Can Greying East Asia Reduce Current Account Surplus?

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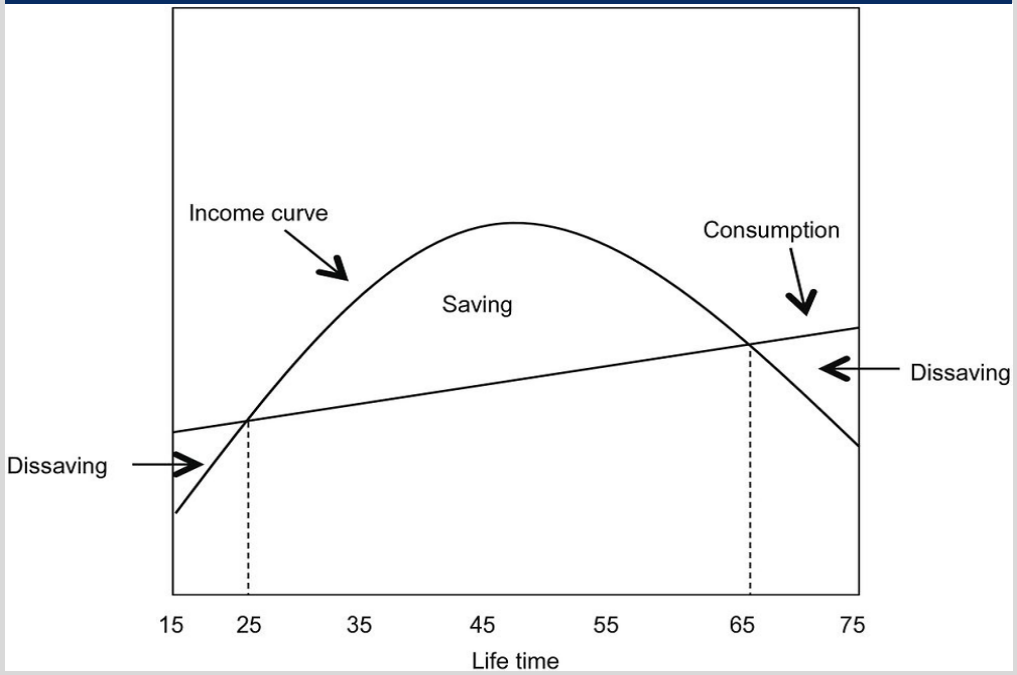
Aging and The Current Account

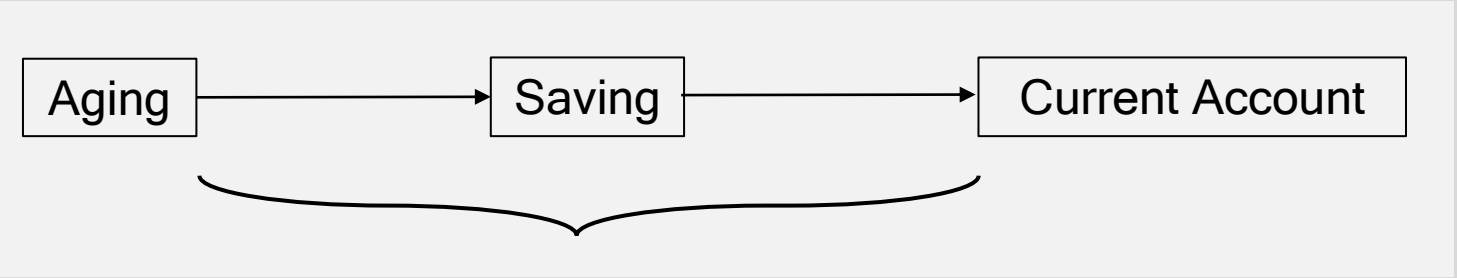
Life Cycle Hypothesis
(Modigliani & Brumberg, 1954)



Source: OECD

- Due to the Life Cycle Hypothesis, at different stages of life, an individual has different saving rate.
- It is likely to see a decline in total saving given that large proportion of the population enters retirement period.
- And with the national income accounting, a decrease in savings corresponds to a decrease in the current account balance.
- The question here is that, given the two major trends: the persistence in current account surpluses and the rapidly aging population in East Asia, how do these two trends interact. Can the aging population, through a decline in savings, reduce the current account surplus?

