The Natural Rate of Interest in Small-Open Economies: Asymmetries and Fragmentation

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Motivation

- Debate continues on whether rates will return to pre-pandemic lows, as resilient economic activity to tighter monetary policy suggests R^* may now be higher
- Analyzing interest-rate trends requires assessment of secular forces
- Much prior work centers on US/'Global' R^*: common trends across countries
- Increased geoeconomic fragmentation risks motivate two key questions:
  - How might fragmentation influence interest-rate prospects across countries, given differing economic outlooks?
  - Could trajectory of integration itself drive cross-country interest-rate differences?

This Paper

- Structural life-cycle model studying trend real interest rates in SOEs $\tilde{R}^*$
- Incl. multiple potential world-SOE (here, UK) asymmetries in unified setup Lit.
- Six potential drivers: productivity growth, population growth, longevity, risk premia, government debt, fragmentation of global capital markets

This Paper

- Structural life-cycle model studying trend real interest rates in SOEs $\tilde{R}^*$
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- Six potential drivers: productivity growth, population growth, longevity, risk premia, government debt, fragmentation of global capital markets

⋆ Against backdrop of ↓ Global R^* of $\sim$ 2.5pp in the past half century, model suggests a more muted decline of $\sim$ 1.5pp in UK

⋆ Looking ahead, increased geoeconomic fragmentation poses significant upside risks to UK equilibrium rates, of nearly 0.5pp

Set Up

- Two-country neoclassical overlapping generations (OLG) model
- Home = SOE (UK) and Rest of the World = Advanced Economies (AEs)
- Finitely-lived households:
  - Face age- and region-specific mortality rates
  - Supply labour
  - Save in capital, domestic bonds or foreign assets
  - Pay taxes/receive transfers from the government
- Two wedges:
  - φ: premium between RoR on domestic capital (r^k) and dom. govt. bond ($r = \tilde{R}^*$)
  - ϕ: premium between RoR on foreign assets (r^f = Global R^*) and dom. bond

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Open-Economy Wedge

ϕ denotes the elasticity of the domestic real interest rate (price) with respect to changes in NFA (quantities)

$$r_t = r_t^f - \phi \frac{NFA_t}{Y_t}$$

Three cases:

- $\phi = 0$: SOE, perfect capital mobility
- $\phi \to \infty$: NFA=0, closed economy
- $\phi > 0$: imperfect capital mobility (two margins of adjustment: r and NFA)

Calibration

Calibration mechanically pins down pre-1950 initial conditions:

- **Age-specific parameters** (ρ_j, β_j): match life-cycle profiles from UK Wealth and Assets Survey (WAS) and US (as RoW) SCF — Survey data
- **Aggregate parameters** (μ, α, δ): match targets from PWT — PWT

Simulate model with trends for UK and RoW from 1950 onwards:

- Population growth n_t and longevity $\Pi_{j,t}$ (UN Population Statistics)
- Productivity growth e_t (Ziesemer, 2023)
- Government debt g_t (IMF Global Debt Database)
- Risk premia φ_t (yield on BAA vs. and 10-year Treasury spread) — Drivers

Calibration: Open-Economy Wedge

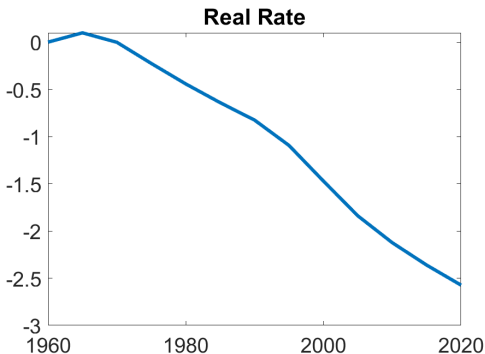
- Baseline calibration for ϕ is static
- Taking wedge equation to data by projecting long-term real rates (UK vs. RoW) on the UK net-foreign asset to GDP ratio (ONS):

