

WHY DO SO MANY OIL EXPORTERS PEG THEIR CURRENCY?

Foreign reserves as a de-facto sovereign wealth fund

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Samuel Wills* and Rick van der Ploeg
Oxford Centre for the Analysis of Resource Rich Economies
Department of Economics, University of Oxford

Introduction

- Resource-dependent countries (RDEs) are more likely to peg their exchange rate
- This seems like a bad idea because of managing short-run shocks (eg Wills, 2013)
- We propose that stabilizing the real exchange rate lets the central bank build a sovereign wealth fund if the government does not (e.g. fear of raiding)
 - *SWFs get all the attention – what about central bank reserves?*
- This improves long-run welfare relative to open or closed capital accounts, for both rich and poor households.
- It also prevents raiding, which would involve abandoning a (very visible) peg

Overview

1. Observations and Hypotheses

2. Currency pegs stabilize oil shocks poorly in the short run

3. Currency pegs can build a de-facto SWF in the long run

- a. Real model of a LIC
- b. Open Capital Account: Poor households piggyback on rich
- c. Closed Capital Account: Pegs build de-facto SWF

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1. Observations and Hypotheses

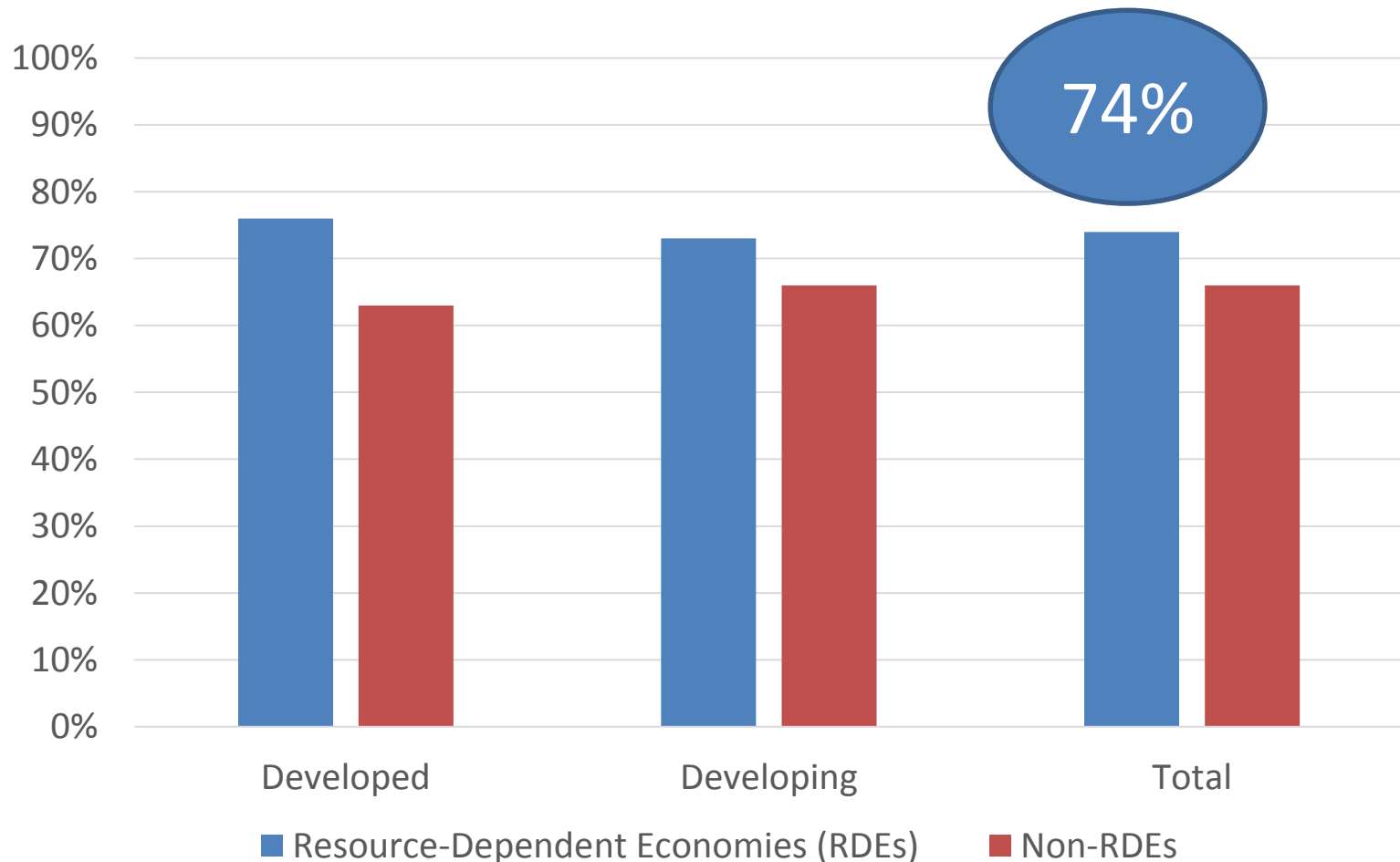
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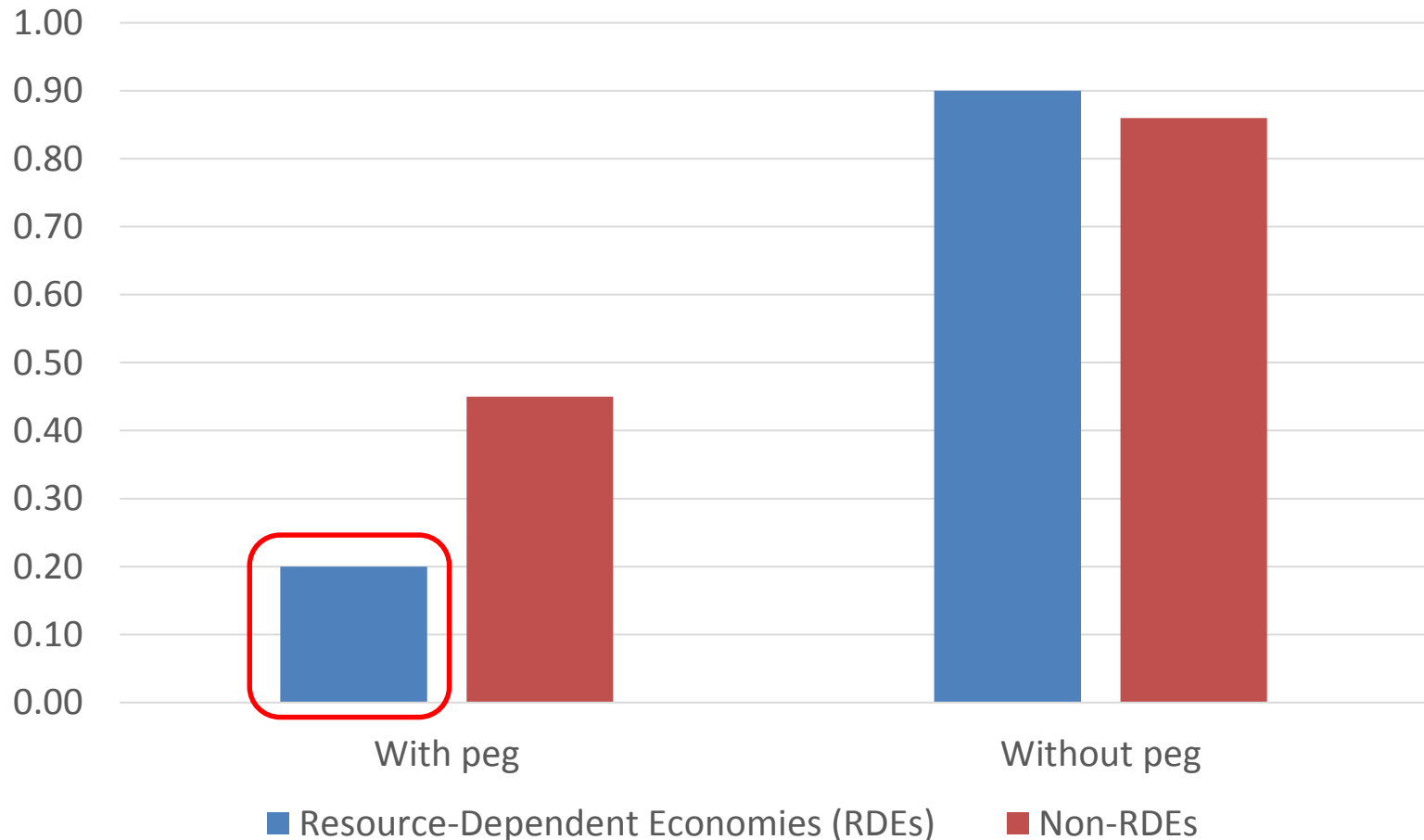
Observation 1: Resource-dependent economies are more likely to peg their currency

