Lucas-Stokey meet Lewis: Optimal Fiscal Policy and Implicit Redistribution in a Dual Economy

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Outline

Introduction

Introduction & Research Questions

- **Optimal Fiscal Policy**: how to use fiscal tools to (1) balance the gov't budget, (2) influence macroeconomic transmission, (3) optimise an objective under restrictions on policy instruments.
- **Macro Literature** (Ramsey and OSRs): prevailing consensus on the optimality of **Tax Smoothing** (Very Doveish FP) in benchmark Lucas-Stokey economies with Ricardian agents and flexible prices (Barro, 1979; Lucas-Stokey, 1983; Bohn, 1990; Debortoli, 2017).
- **Research Questions.** What does optimal fiscal policy look like in economies where *redistribution* is a first order concern in policy transmission?
  1. In particular, optimal fiscal policy and its transmission under *Economic Dualism*, a source of *implicit redistribution*, with applications to fiscal policy developing economies.
  2. Does the Tax Smoothing principle still stand? Can we flip it?

Cont'd: Main Ideas

- Assumptions on institutional capacity in Lucas-Stokey models fall short of *dualist* institutional structure of developing economies (Lewis, 1954; Ranis, 1988; Banerjee and Newman, 1996; Townsend, 2010, 2016): structural income inequalities, depth of gov't debt markets, household financial integration (Kumhof and Tanner, 2005).
- Theory-wise, intuition builds and contributing to interest in *non-ricardianism* and *redistribution channels* as key dimensions to fiscal policy transmission and optimal choice. (Biilbie, Monacelli, and Perotti, 2024)
- If (implicit) redistribution is important, models of fiscal policy in developing economies should incorporate dualism in setting up a model of transmission:
  1. Implications for transmission of fiscal policy
  2. Optimal fiscal policy: is the Tax Smoothing principle still valid?
  3. Interplay with *dualism-reducing* institutional reform/Lewisian transitions: complements or substitutes?

Contributions & Plan

- Model
  1. Small-scale flexible prices TANK (up to 8ANK): overlapping financial market, sectoral, and labour market segmentation.
  2. Match features of Developmental Transitions/Dualism Reducing Reform (Fei-Ranis, 1961; Kuznet, 1961; Lewis, 1954) in the *Sequence Space* (Auclert et al., 2021)
  3. Builds in *implicit redistribution* channel to choice of fiscal rules.
- Analysis
  1. Dynamics under Ramsey Optimal Policy and OSRs at a 2nd Order Perturbation.
  2. Comparative statics on OSR and achieved distortions wrt Ramsey Policy.
- Key Preliminary Results
  1. Tax smoothing principle substantially weakened
  2. At very early development stages... flipped completely $\rightarrow$ **debt-smoothing / hawkish FP**.
  3. Back to Schmidt-Grohé and Uribe (2005): distortions at OSR larger at lower-development stages.

Model

Core of "TANK" Model at a Glance

- Stylised version of a dual economy, building in a redistributive channel to fiscal policy rule transmission via permanent heterogeneity.
- Two type of Households: *traditional* and *modern* economy household.
- Degree of dualism, a proxy for economic development, is encoded by the measure of each type of agent.
  1. Comparative statics are in two-dimensional space
  2. Developmental Transitions as Nonlinear Eq. Paths in the Sequence Space.
  3. Straightforward to extend to more types, more granular view of dualism.
- Two sectors: an *upstream* traditional sector, with lower long-run productivity, and a higher long-run productivity *downstream* modern sector.
- Immobile labour between traditional and modern economy.

Preview of Main Results & Intuition

- Implicit Redistribution in the Transmission of FP Rules
  - Traditional Households $\rightarrow$ FP rules and implied debt paths carry no useful information to plan ahead $\rightarrow$ taxes tomorrow come as surprises/unexpected shocks.
  - Coupled with labour-smoothing... volatile consumption path over time.
  - Because modern household ends up holding the debt, very doveish or tax-smoothing rules implicitly redistribute resources from the modern to traditional sector household.
  - As noted elsewhere, movements in inequality away from the steady state one (implicit inter-group transfers) are inefficient (Biilbie, Monacelli, and Perotti, 2024)
- Consequences for Optimal Policy across Development Stages
  1. Tax smoothing principle substantially weakened
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Households

Ex-Ante Heterogenous agents ("TANK") model. Space of households partitioned between modern-economy household and traditional-economy household, with *Lebesgue* measure/mass $\mu \in (0,1)$ and $1-\mu$.