Why might the impact differ across countries?



Characteristic	Impact to the Relationship	Measurements	Literature
Longevity	Stronger	Life expectancy	Li, Zhang, and Zhang (2007)
Pension System	Stronger	Coverage of Pension System	Bloom, et. al. (2006) Chai and Kim (2018)
Financial Openness	Stronger	Chinn-Ito Index	Chinn and Ito (2005) Mendoza, Quadrini, and Rios-Rull (2009)
Financial Development	Stronger	Financial deepening	

- However, magnitudes of the demographic impact may not be the same across countries.
- Based on the past studies, there are four key characteristics that influence such the impact.
- Because this study focuses on East Asian countries, and therefore it is important to account for the region's characteristics when attempt to project the demographic impact.

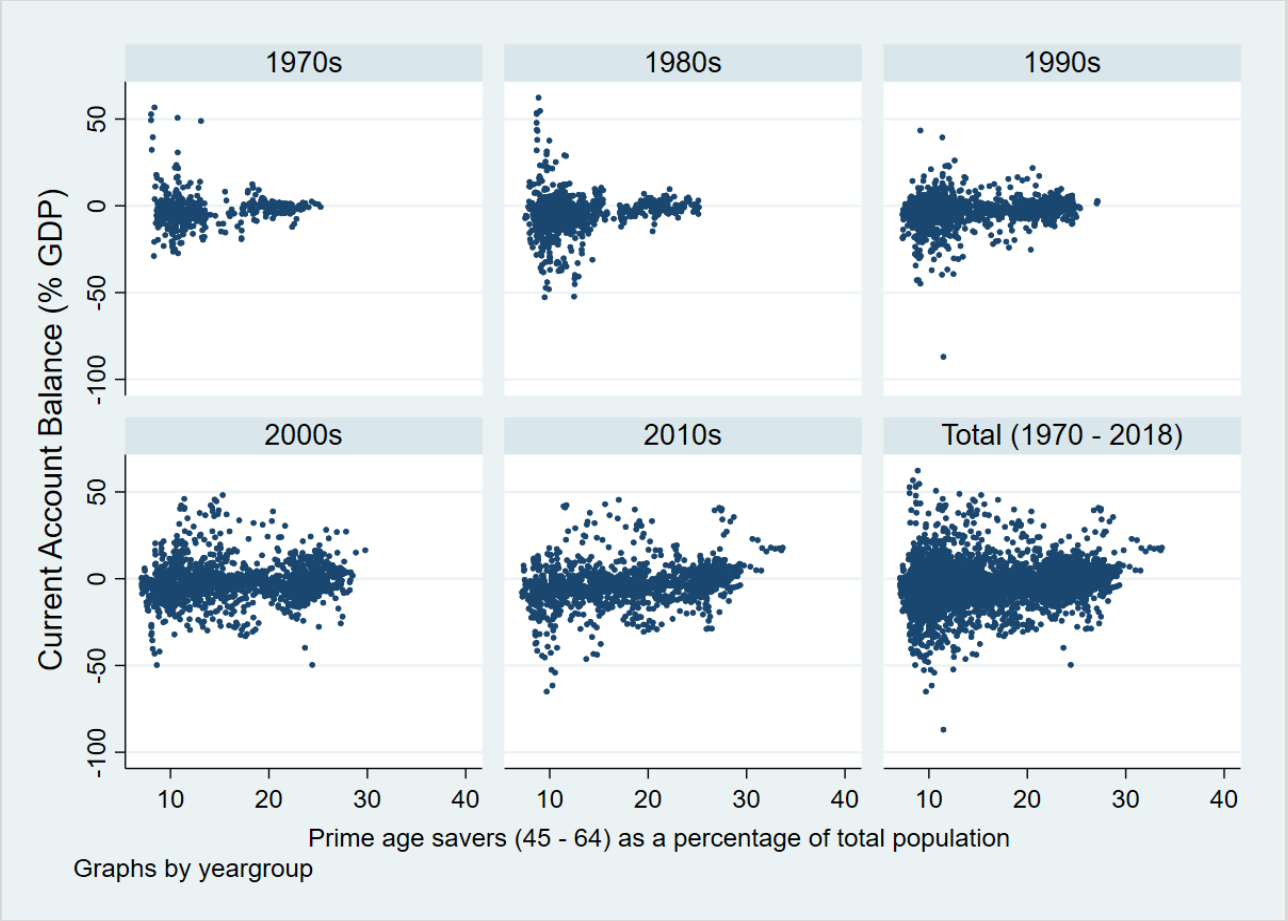
Hypotheses and the Projections

I : Baseline	A decrease in prime saver population (accompanied by an increase in old dependency ratio) should associate with a worsened current account balance (decrease in surpluses in East Asia).
II : Heterogeneity	The demographic impact on the current account balance should be stronger in the country that have • High life expectancy • More developed pension system • High degree of financial openness • More developed financial markets