Proportion of countries with a fixed exchange rate regime, 2008



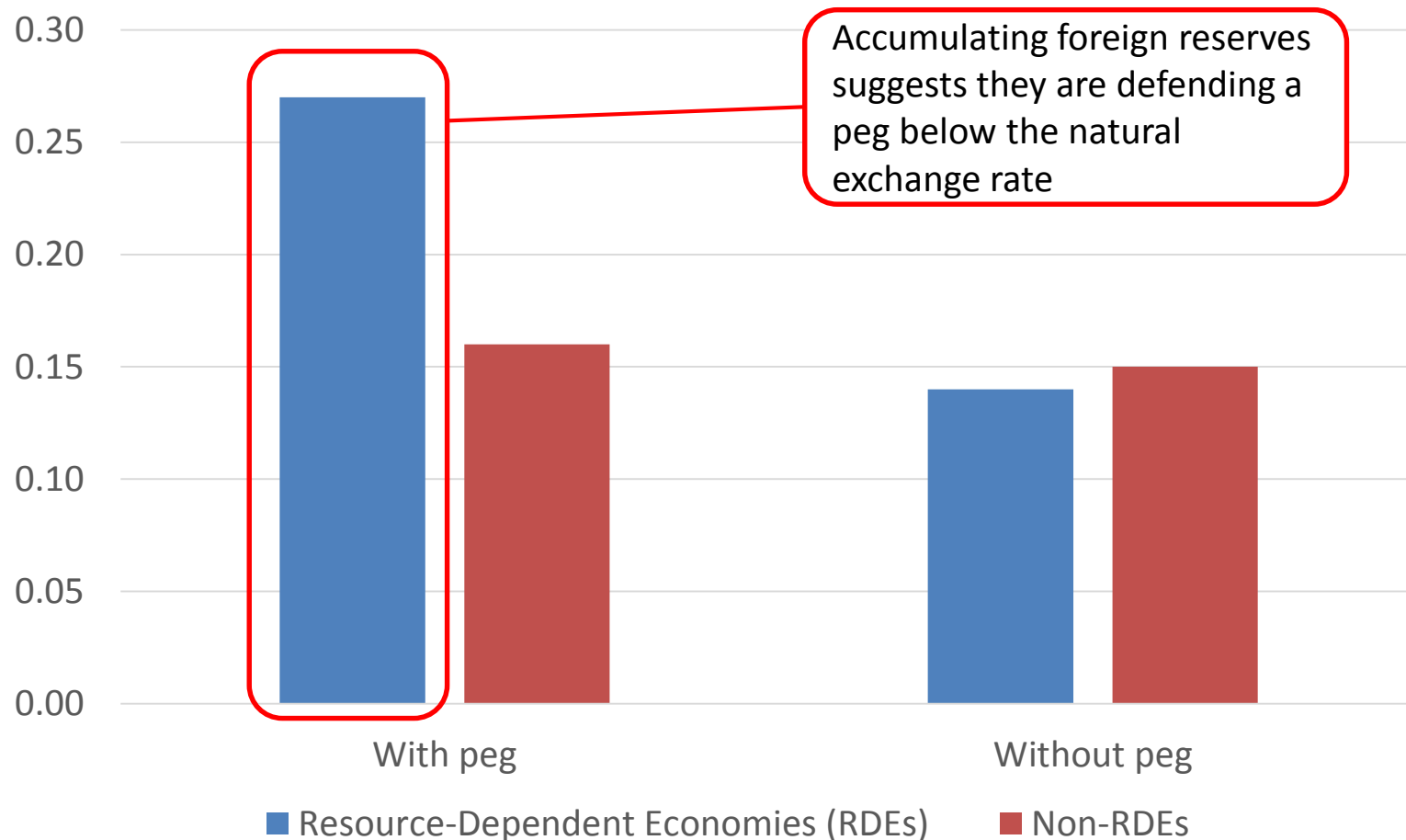
Observation 2: Countries with currency pegs have very closed capital accounts, particularly RDEs

Average Chinn-Ito Capital Account Openness score, 2008



Observation 3: RDEs that peg their currency accumulate large foreign exchange reserves

Average central bank foreign reserves, % of nominal GDP, 2008



Hypothesis 1: Committing to a stable real exchange rate during a commodity boom accumulates a de-facto sovereign wealth fund

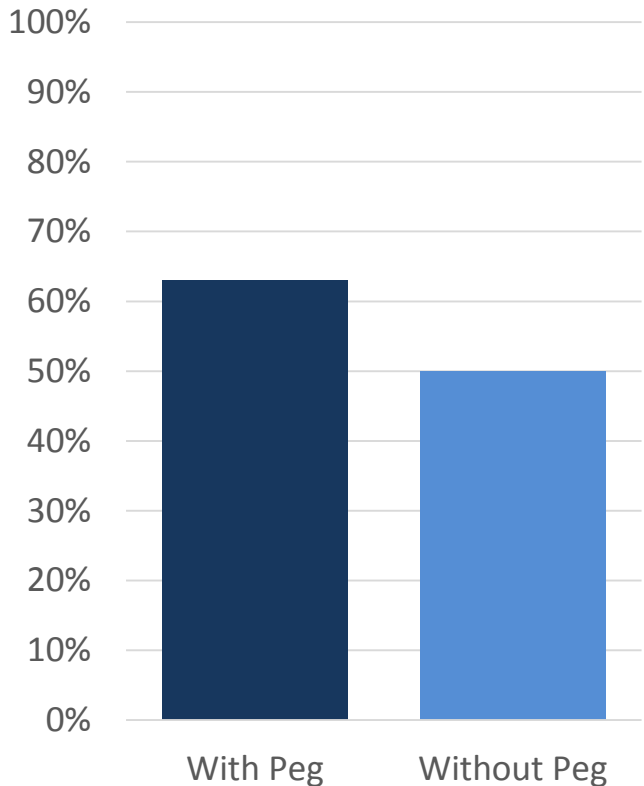
- Governments should build a SWF during oil booms, van der Ploeg + Venables (2012), but may not due to raiding
- The central bank can accumulate a de-facto SWF instead, by pegging the real exchange rate* below equilibrium and accumulating reserves
 - Requires capital account to be closed
 - Replaces short, sharp appreciation with permanent, modest one
 - Supports permanently higher consumption
- Central bank reserves are harder to raid than a SWF, as this would involve abandoning a (highly visible) peg