- **Modern-Sector Household** (Standard DSO Programme)

$$q_t c_{0,t}^{-\theta} = \beta E_t c_{0,t+1}^{-\theta}$$

$$c_{0,t}^{\theta} n_{0,t}^{\nu} = (1-\tau_t) w_{f,t}$$

$$c_{0,t} + q_t b_t = (1-\tau_t) w_{f,t} n_{0,t} + (1+\delta q_t) b_{t-1}$$

- **Traditional-Sector Household** (Hand-to-Mouth)

$$c_{1,t}^{\theta} n_{1,t}^{\nu} = (1-\tau_t) w_{a,t}$$

$$c_{1,t} = (1-\tau_t) w_{a,t} n_{1,t}$$

- Decay factor $\delta = (1+r^*)\left(1-\frac{1}{t_b}\right) \rightarrow q^* = \frac{1}{1+r^*-\delta} = \frac{t_b}{1+r^*}$

Firms

- Two types of firms facing competitive markets programmes, flexible prices.
- Downstream modern economy firms f employing modern sector households' labour and traditional sector output as inputs;
- Upstream traditional economy firms a employing traditional sector households' labour as input.
- Assuming linear technology to simplify output side (linear/perfect substitutes – AS dominates).

$$y_{f,t} = A_t N_{f,t} + Z_t y_{a,t}$$

$$y_{a,t} = L_t N_{a,t}$$

- Alternative setup with concave production technology/convex upper contour sets isoquants
- Benefits of a linear technology... view

Fiscal Policy I

- Government sets fiscal policy according to the FP rule (debt-stabilising rule) and balanced budget/solvency at all times:

$$B_t = \phi_b B_{t-1} + \phi_g G_t$$

$$q_t B_t + \tau_t(w_{a,t} N_{a,t} + w_{f,t} N_{f,t}) = (1 + \delta q_t) B_{t-1} + G_t$$

- Where q_t = price of bond with maturity structure modelled by the decay factor δ (cf. Auclert et al, 2020).
- **Restriction to debt-stabilising, passive fiscal policy**

$$\phi_b = \left(1 - \frac{\bar{G}}{\bar{B}} \phi_g\right)$$

Design space is $\Phi \equiv \{\phi_g\}$

Fiscal Policy II

- Can show that B_t is *globally asymptotically stable at long-run debt target* $\bar{B}$. Practically $\bar{B}$ and $\bar{G}$ set to around 50% and 5% of output.
- Integrating the Diff. Equation backward

$$B_t = \lim_{k \to \infty} [\phi_b^k B_{t-k} + \phi_g \sum_{s=0}^{k} \phi_b^s G_t]$$

- By the Neumann Series Lemma

$$B_t = \frac{1}{1 - \phi_b} \phi_g G_t$$

$$B_t = \frac{\bar{B}}{\bar{G} \phi_g} \phi_g G_t$$

For a stable process $G_t \to \bar{G}$, as all shocks settle down:

$$B_t \to \bar{B}$$

- Clearing for government debt market

$$B_t = \int b_{j,t} P(dj) = \mu b_t$$

Shocks

- Four main sources of aggregate fluctuations
- Future Bayesian estimation work
- Fiscal expenditure shocks + productivity levels of factor-specific technologies
- Log-normal around non-stochastic LR mean
- Focus today is particularly on transmission of the fiscal expenditure shock
- Shocks View

Welfare Criterion (Planner's Preferences)

- Standard programme: welfare given by aggregation of individual intertemporal preferences in consumption and leisure over the distribution/lebesgue measure:

$$\mathcal{W} = \mathbb{E}_t \sum_{t=0}^{\infty} \beta^t \int U_j(c_{j,t}, n_{j,t}) P(dj)$$

$$\mathcal{W} = \mathbb{E}_t \sum_{t=0}^{\infty} \beta^t \left[\mu \left(\frac{c_{0,t}^{1-\theta}}{1-\theta} - \frac{n_{0,t}^{1+v}}{1+v} \right) + (1-\mu) \left(\frac{c_{1,t}^{1-\theta}}{1-\theta} - \frac{n_{1,t}^{1+v}}{1+v} \right) \right]$$

- CRRA parameter θ and inverse Frish-Elasticity of labour supply v calibrated as standard $\theta \approx 1$, $v = 2$ (quadratic marginal disutility from labour effort).