III : Projections	Heterogeneity of the impacts in II will be considered in the projections of Asian countries' current account balances given the population projections.

Data: Overview

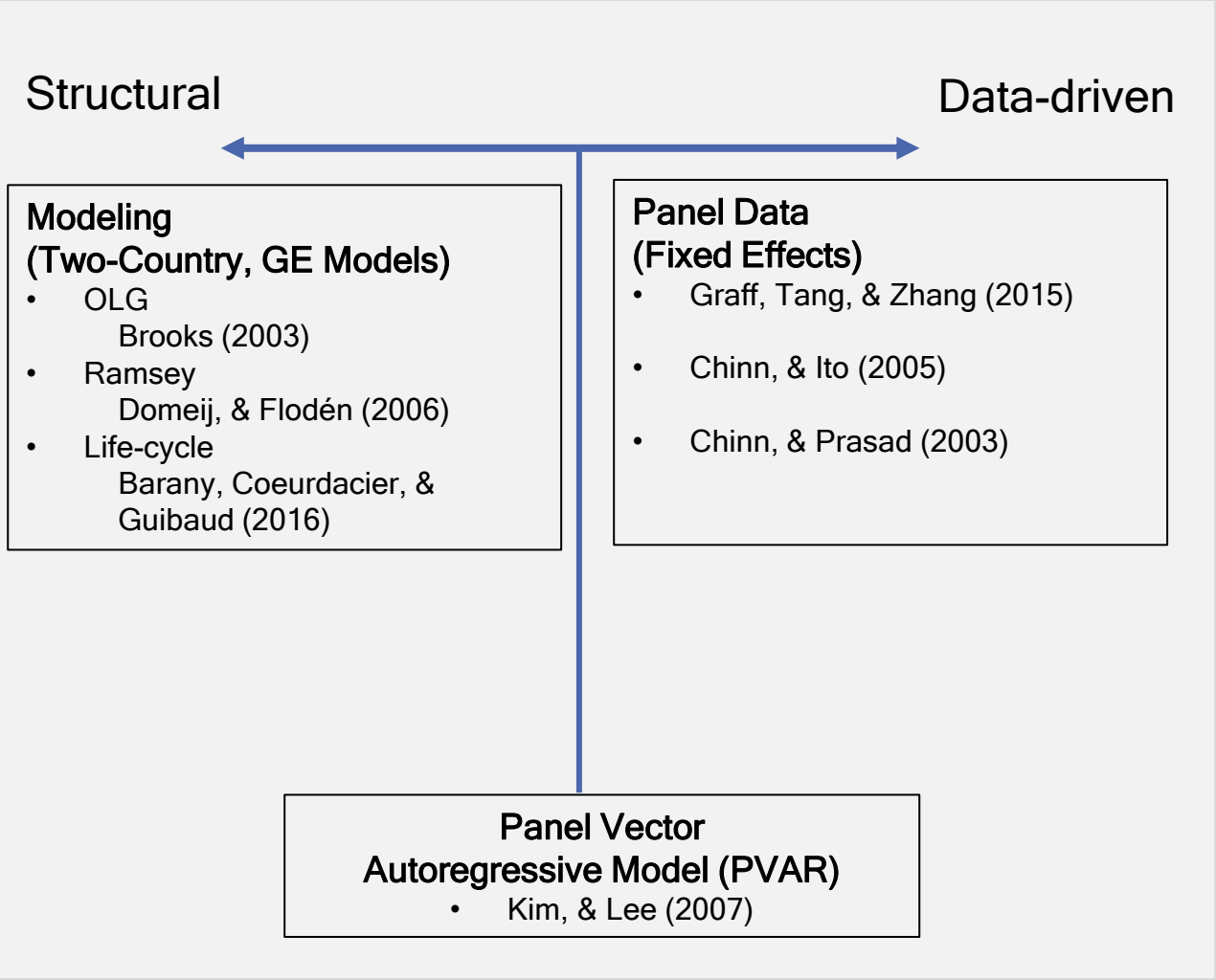
Area	Variables	Source
Main Variables in PVAR		
Demography	Prime-age (16 - 64) population (% of total population) Prime-age (41 – 64) saver (% of total population) Old Age (65 and over) dependency ratio	WDI
Current Account	Current Account Balance (BoP basis, USD) Current Account Balance (% of GDP)	WDI
Other Endogenous Variables in VAR	Gross Savings (level and % of GDP) Gross Capital Formation (level and % of GDP) GDP Real Interest Rate	WDI
Control Variables for Classifications		
Pension	Coverage of Social Security Program (% Population) Mandatory old-age income security programs (Indexing TBD) (Universal, Non-universal, Retirement Age, Early Pensionable Age) Pension Fund Assets (% of GDP)	The Atlas of Social Protection World Bank's Global Financial Development
Longevity	Life expectancy at birth Life expectancy at age of 65	WDI
Financial Development	Financial Deepening (M2-to-GDP) Bank Accounts per 1,000 People	World Bank's Global Financial Development
Capital Openness	Ito-Chinn Index	Chinn, Ito (2008)