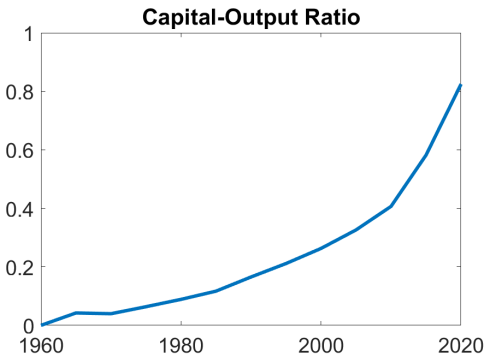
$$\log\left(\frac{R_t^{UK,10y}}{R_t^{RoW,10y}}\right) = \phi_1 + \phi_2\left(\frac{NFA_t}{GDP_t}\right) + \varepsilon_t$$

- Results suggest $\phi_2 \approx -0.2$ (this is ongoing work though)

Results

Global R^* ($\tilde{R}^*$ with Perfect Capital Mobility)

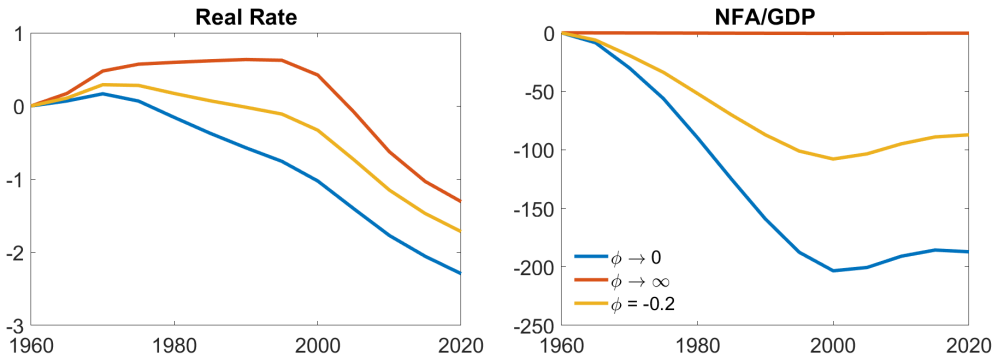




Note: Both panels present changes relative to 1960. Left panel presents change in percentage points, right panel presents change in ratio.

More

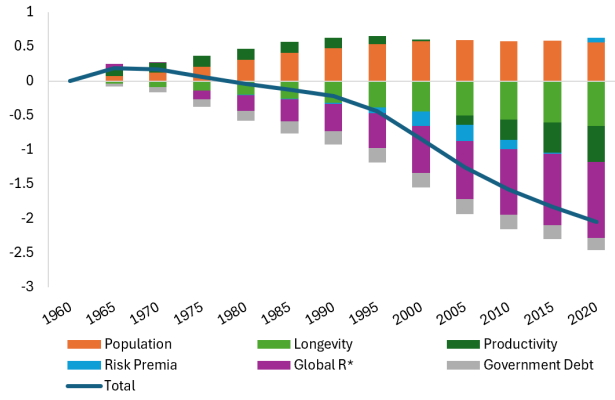
$\tilde{R}^*$ with Imperfect Capital Mobility



Note: Left panel presents change in percentage points while right panel presents change in fraction, all relative to 1960.

More

Decomposition of UK $\tilde{R}^*$



Note: $\phi = -0.2$. Decomposition of percent point change relative to 1960, varying one driver at a time.

More

Taking Stock

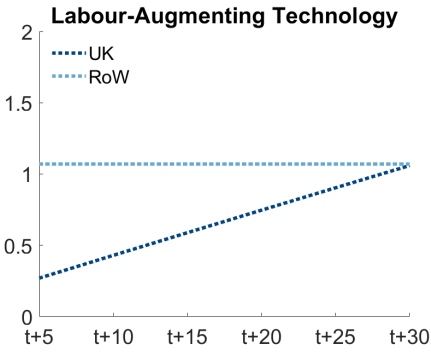
- Global R^* acts as our anchor for domestic rates
- International financial market frictions create a wedge: the more imperfect is capital mobility, the less sensitive an SOE's trend rate is to global factors

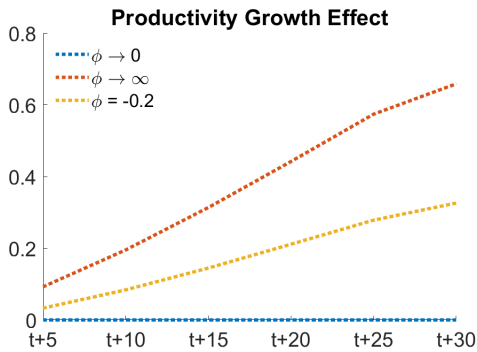
$\Rightarrow$ **Asymmetries contribute to wedge between Global R^* and SOE $\tilde{R}^*$**