* Will think about real exchange rate as underpinning a stable nominal exchange rate

Observation 4: RDEs that peg are both more likely to have a sovereign wealth fund, and have larger funds on average

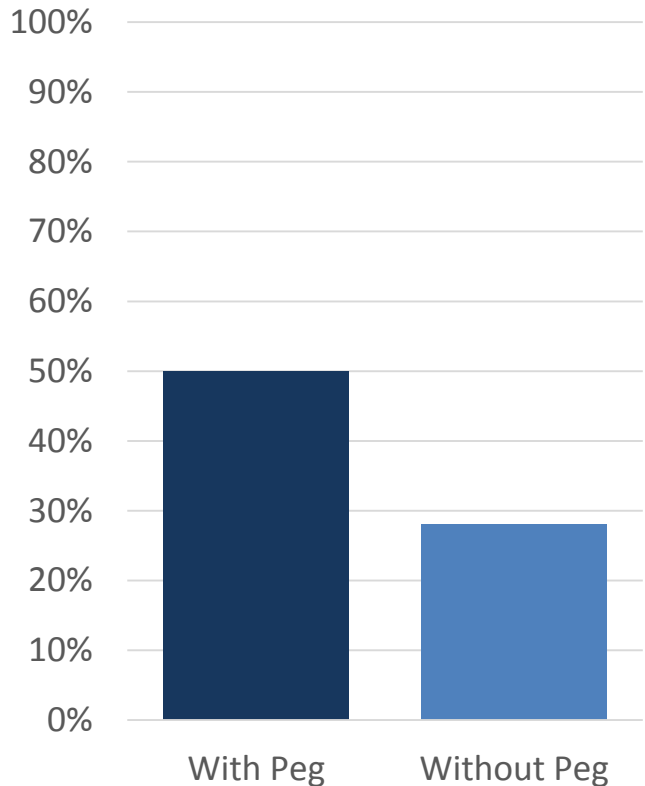
RDEs that peg are more likely to have a sovereign wealth fund...

Share of RDEs with SWF, %, 2013



...and have larger funds on average

Average size of SWF*, % nominal GDP, 2013



* Excl. Timor-Leste at 12x GDP

Hypothesis 2: Committing to a stable real exchange rate also makes a sovereign wealth fund more attractive

- Governments may want a SWF, but avoid them for fear of raiding by successors/political rivals
 - SWFs without a peg are easily raided: see Nauru Phosphate Royalties Trust.
- Committing to a stable RER as well ties the hands of political rivals
 - Any SWF assets sold and spent at home must be offset by private saving, via the central bank, in foreign reserves
- A peg is an insurance policy, in case the SWF fails

Existing literature

- Floating exchange rates are useful for absorbing commodity shocks when prices and wages are rigid, Friedman (1953)
- Not supported by recent empirical evidence
 - Low pass-through or high foreign debt, Towbin + Weber (2013).
 - No systematic effect on current account reversion, Chinn + Wei (2013)
- There are also many arguments for nominal and real exchange rate stability
 - Central bank credibility, Rogoff (1985)
 - Reduced trade costs, EU and EAMU
 - Market exchange rate ineffective when credit is low and FX risk high, McKinnon (2010)
 - Sterilization: intervention to stabilise the nominal exchange rate in the short-run, Aizenman et al. (2011). We focus on the long-run benefits of accumulating wealth.
- To explain observations, RDEs must be relatively more affected by these concerns (which is possible, but we are introducing new one)

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Begin with a standard DSGE model of a small open economy, with an anticipated oil windfall

Households

- Log utility
- Cobb-Douglas consumption: Home and Foreign goods
- Perfect access to financial markets

Firms

- Linear production
- Monopolistic competition
- Calvo prices

ToT and Exchange Rates

- Perfectly substitutable international assets and identical risk preferences
- Uncovered Interest Parity
- Home and world consumption linked by the ToT (adjusted for wealth)

Government

- Receives anticipated oil revenues (construction time)
- Spends all revenues on Home goods as they are received

The model can be summarised by an IS curve, Phillips curve and monetary rule, which depend on changes in natural output

Natural output

$$\hat{y}_t^n = \frac{\gamma_G}{1+\varphi} \widehat{rb}_t - \frac{\alpha + \gamma_G(1-\alpha)}{1+\varphi} \hat{v}_t$$

Natural output *Govt Resource Balance* *Household wealth*

- Resources spent, adjusted for HH consumption of foreign goods

Aggregate Demand: IS Curve

$$\hat{y}_t = E_t[\hat{y}_{t+1}] - (i_t - E_t[\pi_{H,t+1}] - \rho) - (1+\varphi) E_t[\Delta \hat{y}_{t+1}^n]$$

Output *Real interest rate* *Time pref* *Labour elasticity* *Natural output*

- Expected changes in natural output affect output today: consuming leisure

Aggregate Supply: Philips Curve

$$\pi_{H,t} = \beta E_t[\pi_{H,t+1}] + \lambda(1 + \varphi)(\hat{y}_t - \hat{y}_t^n)$$

Domestic inflation *Output gap* *Natural output*

- Output gaps usually inflationary
- But, must adjust for higher natural output

Monetary Rule

$$(i_t - \rho) = \phi_\pi \pi_{H,t} + \phi_y \hat{y}_t + \phi_n E_t[\Delta \hat{y}_{t+1}^n]$$