Data: Correlations



	Old	Saver	S/GDP	I/GDP
Current Account to GDP:	0.08	0.16	0.64	-0.21

Empirical Strategy I : The baseline

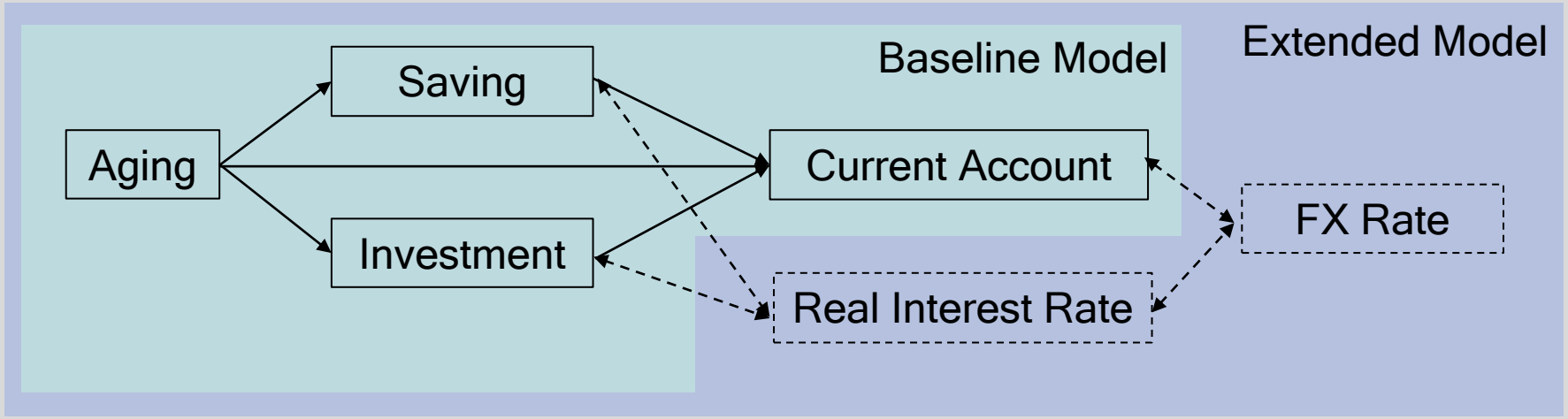


- According to past studies, there are two approaches in determining the relationship between demography and the current account.
- **The structural Approach** – this approach employs macroeconomic model. To find the magnitude of relationship, the models then were calibrated using real-world data to gauge the magnitude of relationships.
- **The data-driven Approach** – this approach employs fixed effect panel data methods to regress the panel data. The magnitude of relationship can be observed via estimated coefficients.