$\star$ Accounting for realistic frictions to capital mobility for UK, asymmetries in productivity slowdown and demographic forces explain difference w.r.t. Global R^*

- Next, we can use this framework to think about the future, including role for **fragmentation**

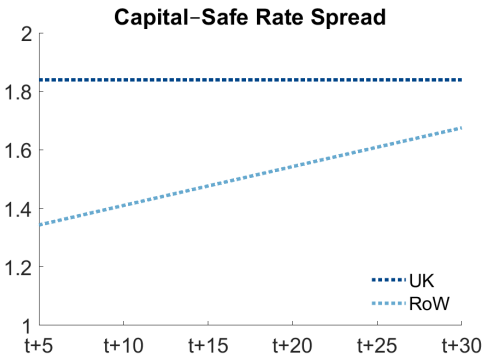
Cross-Country Asymmetries in Productivity

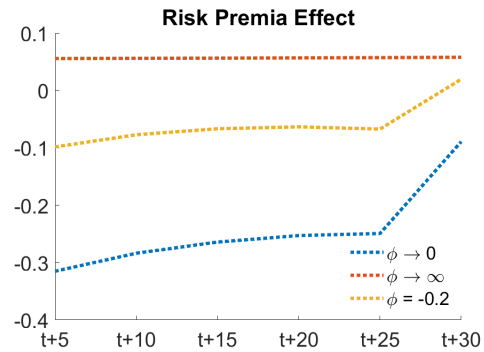




Note: Productivity growth rate (percent) prospects in left panel assume a 1sd increase in $t + 30$ just for UK. Right panel are differences, in percentage points, w.r.t. Global R^* estimated without productivity changes. All cases include demographic projections.

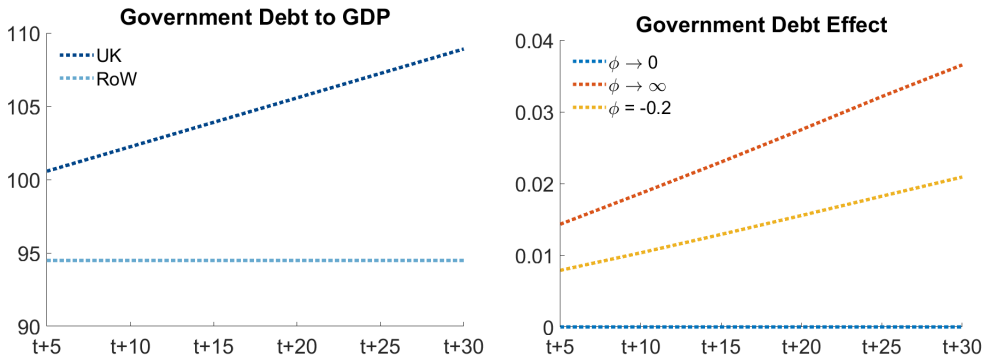
Cross-Country Asymmetries in Risk Premia





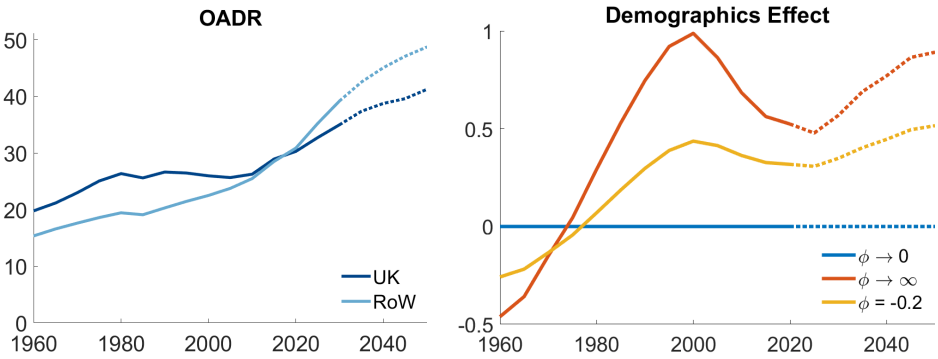
Note: panels are in percentage points. Risk premia prospects in left panel assume a 1sd increase $t + 30$ just for RoW. Right panel are differences w.r.t. Global R^* estimated with risk premia changes. All cases include demographic projections.