Full Model View

Main (Preliminary) Results

Analysis: Main Routine

- Iterated Ramsey Problem on discretised grid of dualism/development parameter μ.
- OSRs: solve above model for a recursive law of motion over the space of feasible fiscal policy designs $\{\phi_g\}$ AND dualism/development parameter μ.
  1. State-Space Solution: *Second-order* perturbation locally around the non-stochastic steady state of the economy.
  2. Solvent obtained through Generalised Schur/QZ decomposition methods for the stacked system. In practice, done with DYNARE (Soderlind, 1999; Uhlig, 1995).
  3. Second order perturbation... process variances matter (Schmitt-Grohé & Uribe, 2001)
- Using above, simulation based welfare analysis to rank fiscal policy designs according to quadratic app. to planner's welfare and loss relative to Ramsey Policy.
- Non-linear transitions to study interaction between optimal fiscal policy and institutional-reform in Sequence Space.

Ramsey Optimal Policy Benchmark

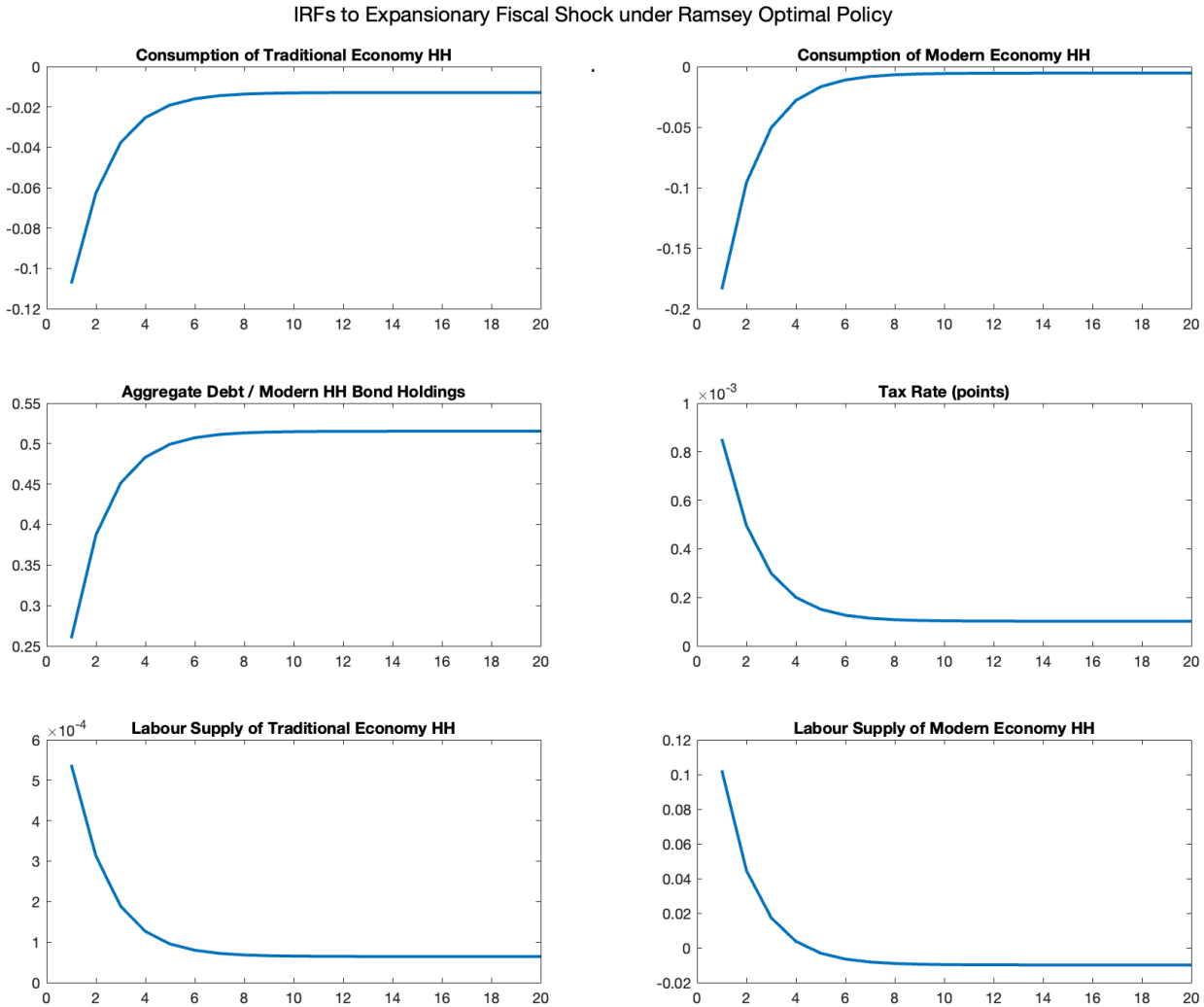


Figure: IRFs to Expansionary Fiscal Expenditure Shock – Ramsey Optimal Policy under Commitment. $\mu = 0.4$