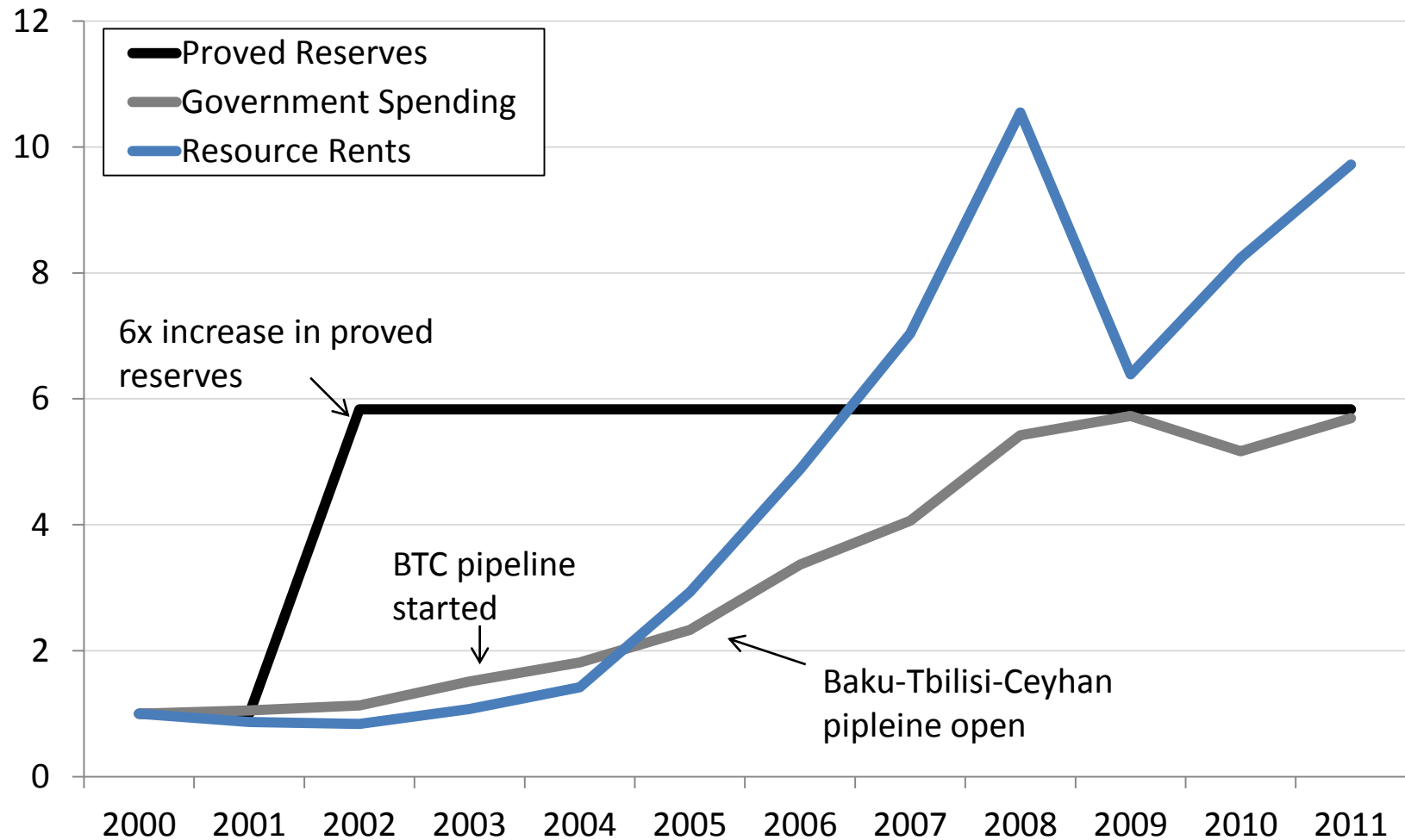
Nom. interest rate *Inflation* *Output gap* *Natural output*

- Closely approximates optimal policy

- All are standard but also respond to expected changes in natural output -

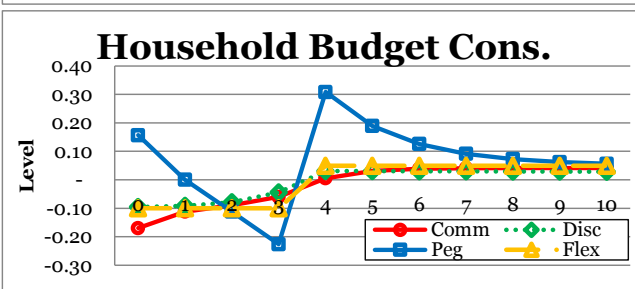
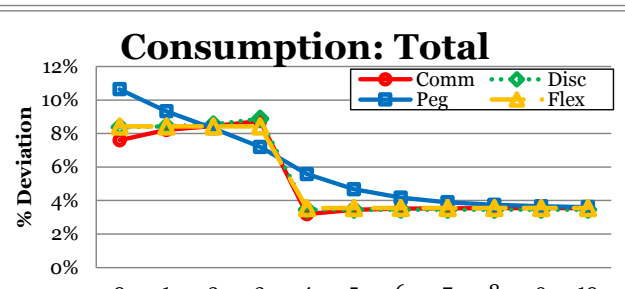
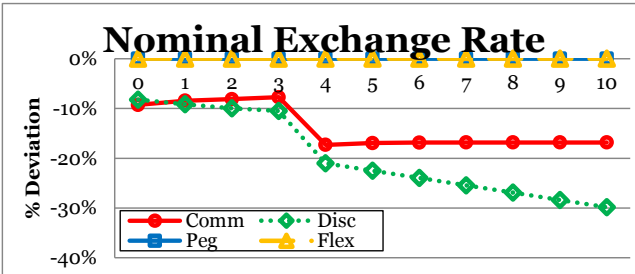
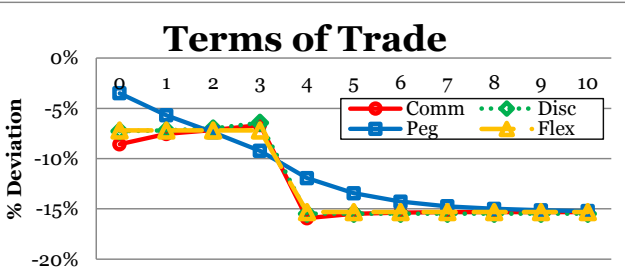
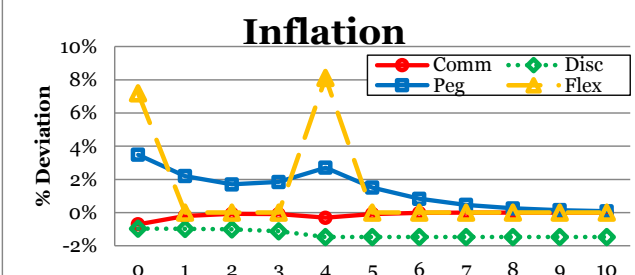
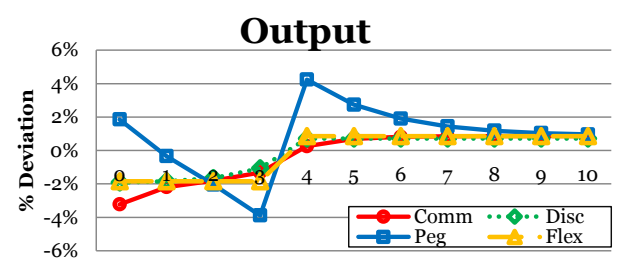
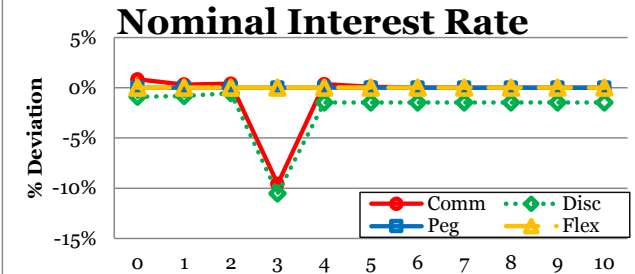
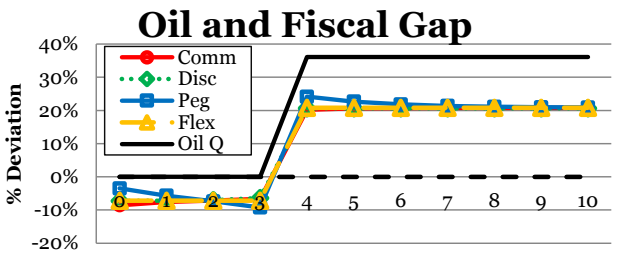
We focus on an anticipated oil windfall which is typical, as illustrated by Azerbaijan's experience

Azerbaijan's proved reserves, resource income and government spending, Index of levels, 2000=1