Empirical Strategy I : The PVAR

- To strike the balance between structural and data-driven model, The study of dynamic relationships between demography (prime-saver population) and the current account balance to GDP employs the **Panel Vector Autoregressive Model (PVAR).**
- Challenges of PVAR model in this study is that (1) the panel is not balanced, and (2) large number of N small number of T (affects the precision of the model due to large standard error from heterogeneity problems)
- **Stationarity of the variables:** only demographic variable, i.e. the prime-age saver proportion is not stationary as per Im-Pesaran-Shin panel unit root test (more detail on page 10 of the full paper). The **Forward Orthogonal Deviation (FOD) Transformation** is employed to tackle with this problem (more detail on page 10 of the full paper).
- **Estimation:** Holtz-Eakin-Newey-Rosen-style GMM is employed here because the FOD transformation requires variables to be instrumented.

Empirical Strategy I : Structural Model



Structural: $\mathbf{Y}_{it} = C_i + C_t + \beta_1 \mathbf{Y}it_{-1} + \beta_2 \mathbf{Y}it_{-2} + \ldots + \beta_k \mathbf{Y}it_{-k} + \varepsilon_{it}$

Reduced: $B^{-1}(L)\mathbf{Y}_{it} = C_i + C_t + \varepsilon_{it}$

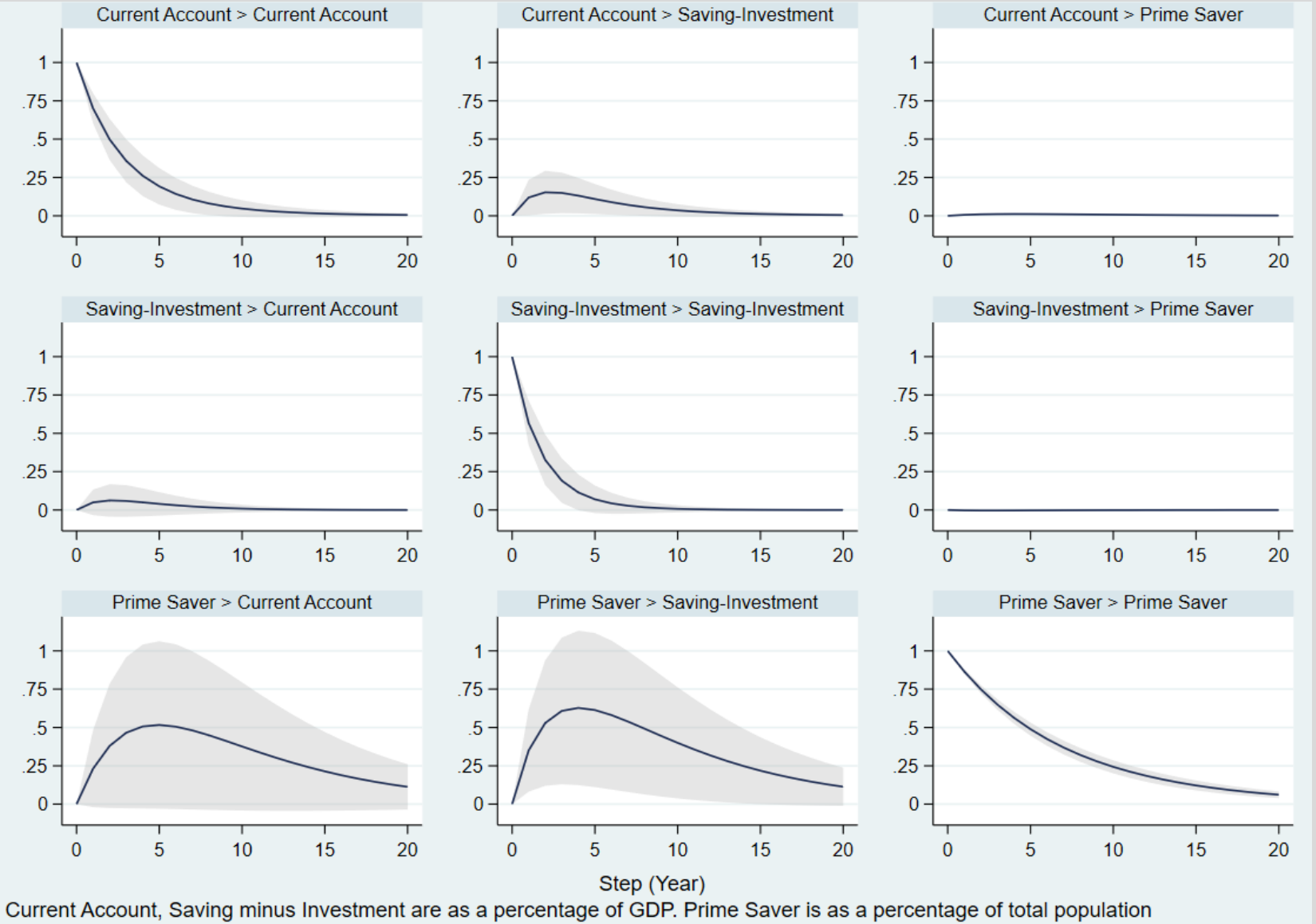
Where **Y** = **[**Aging, S, I, CA, RIR, ER**],** **C**(i) country control, **C**(t) year control