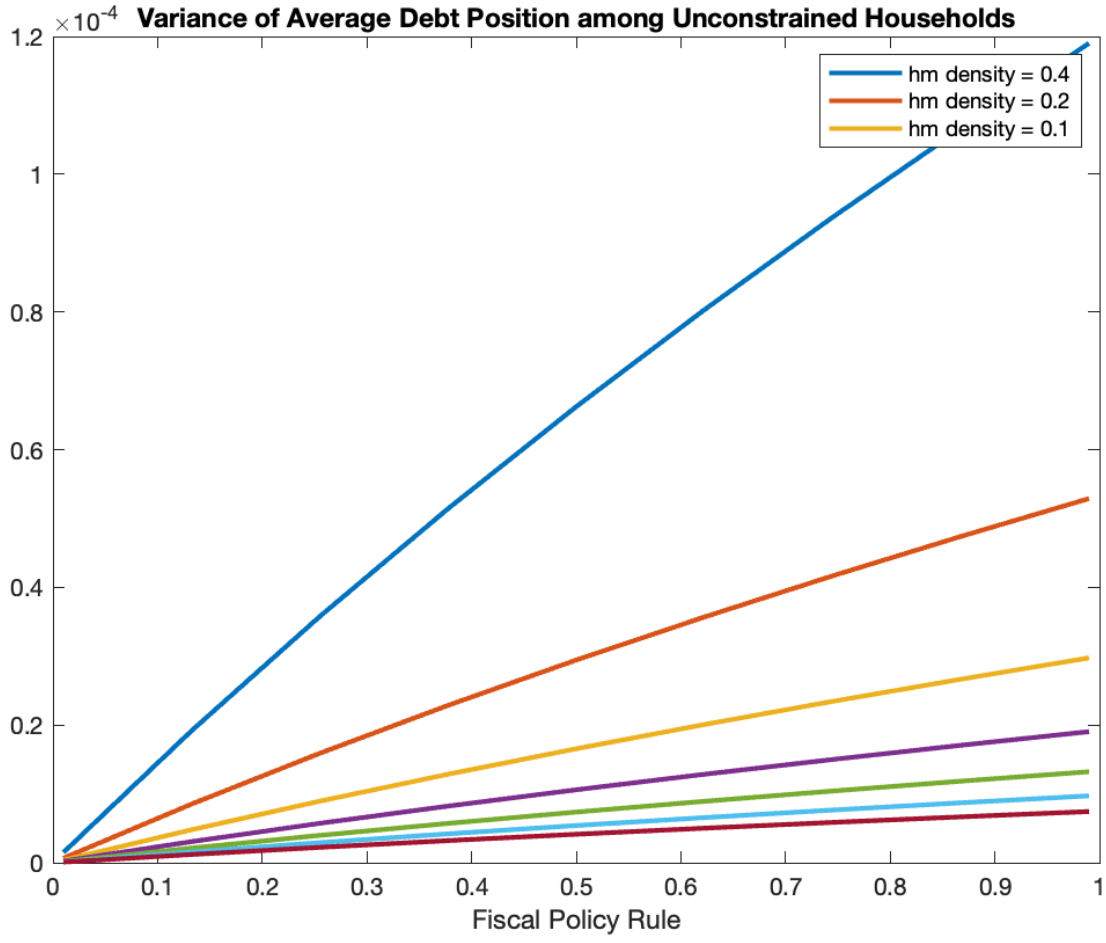
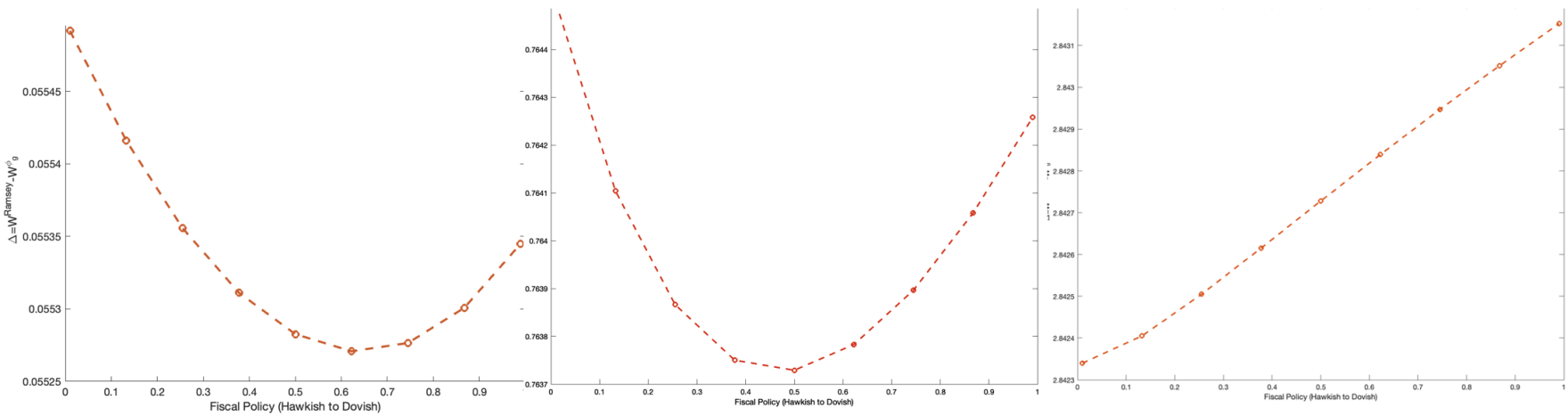