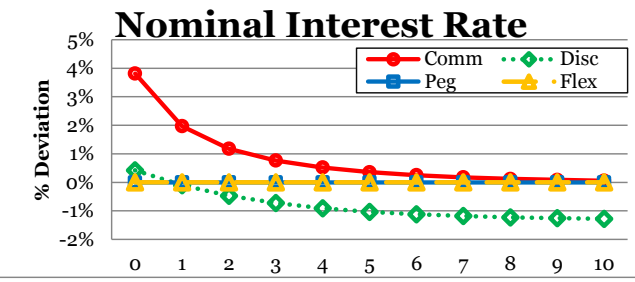
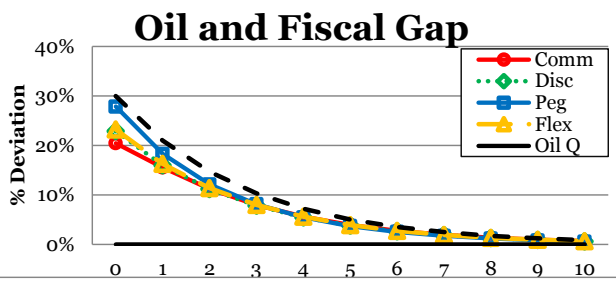


In a standard short-run DSGE model, exchange rate pegs perform poorly during an anticipated oil boom

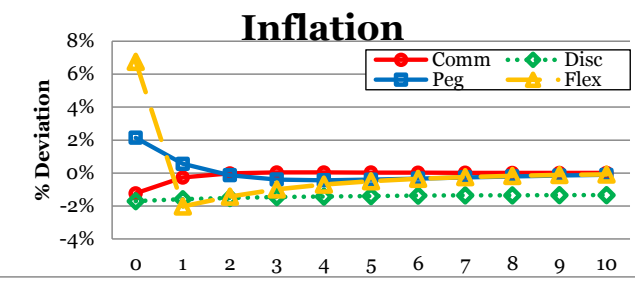
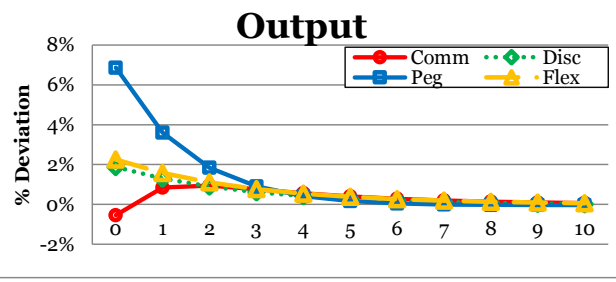
Deterministic response to an anticipated oil boom



Exchange rate pegs also respond poorly to oil price shocks, as they push all adjustment through domestic inflation and output

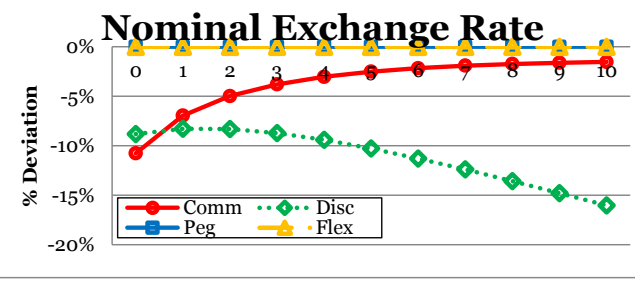
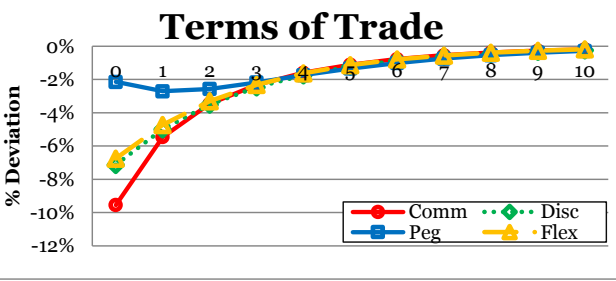


Impulse responses to an oil price shock

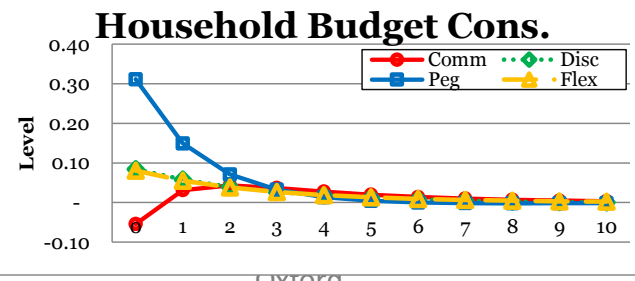
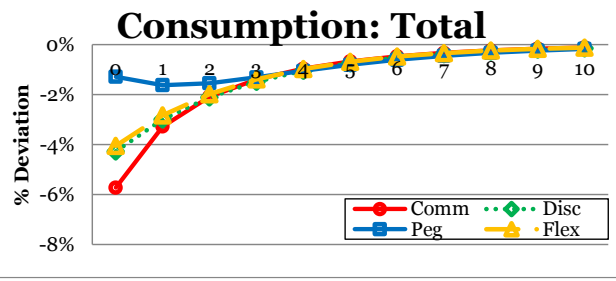


Volatility

Policy	$\hat{p}_{O,t}$	\hat{g}_t	$\pi_{H,t}$	\hat{y}_t
Optimal (C)	1	0.77	0.01	0.04
Optimal (D)	1	0.79	0.01	0.05
Peg	1	0.93	0.06	0.19



Policy	\hat{s}_t	\hat{e}_t	\hat{c}_t	$\hat{c}_{H,t}$
Optimal (C)	0.21	0.22	0.13	0.21
Optimal (D)	0.2	0.21	0.12	0.2
Peg	0.06	0	0.04	0.06



