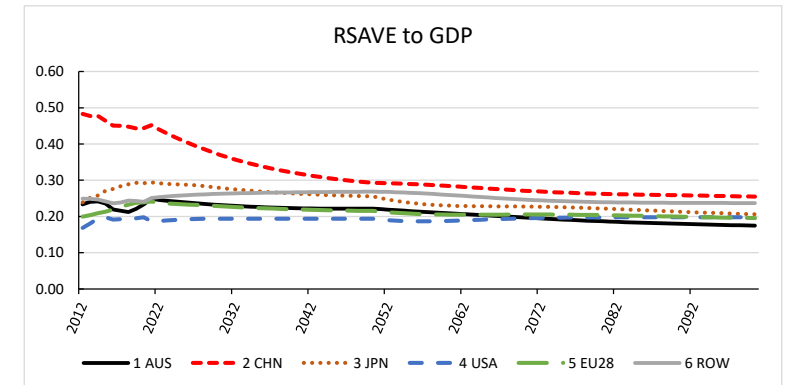
S2 Passive CAB/GDP policy



S3 Active policy via saving



S4 Active policy via returns on capital



Take a closer look at conjectured and projected Gross saving to GDP in 2100 under each scenario

	Conjecture 2050 (Gretton 2022) (S1 & S2)	CEPII (2021) at 2100	Simulated Ramsey- model based at 2100 ^a	Simulated at 2100 (S3)	Simulated at 2100 (S4)
1 AUS	22	22	21	22	18
2 CHN	27	38	15	25	26
3 JPN	27	24	18	28	21
4 USA	20	11	15	14	20
5 EU28	22	20	17	20	20
6 ROW	27	16	19	27	24

^a A steady state gross saving rate, s^* is calculated for the global economy for the Cobb-Douglas case according to $s^* = \alpha * (x + n + \delta) / (\delta + \rho + \theta x)$ where α is the capital input share of gross value added, $x + n$ are technological and population growth, respectively, δ is the depreciation rate, ρ is the rate of time preference and θ is the inverse of the intertemporal elasticity of substitution (Barro and Sala-i-Martin 1995, p.78). The estimates reported are generated in the baseline simulation of scenario 1 at 2100.

Varying alignment between conjectured and projected Gross saving to GDP in 2100

- Close alignment between projections and first conjectured estimates based on historical experience (Scenarios 1, 2 & 3)
- Targeting the CAB/GDP via RoR can indirectly affect the demand for saving (Scenario 4)
- CEPII projection for CHN high, with offsets for others, particularly USA, ROW
- Ramsey model theoretic estimates low – indicating adaptive conjectures do not include all information, eg forward population growth?

What has been achieved, some policy implications and further investigations

- Possible to establish a long-run base line with projected CAB/GDP falling within plausible ranges
 - Although the projections indicate LR adjustment path may not be even
- Active country-specific policies toward the Consumption-Saving or Country risk would be required to realize CAB/GDP within accepted range
 - There may be unanticipated flow-on effects to/policy implications for the BoT/GDP
- Further investigation
 - Apply the method to a country-specific study, eg China
 - Assess implications for broader baseline assumptions, GDP growth
 - Evaluate policy implications of divergent trade and current account balances in GDP
 - Apply method to a disaggregated database eg 32 regions by 57 sectors
 - Better understanding of relationship between WDI benchmark indicators & DB

THANK YOU