Figure: Variance of Debt over Fiscal Rules – Dualism space

Weakening the Tax-Smoothing Principle: OSRs across Development Stages in the Dual Economy

- Loss of OSRs relative to Ramsey Optimal Policy are a "decreasing function" of the level of development of the dual economy... complementarity.
- Quadratic loss even in "more" developed dual economies. Full specialisation/Tax-Smoothing sub-optimal. In dual economy, with $\mu = 40\% - 70\%$, pass-through $\phi_g \approx 0.63$
- As redistribution channel from Dual Economy becomes more pronounced at earlier development stages... desirability of tax-smoothing weakens and flipped completely in (c).



(a) $\mu = 40\%$ $(b)\mu = 10\%$ (c) $\mu = 1\%$

Recalling Main Intuition

- Implicit Redistribution in the Transmission of FP Rules
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Summary and Next

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Next... some directions

- Make maturity structure parameter δ a second dimension of OSR problem.
- Enrich asset side. Illiquid assets and scale-up core model to include investment and capital accumulation.
- THANK?
- Bayesian estimation with time series and micro data from South-Asian economies (India, Bangladesh, or Sri Lanka) for quantitative policy application.

Thank you!

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Appendix Materials

Concave Production Technology

- Modern sector household and traditional household (via trad. inputs) labour no longer perfect substitutes $\rightarrow$ *stronger* rationale to *stabilise* equilibrium labour supply flow ($\gamma = 0.5$).

$$y_{f,t} = (A_t N_{f,t})^{\gamma} (Z_t y_{a,t})^{1-\gamma}$$

- However, some theoretically unwelcome issues...
- Linear technology might make more sense in early stage growth or developing economies (dim. marg. returns have not kicked in yet). back