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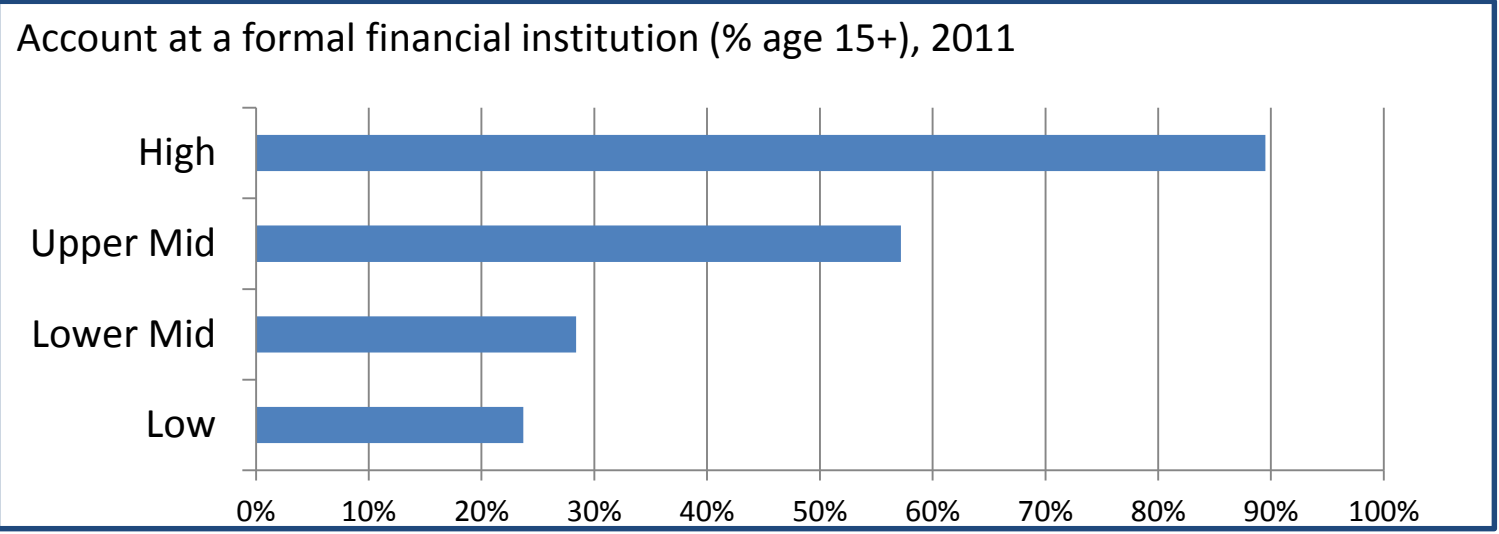
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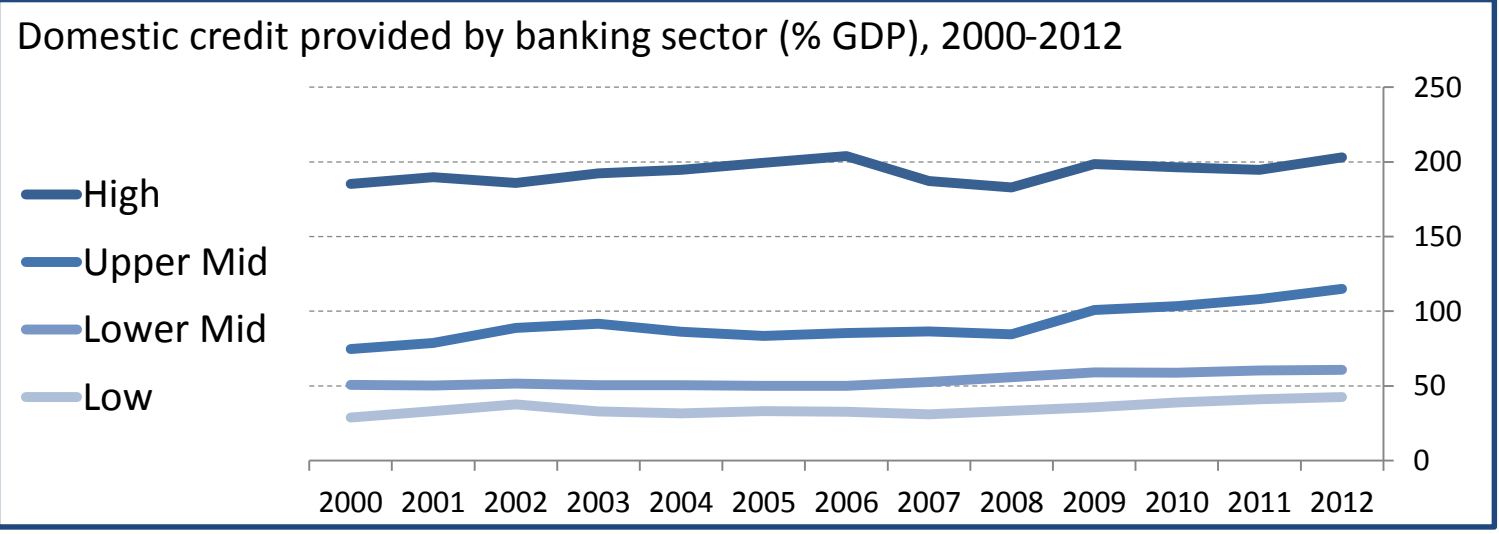
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Financial inclusion in Low Income Countries is low (but improving), so we include Hand to Mouth households

Few households in LICs have bank accounts...



... and they receive relatively little credit from banks



Source: Global Partnership for Financial Inclusion, 2013; World Bank, 2013

As we are interested in LICs there will be both Ricardian (rich) and Hand-to-Mouth (poor) households

Ricardian Households (R)

Hand to Mouth Households (M)

$$C_t \equiv (1 - \lambda)C_t^R + \lambda C_t^M$$

0 \longleftarrow $\xrightarrow{\lambda}$ 1

Utility

- Same preferences

$$i \in [R, M] \quad U_0 = E_0 \sum_{t=0}^{\infty} \beta^t \left[(1 - \chi) \ln C_t^i + \chi \ln G_t - \frac{N_t^{i(1+\varphi)}}{1 + \varphi} \right]$$

Budget constraint

$$P_t C_t^R \leq W_t N_t^R - P_{H,t} T_t^R - E_t \left[\frac{1}{1+r_t} D_{t+1} \right] + D_t$$

$$P_t C_t^M \leq W_t N_t^M - P_{H,t} T_t^M$$

Consumption

- Both have Cobb-Douglas consumption bundle (no “divine coincidence”: asymmetric wealth)

$$C_t^i \equiv C_{H,t}^{i(1-\alpha)} C_{F,t}^{i\alpha} / (1 - \alpha)^{(1-\alpha)} \alpha^\alpha$$

Labour supply

- Competitive: same wages

References

- Gali Monacelli (2005)
- Wills (2013)

- Gali, Lopez-Salido, Vallez (2007)

The openness of the capital account is crucial as it determines whether the central bank can affect consumption

	Ricardian Households (R)	Hand to Mouth Households (M)
Open capital account	<ul style="list-style-type: none">• Consume smoothly based on world real interest rate• Central bank intervention is perfectly offset by private capital flows (UIP)	<ul style="list-style-type: none">• Consume everything earned• Central bank intervention has no direct effect (no assets)
Closed capital account	<ul style="list-style-type: none">• Consume smoothly based on domestic real interest rate• Central bank intervention not offset, and will change real interest rate	<ul style="list-style-type: none">• Consume everything earned• Central bank intervention has no direct effect (no assets)

The openness of the capital account is crucial as it determines whether the central bank can affect consumption

Ricardian Households (R)

Hand to Mouth Households (M)

Open capital account

$$\begin{aligned} \frac{1}{1+r_t^*} &= \beta \left(\frac{C_t^R}{C_{t+1}^R} \right) \left(\frac{P_t}{P_{t+1}} \right) \\ &= \beta \left(\frac{C_t^*}{C_{t+1}^*} \right) \left(\frac{P_t^*}{P_{t+1}^*} \right) \left(\frac{\varepsilon_t^*}{\varepsilon_{t+1}^*} \right) \end{aligned}$$

$$P_t C_t^M = W_t N_t^M - P_{H,t} T_t^M$$

Closed capital account

$$\frac{1}{1+r_t} = \beta \left(\frac{C_t^R}{C_{t+1}^R} \right) \left(\frac{P_t}{P_{t+1}} \right)$$

$$P_t C_t^M = W_t N_t^M - P_{H,t} T_t^M$$

The central bank affects consumption by buying foreign assets, altering domestic savings and in turn the real interest rate

Stylised central bank balance sheet

	Assets	Liabilities
Modelled:	Foreign reserves, F	Net household assets, D (Monetary base)
Not modelled:	Government debt Private debt Gold and other assets	

Central bank budget constraint

$$D_{t+1} - (1 + r_t)D_t = S_{t+1}F_{t+1} - (1 + r^*)S_tF_t + \pi_t$$

CB profits

KA open: F offset immediately by private sector and $r=r^*$

KA closed: F determines D and $r \neq r^*$

Summary: Very standard model with only differences being some HtM consumers and a closed KA

Element

- Oil windfall: spent as received
- Two goods: Home and Foreign
- Two types of capital account
 - Open
 - Closed
- Two households:
 - Ricardian (can save)
 - non-Ricardian (can't save)

Why it's important

- Creates a temporary distortion
- Relative price is the RER
- Open: gives a benchmark
- Closed: gives Central Bank a role
- Some households can't save for themselves, so the CB will do it for them (F).