Cross-Country Asymmetries - Government Debt



Note: Government debt ratio (percent) prospects in left panel assume a 10pp increase in $t + 30$ just for UK. Right panel are differences, in percentage points, w.r.t. Global R^* estimated without government debt ratio changes. All cases include demographic projections.

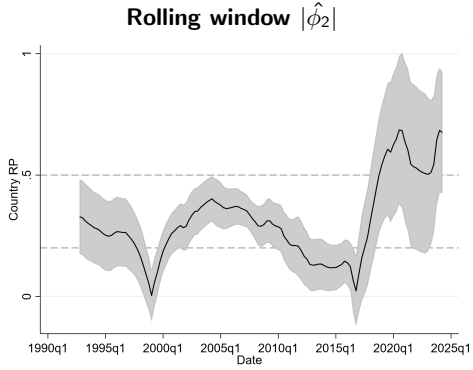
Cross-Country Asymmetries in Demographics



Note: Old-Age Dependency Ratio (65+/20-64 years-olds) projections in left panel are from UN Population Statistics data, based on median fertility scenario. Right panel are differences w.r.t. Global R^*. All cases only include demographic projections for future path.

Fragmentation

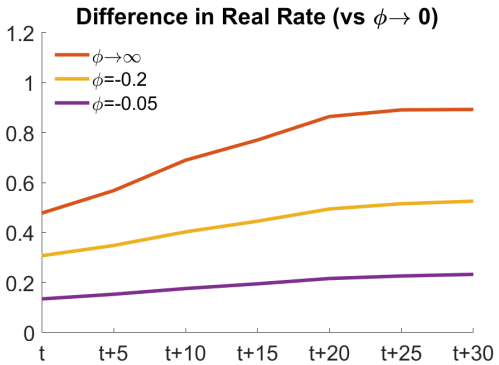
We aim to evaluate the extent to which the degree of global capital mobility has evolved over time...



Note: Country RP ϕ in absolute value, estimated with 15 years rolling windows in black, 95% confidence intervals in shaded grey area.

Potential Effects of Fragmentation

The acceleration of fragmentation presents an upward risk



Note: panel is in percentage point difference w.r.t. perfect capital mobility estimation - Global R^*.

Conclusions

- Explored behaviour and determinants of trend real interest rates in SOEs ($\tilde{R}^*$), focusing on the case of the UK over 1960-2020
- Due to global capital market imperfections, decline in UK $\tilde{R}^*$ of $\sim$1.5pp less pronounced than decline in Global R^* of $\sim$2.5pp over the past 60 years
- Productivity and demographic factors weighed more on Global rate than UK's
- Looking ahead, asymmetries could continue to generate a wedge between rates
- Without asymmetries, accelerated geoeconomic fragmentation poses upside risks
- Reduced (financial) openness could increase UK's equilibrium rates by $\sim$0.8pp

Appendix

Households

- Each period, a continuum of mass N_t of households is 'born'
- The growth rate of consecutive cohorts n_t is exogenous, where $(1 + n_t) \equiv N_t / N_{t-1}$
- They solve

$$\max_{c_{t,j}, a_{t,j}} \sum_{j=1}^{J} \beta_j \Pi_{t,j} \log(c_{t,j})$$

subject to

$$c_{t,j} = \rho_j w_{t+j-1} + (1 + r_{t+j-2}) a_{t,j-1} - a_{t,j} + \varpi_{t,j} \quad \text{for } j = 1, \ldots, J$$

where the unconditional survival probability $\Pi_{t,j}$ is also exogenous

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Firms

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- A monopolistic retailer buys Y_t units of an intermediate good and sells it as a final good with a net mark-up μ over its marginal cost

- Intermediate good producer solves:

$$\max_{K_t,\ L_t} \quad \frac{1}{1+\mu} Y_t - \left(r_t^k p_t^k K_{t-1} + w_t L_t \right)$$

given technology

$$Y_t = \left(\alpha K_{t-1}^{\frac{\sigma-1}{\sigma}} + (1-\alpha)(E_t L_t)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

where E_t is labour-augmenting technological process (exogenous growth rate e_t)