Empirical Strategy I : Granger Causality

Excluded Variables	Baseline		Extended Model	
Prime Saver	**Chi2**	**prob**	**chi2**	**prob**
Saving-Investment	7.35	0.01	57.59	0.00
Current Account	36.23	0.00	113.24	0.00
Real Interest Rate			18.65	0.00
Nominal Exchange Rate			44.96	0.00
ALL	36.88	0.00	255.24	0.00
Saving-Investment	**Chi2**	**prob**	**chi2**	**prob**
Prime Saver	6.55	***0.01***	4.98	***0.03***
Current Account	4.07	0.04	197.74	0.00
Real Interest Rate			1.57	0.21
Nominal Exchange Rate			0.14	0.71
ALL	10.98	0.00	1251.3	0.00
Current Account	**Chi2**	**prob**	**chi2**	**prob**
Prime Saver	3.10	***0.08***	3.86	***0.05***
Saving-Investment	1.37	0.24	41.56	0.00
Real Interest Rate			1.78	0.18
Nominal Exchange Rate			0.06	0.81
ALL	4.33	0.12	48.39	0.00
Real Interest Rate	**Chi2**	**prob**	**chi2**	**prob**
Prime Saver			5.52	0.02
Saving-Investment			0.02	0.90
Current Account			23.65	0.00
Nominal Exchange Rate			7.23	0.01
ALL			49.77	0.00
Nominal Exchange Rate	**Chi2**	**prob**	**chi2**	**prob**
Prime Saver			4.36	0.04
Saving-Investment			0.10	0.75
Current Account			5.37	0.02
Real Interest Rate			8.16	0.00
ALL			8.75	0.07

- The Granger Causality test tests how the variables “Granger cause” each other.
- The prime saver population Granger causes both Savings and the current account balance at 10% level of significance in both baseline and extended models.
- The demographic change also has Granger causes real interest rate (in IRF, a rise in prime-saver population ratio depresses the real interest rate) and nominal exchange rate (in IRF, a rise in prime-save population ratio causes an appreciation in local currency against US dollar)

Empirical Strategy I : Baseline IRFs



- The central result is the bottom-left panel. A one-standard deviation (positive) shock in prime saver population contributes a persistent change in current account balance. (after 20 years, the effect is still about 0.15 standard-deviation)
- The apex of the prime saver occurs about 5 years after the shock due to the continuous nature of demographic transitions.
- In the bottom-middle panel, the demographic change also impacts the saving-investment rate with the more intense impact. This is expected because savings should be directly impacted by a rise in prime saver.

Empirical Strategy II : Heterogeneity

Due to missing entries, countries are divided into three groups according to the four key characteristics (see slide 3). The baseline group is the middle group (the characteristic score, according to the variables in slide 3, is between 33rd – 67th percentiles).

Sub-group PVAR	Interactions FE
• Classify country into subgroups according to each characteristics • Estimate PVAR separately for every subgroups	• Interact characteristic variables with demographic variable • Y = age + age X characters
✓ Maintain dynamics and structure of the model	✓ Easy to make inferences (Comparing impacts)
X Hard to make inferences (Comparing impacts)	X Losing dynamic and structural properties

- In this study, **the interaction Fixed Effect Model** is deployed to determine whether the characteristics plays a role in the variations in demographic impacts on the current account balance.
- **The Sub-group PVAR** is employed in the projection of the current account balances of each country.