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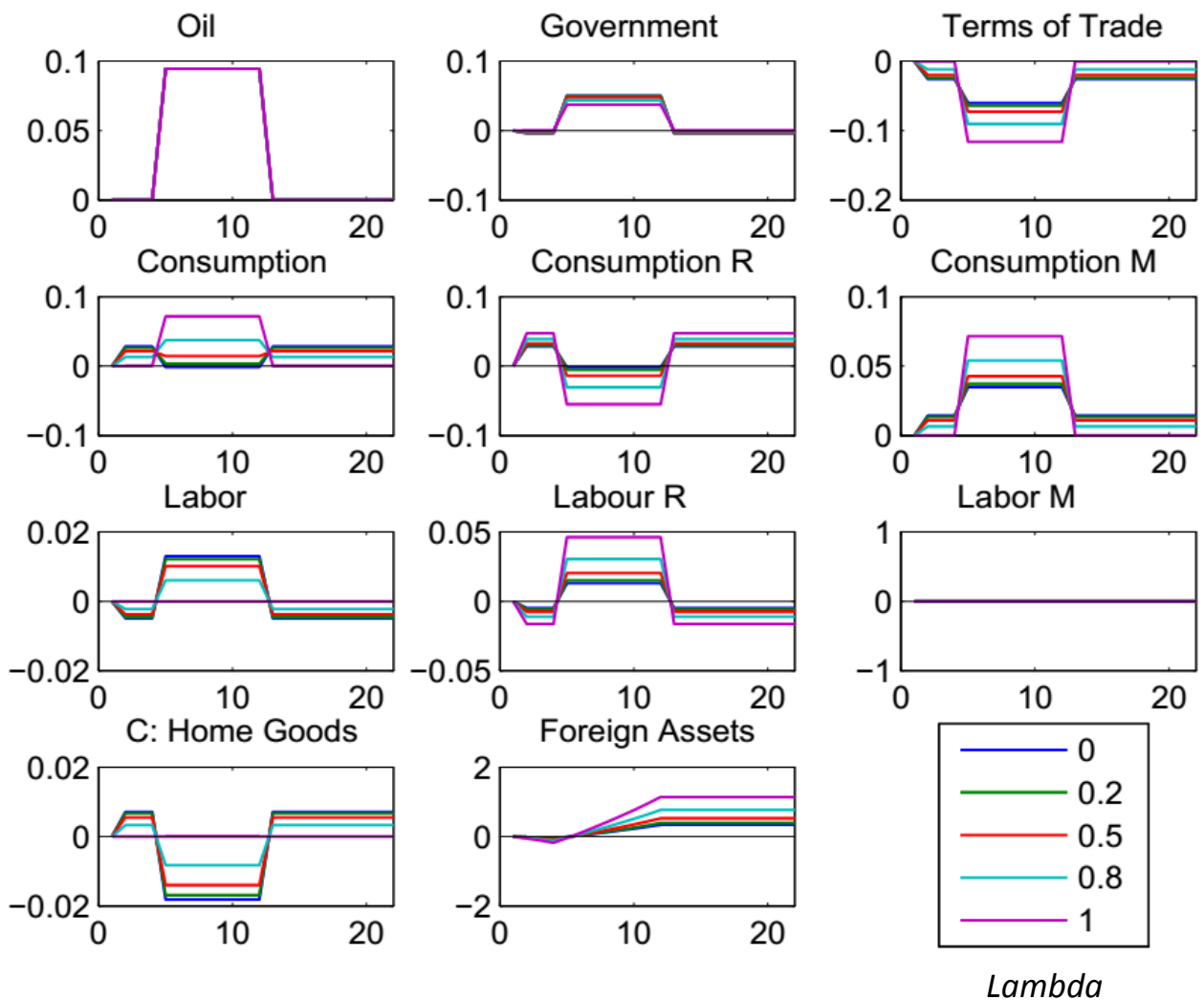
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Open KA: Effects of an oil discovery depend on equality in economy (number of Ricardians) - non-Ricardians “piggyback”

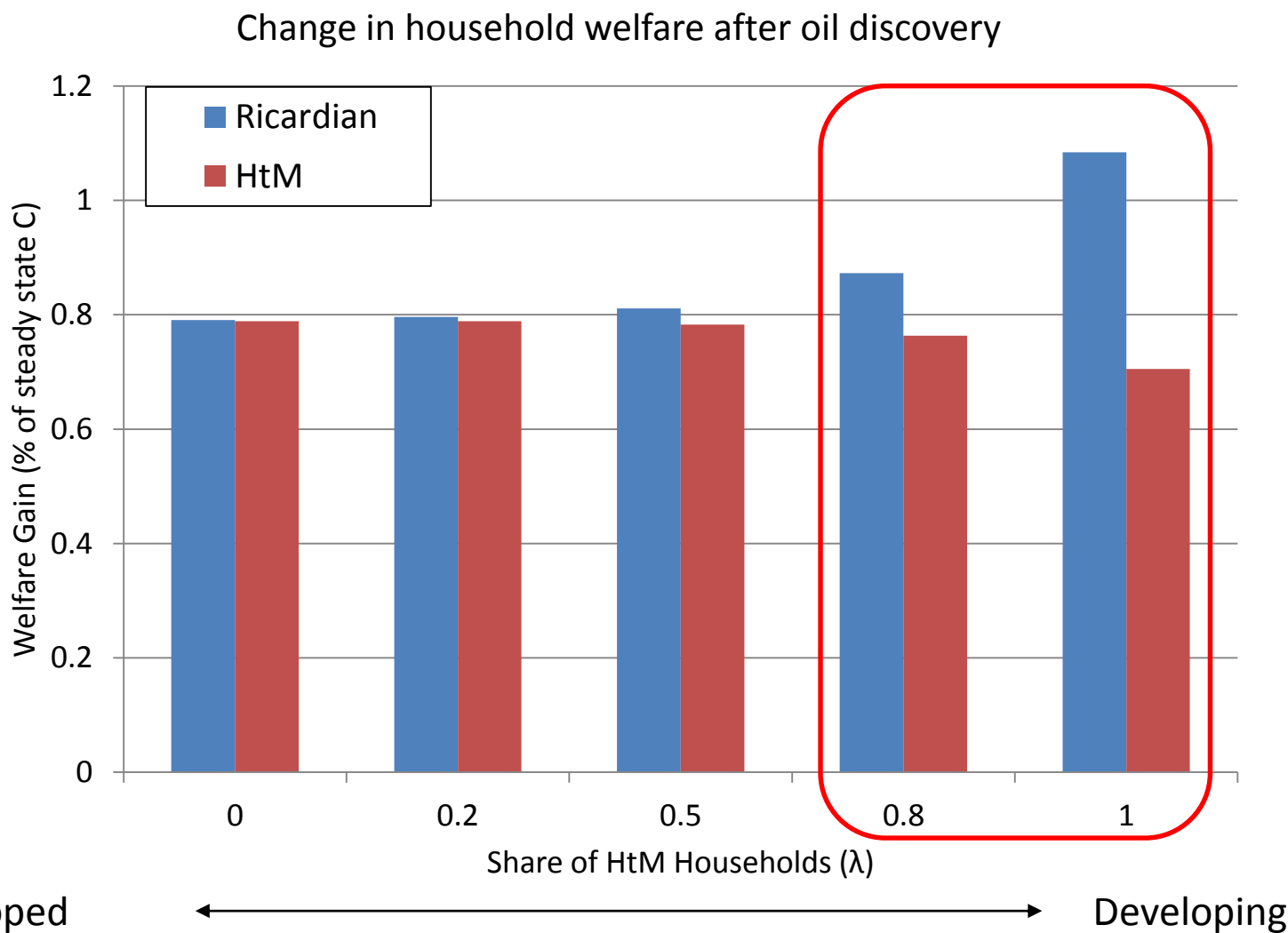
Temporary oil shock for different shares of hand-to-mouth households (λ : more), KA open



Notes

- 2 real appreciations:
 - Anticipation
 - Boom
- Ricardians smooth more if they are fewer
 - HtM demand causes big appreciation during Boom
- HtM consumers piggyback
 - Smooth more if there are Ricardians
 - Externality in Ricardian saving decision

Welfare: Ricardian consumers prefer fewer Ricardians. Hand to Mouth consumers prefer more (more equality).