Financial Intermediary

Back

- Takes aggregate assets of the households, promising r_t
- Buys government debt or turns them into capital goods
- We assume φ_t is an exogenous wedge such that

$$1 + r_t = \left(1 + r^k_{t+1} - \delta\right) \frac{p^k_{t+1}}{p^k_t} - \varphi_t$$

Government

Back

Government budget constraint is given by:

$$G_t = (1 + r_{t-1})G_{t-1} + \mathcal{S}_t - \mathcal{T}_t$$

where

$$\mathcal{T}_t = \sum_{j=1}^{J^R-1} \tau_{j,t} = (J^R - 1)\tau_t \implies \tau_t = \frac{1}{J^R - 1}\mathcal{T}_t$$

$$\mathcal{S}_t = \sum_{j=J^R}^{J} s_{j,t} = (J - J^R)s_t \implies s_t = \frac{1}{J - J^R}\mathcal{S}_t$$

with the government debt-to-GDP ratio, g_t, exogenously determined

Market Clearing

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Labour Markets

$$L_t = \sum_{j=1}^{J} \Pi_{t-j+1,j} N_{t-j+1} \rho_j$$

Goods Markets

$$\sum_{j=1}^{J} \Pi_{t-j+1,j} N_{t-j+1} \varpi_{t-j+1,j} = \mathcal{P}_t + \mathcal{B}_t - \mathcal{T}_t + \mathcal{S}_t$$

Asset Markets in SOE

$$\sum_{j=1}^{J} \Pi_{t-j+1,j} N_{t-j+1} a_{t-j+1,j} = NFA_t + G_t + p_t^k K_t$$

Selected Global R^* estimates

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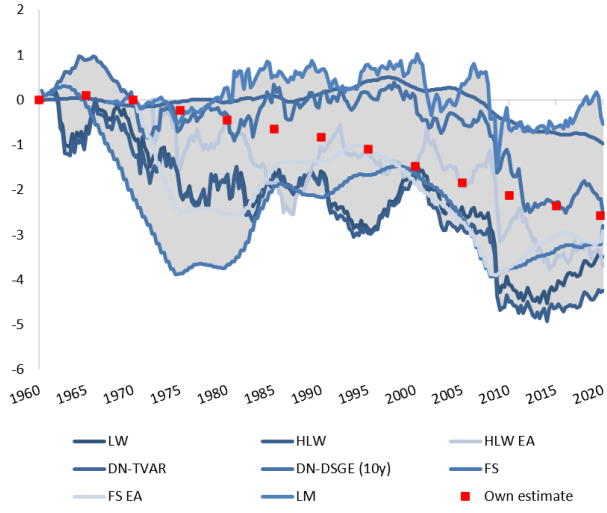


Literature Review

Drivers of R^* in SOEs: Lisack et al. (2021); Carvalho et al. (2023); Kuncl and Matveev (2023)

- First to include all drivers together

Semi-structural models of r^*: Laubach and Williams (2003); Holston et al. (2017); Harrison et al. (2024)

- Focus on longer-term trends, abstracting from effects of shocks over shorter horizons

Empirical studies of country-specific R^*: Ferreira and Shousha (2023); Davis et al. (2024)

- Provide a structural decomposition of drivers

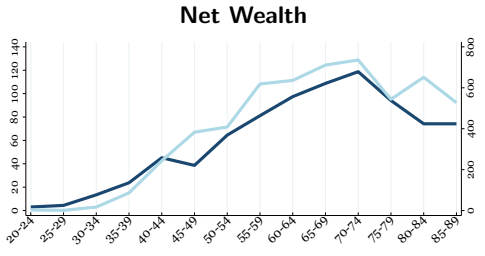
Global R^* models: Cesa-Bianchi et al. (2023); Del Negro et al. (2019); Kiley (2020)

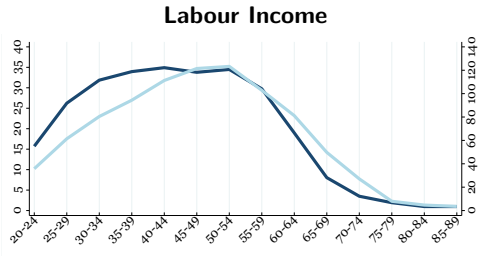
- Incorporate possible deviations from global trends, fragmentation effects

Fragmentation and interest rates: International Monetary Fund (2023)

- Conduct a structural analysis Back

Life-cycle profiles





Note: ife-cycle Profiles in the UK (dark, left) and US (light, right). Thousands GBP and USD, respectively. Sources: WAS (2011-2020), and SCF (2019).