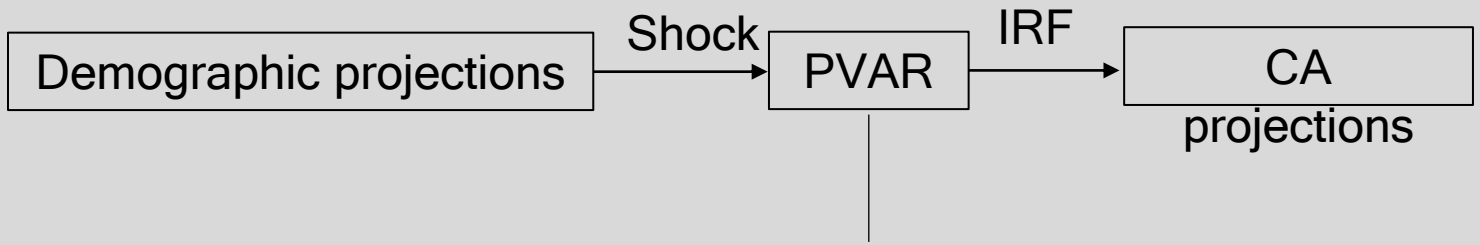
Heterogeneity based on Characteristics

Characteristic	Baseline	Life Exp	Pension	Openess	Deepening
	Current Account Balance to GDP				
Prime Saver	.293***	.288***	.288***	.286***	.275***
(% of total population)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
GDP Growth (%)	.0498*	.0535*	.0467*	.0505*	.0434
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
FDI (% GDP)	-.096***	-.095***	-.097***	-.095***	-.096***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Manufacturing (% GDP)	.0622**	.0608**	.0637**	.0626**	.06**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Dummy for Top 33% Countries		-.0893	**.703*** **	.0728	-.167
for ….. X Prime Saver (γ_{top})		(0.14)	**(0.15)**	(0.14)	(0.12)
Dummy for Bottom 33% Countries		**-.386****	**-.515***	-.138	**.814*****
for ….. X Prime Saver(γ_{bottom})		**(0.20)**	**(0.21)**	(0.14)	**(0.2)**
Dummy for Top 33% Countries		.0109	-2.006	1.59	1.395
for …...		(1.46)	(1.42)	(1.53)	(1.40)
Dummy for Bottom 33% Countries		-1.536	-2.389	0.135	-0.869
for …...		(1.458)	(1.544)	(1.408)	(1.509)
Country-year	5,089	5,084	5,084	5,084	5,084
R-sq	0.0696	0.0627	0.0673	0.0723	0.0666
Standard errors in parentheses * p<0.05, ** p<0.01, *** p<0.001					

$$\text{current account}_{it} = \alpha_i + \beta \text{primesaver}_{it} + \lambda_{top}\text{primesaver}_{it} \times \text{top33\%}_i + \gamma_{top}\text{top33\%}_i + \lambda_{bottom}\text{primesaver}_{it} \times \text{bottom33\%}_i + \gamma_{bottom}\text{bottom33\%}_i + \theta\text{controls}_{it} + \varepsilon_{it}$$

- Random-effects Panel with robust standard errors
- According to the statistical significance of estimated coefficients of the interaction terms, the demographic impact will be stronger if;
  - Higher social security coverage
  - Lower financial deepening
- the demographic impact will be weaker if;
  - Lower life expectancy
  - Lower social security coverage