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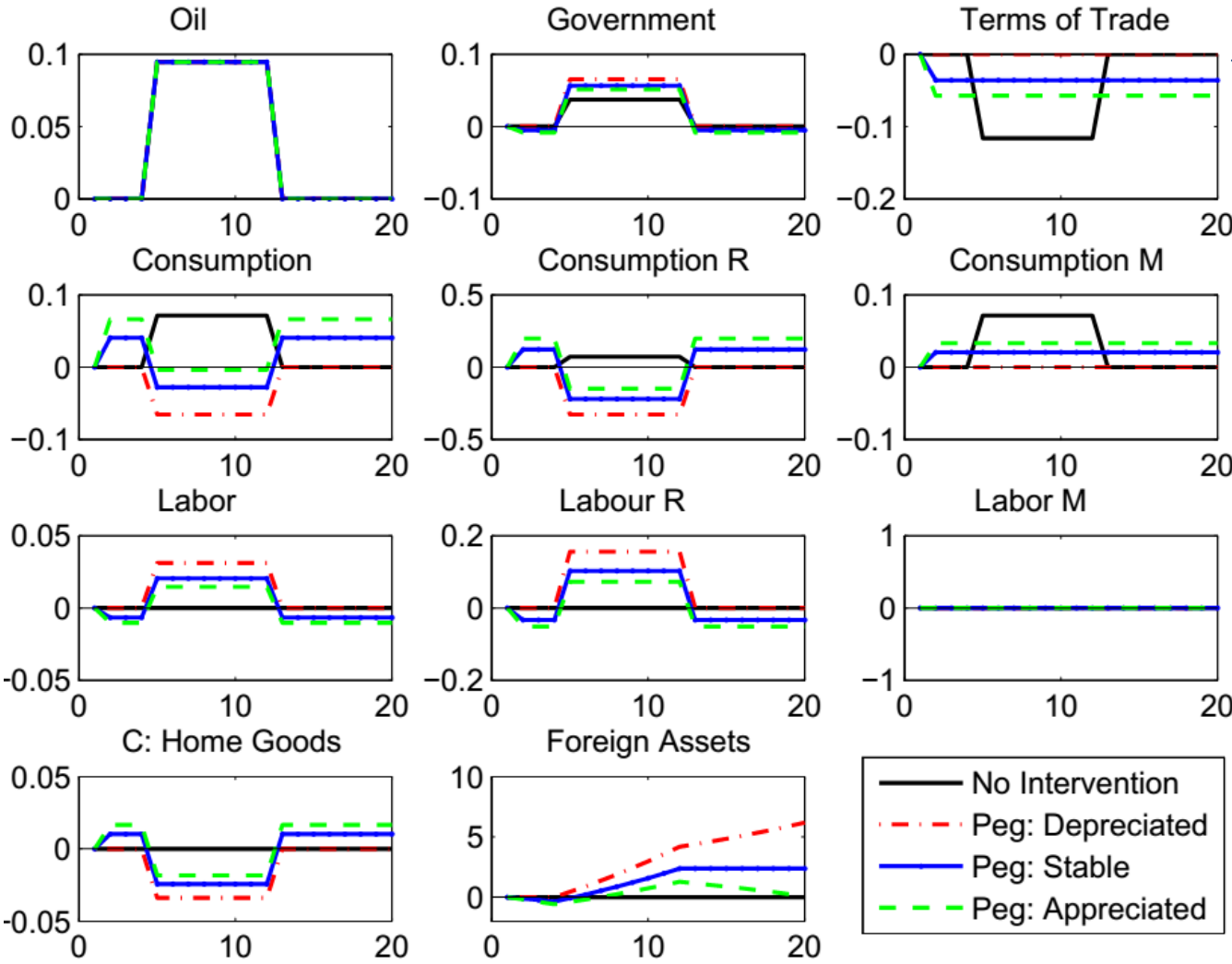
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Closed KA: Stabilizing the RER accumulates a de-facto SWF, supporting permanently higher consumption

Temporary oil shock for different central bank interventions, KA open



Notes

- No intervention
 - No net saving, Ricardians become like HtM
- Peg too high or low?
 - Accumulate too many or too few foreign assets
- Peg stable
 - Replace short, sharp appreciation with permanent, modest one
 - Ricardians save more than in Open KA to keep RER stable: corrects externality
 - Consumption permanently higher for all

A stable real exchange rate performs better than no intervention, or indeed an open capital account

Comparison of welfare under different interventions, consumption equivalent in perpetuity

Policy	Mostly Ricardian ($\lambda=0.2$)		Mostly Hand to Mouth ($\lambda=0.8$)	
	Ricardian	Hand to Mouth	Ricardian	Hand to Mouth
No Intervention	100.0%	100.0%	100.0%	100.0%
Peg: Depreciated	98.5%	99.6%	94.7%	99.6%
Peg: Stable	104.5%	101.3%	111.6%	101.3%
Peg: Appreciated	107.4%	102.4%	122.4%	102.4%
Open KA	102.7%	100.9%	103.9%	100.4%

**Peg: Depreciated and Peg: Appreciated don't satisfy transversality condition.*

Notes

- *Peg: Depreciated* at pre-oil level is the worst: allows no increase in consumption
- *Peg: Stable* better than *Open KA*:
 - Ricardians benefit from stable HtM consumption, and save more
 - HtM benefit from more saving by central bank on their behalf, corrects externality
- Greater benefit with more HtM consumers
 - Central bank has bigger distortion to correct.

Conclusion

- Resource-dependent countries (RDEs) are more likely to peg their exchange rate
- This seems like a bad idea: short-term stabilization benefits (eg Wills, 2013)
- We propose that stabilizing the real exchange rate lets the central bank build a sovereign wealth fund if the government does not (raiding)
- This improves long-run welfare relative to open or closed capital accounts, for both rich and poor households.
- Also prevents raiding, which would involve abandoning a (very visible) peg
- This is more a story of a currency peg than a union
 - More Angola and Libya than EAMU.

How does this relate to macro in LICs more generally?

- The standard DSGE framework focuses on short-run fluctuations around a steady state. It often misses
 - Asset balances
 - Financial imperfections
 - Long-term wealth effects
- We have shown that this can have dramatic effects when evaluating policy
 - Eg. Should exchange rates be floating or fixed?
- They are particularly important in Low Income Countries
- The current macro agenda on financial frictions is likely to yield many more insights that will be useful for policymakers in LICs

End