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Aggregates

Targets	**US**	**UK**
Capital depreciation	3.6%	3.6%
Labour income share	60%	57%
Capital to output ratio	4.5	4.2

Source: Penn World Tables (PWT), 1950-2019 average

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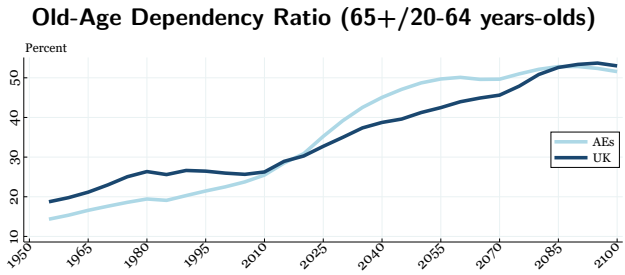
Demographics



Source: UN Population Statistics, projections based on median fertility scenario.

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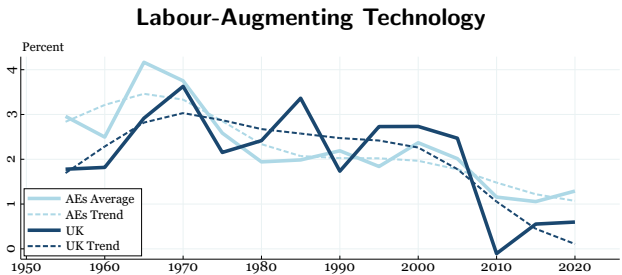
Productivity



Source: Ziesemer (2023). CES estimation, 0.7 elasticity.

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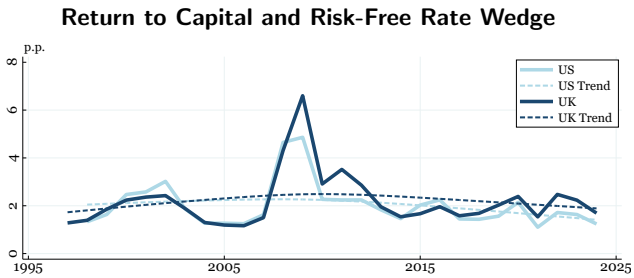
Risk Premia



Source: Spread in p.p., computed as the difference between the yield on BAA bonds and 10-year Treasuries.

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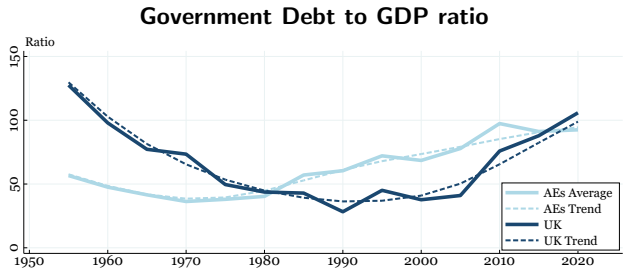
Government Debt



Source: Global Debt Database (GDD), IMF.

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Open-Economy Wedge

	$\log\left(R^{UK,10y}/R^{US,10y}\right)$
NFA/GDP $(\hat{\phi}_2)$	-0.121*
	(2.05)
$\mathbb{1}^{GFC}$	-0.329***
	(-4.93)
$\mathbb{1}^{Covid}$	-0.580***
	(-6.15)
Constant $(\hat{\phi}_1)$	0.127***
	(7.85)
Observations	186
R^2	0.347

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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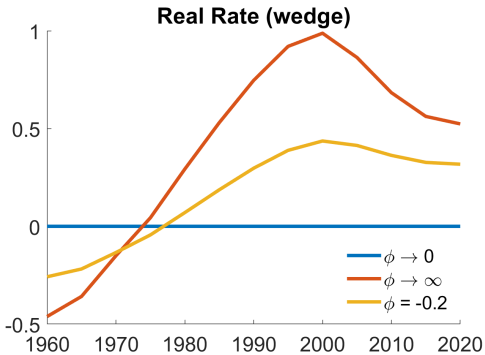
UK $\tilde{R}^*$ with Imperfect Capital Mobility



Note: Panel presents change in percentage points relative to SOE case.