The Projections



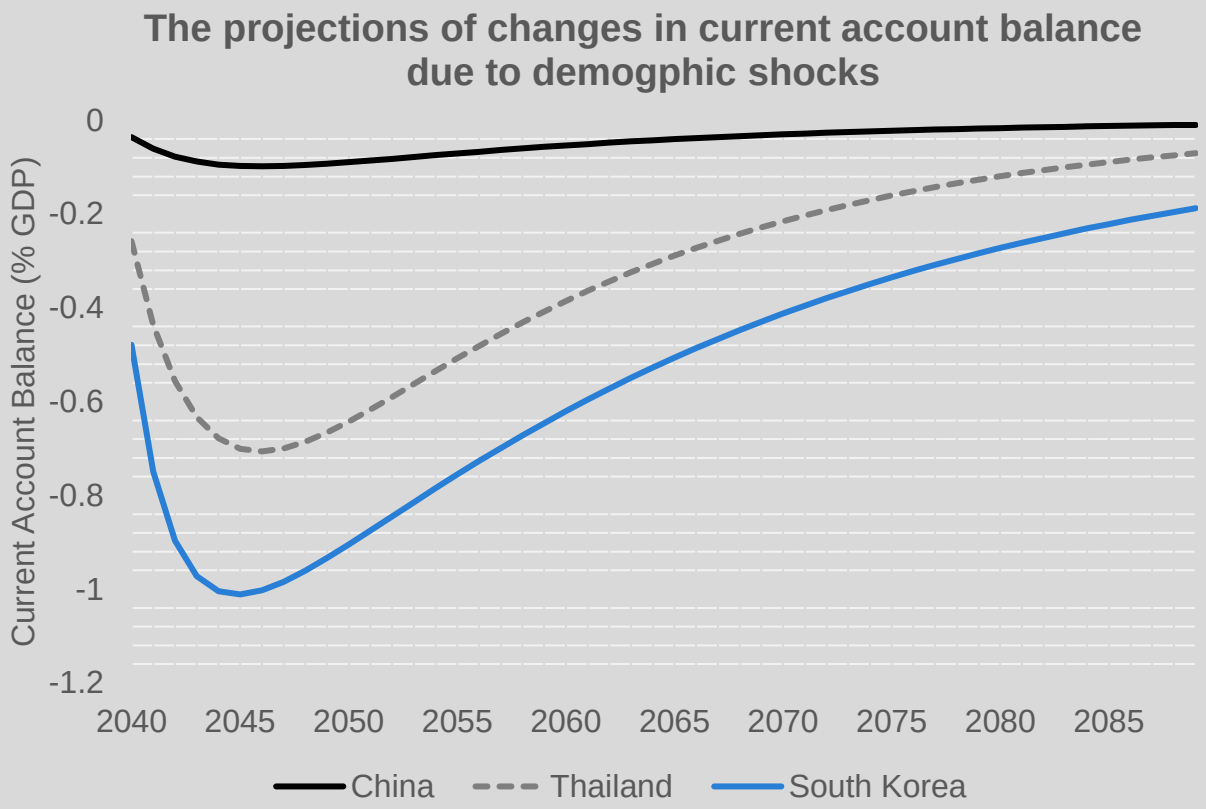
PVAR constructed and calibrated from group of countries similar to (based on 4 characteristics) the projected country

**For the detail see Page 20 of the Final Paper*

Country	Life Expectancy	Social Security	Financial Openness	Financial Deepening
China	Middle 33%	Top 33%	Bottom 33%	Middle 33%
Thailand	Middle 33%	Top 33%	Middle 33%	Middle 33%
South Korea	Top 33%	Middle 33%	Middle 33%	Middle 33%

- Projection data from The United Nations' *World Population Prospects 2019*
- Countries to be projected includes: China, South Korea, Thailand.

The Projection Results



- The projections based on the United Nations' forecasted proportion of prime-saver population (age 45 – 64) for the year 2040. Each countries have different size of decline in prime-saver population with South Korea sees the largest drop followed by Thailand and China.
- The magnitude of current account balance decline largely influenced by the size of population shock. The dynamic of the shock is similar among countries with the highest response during the year 4 – 6 after the shock. However, the current account balance response to shock persists, for example, for South Korea, the decline in current account balance can be observed 30 years after the shock.
- The projections imply that the demographic shock may not eliminate these countries' surpluses but may act as a "level shift" downward.
- These countries will see a slightly smaller surplus in the future due to the demographic transition.

Conclusion

- This study attempts to forecast whether the decline in prime-saver population can reduce East Asian countries' current account surplus through a combination of methods
  - This study employs PVAR model and attempt to address the heterogeneity of the relationships via variations in key characteristics of the economy.

- The PVAR model indicates that demographic shift granger causes changes in the aggregate savings, and the current account balance. The IRF suggests that responses of the current account balance persists for more than 20 years after the demographic shock.

- The Panel regression also suggests that the demographic impact on the current account varies among countries. The impact relies heavily on social security coverage (higher coverage, stronger impact, vice versa), and somewhat relies on life expectancy (lower life expectancy, weaker impact).

- The projections of changes in current account balance as a result of demographic shifts for China, South Korea, and Thailand indicates that the current account changes may not be large. However, these changes create a long-term downward shift in current account balance, not enough to eliminate the surpluses entirely but create the new long-term current account norm for these countries.

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