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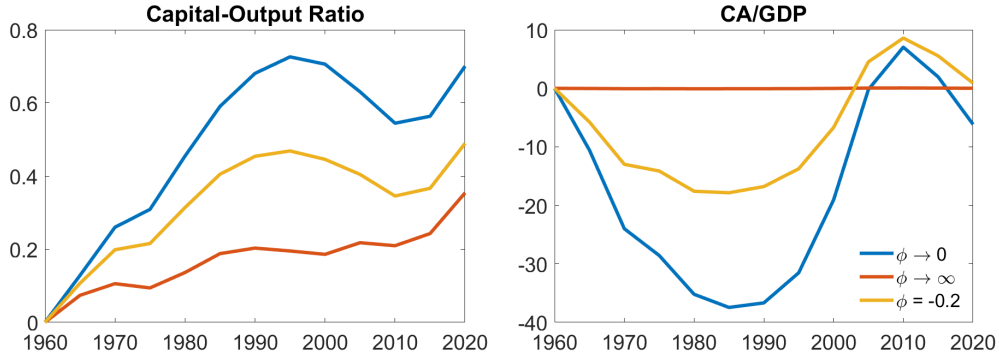
UK $\tilde{R}^*$ with Imperfect Capital Mobility (2)



Note: All panels present changes in fraction relative to 1960.

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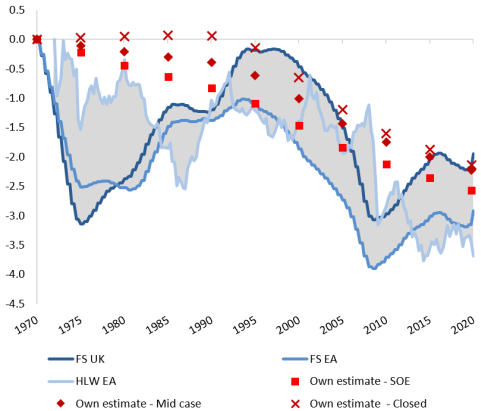
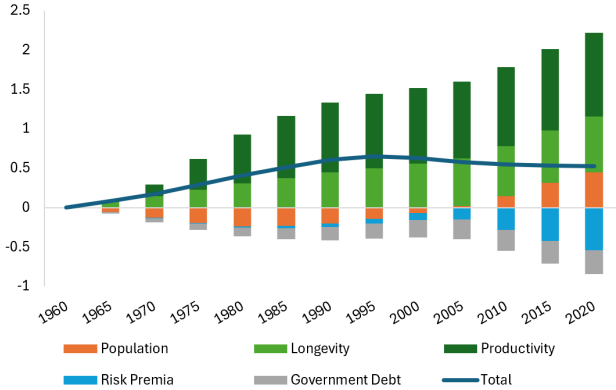
UK selected R^* estimates



Source: models included are Ferreira-Shousha (FS), and Holston-Labauch-Williams (HLW) . Estimates refer to 'UK' or 'EA'. Own estimates in p.p. differences w.r.t. 1970. Back

UK $\tilde{R}^*$ decomposition - vs Global R^* -



Note: differences in estimated R^* with $\phi = -0.2$ vs $\phi \to 0$, in changes w.r.t. 1960 real interest rate, changing one driver at a time.

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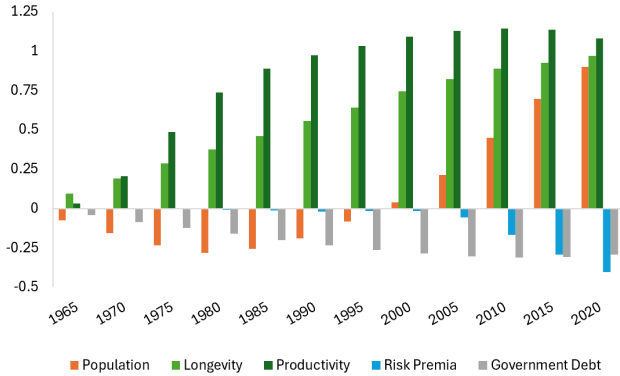
UK $\tilde{R}^*$ contributions - vs Global R^* -



Note: differences in estimated R^* contributions with $\phi = -0.2$ vs $\phi \to 0$, in changes w.r.t. 1960 real interest rate, shutting down one driver at a time.

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