Matching Fei-Ranis/Kuznet Transitions

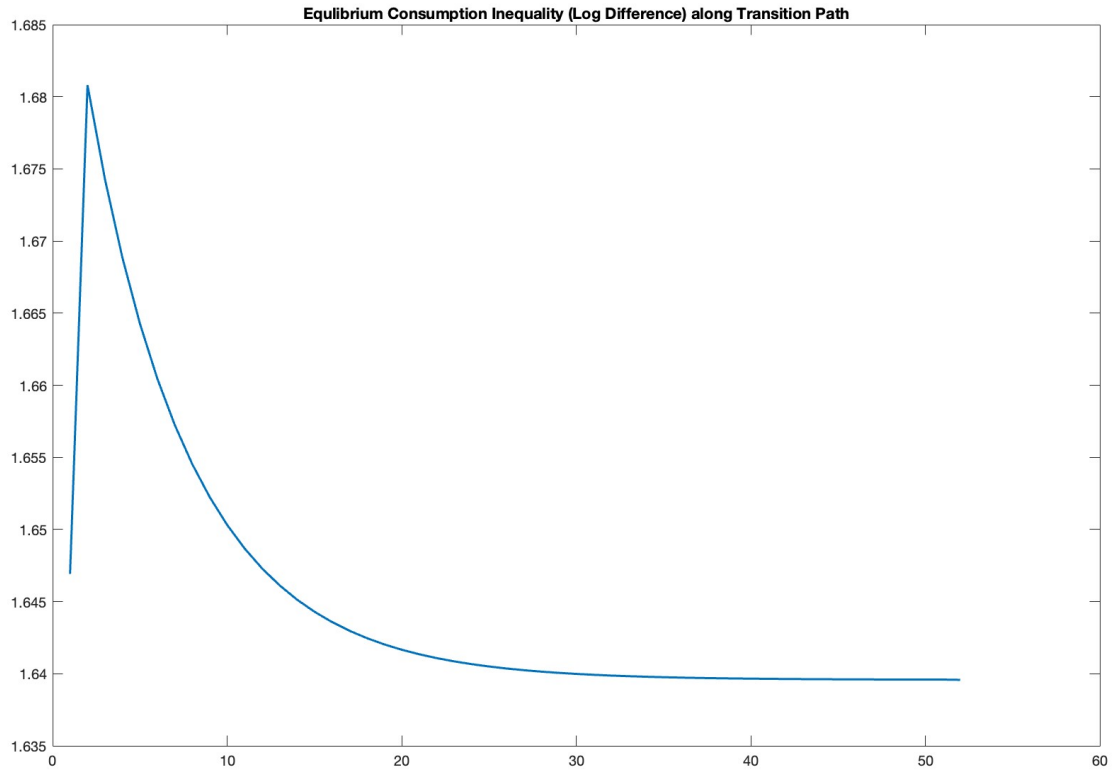

Figure: Inequality along a Lewisian Transition, under optimal fiscal policy

Fiscal Policy III: Tax Compliance and Differential Statutory-Effective Pass-Through

- Model extended to accommodate realistic feature that in traditional sector, effective incurred tax $\neq$ statutory tax (τ_t) as charged to formal sector

$$T_{0,t} = \tau_{0,t} w_{f,t} n_{0,t}$$

$$T_{1,t} = \tau_{1,t} w_{a,t} n_{1,t}$$

$$\tau_{0,t} = \kappa_0 \tau_t$$

$$\tau_{1,t} = \kappa_1 \tau_t$$

Where

$$\kappa_j = \frac{\partial T_{j,t}}{\partial x_{j,t}} / \tau_t = \frac{\partial \tau_{j,t}}{\partial \tau_t}$$

Full Benchmark DSGE Model: State Space Equilibrium

$$q_t c_{0,t}^{-\theta} = \beta \mathbb{E}_t c_{0,t+1}^{-\theta}$$

$$c_{0,t}^{\theta} n_{0,t}^{\nu} = (1-\tau_t) w_{f,t}$$

$$c_{0,t} + q_t b_t = (1-\tau_t) w_{f,t} n_{0,t} + (1+\delta q_t) b_{t-1}$$

$$c_{1,t}^{\theta} n_{1,t}^{\nu} = (1-\tau_t) w_{a,t}$$

$$c_{1,t} = (1-\tau_t) w_{a,t} n_{1,t}$$

$$w_{f,t} = A_t$$

$$w_{a,t} = p_{a,t} L_t$$

$$p_{a,t} = Z_t$$

$$y_{f,t} = A_t N_{f,t} + Z_t y_{a,t}$$

$$y_{a,t} = L_t N_{a,t}$$

$$N_{f,t} = \mu n_{0,t}$$

$$N_{a,t} = (1-\mu) n_{0,t}$$

$$B_t = \mu b_t$$

$$C_t = \mu c_{0,t} + (1-\mu) c_{1,t}$$

$$q_t B_t + \tau_t (w_{a,t} N_{a,t} + w_{f,t} N_{f,t}) = (1+\delta q_t) B_{t-1} + G_t$$

$$B_t = \left(1 - \frac{\bar{G}}{\bar{B}} \phi_g\right) B_{t-1} + \phi_g G_t$$

Cont'd – Structural Shocks Processes

$$G_t = \bar{G} e^{g_t}$$

$$Z_t = \bar{Z} e^{z_t}$$

$$L_t = \bar{L} e^{l_t}$$

$$A_t = \bar{A} e^{a_t}$$

$$g_t = \rho_g g_{t-1} + \epsilon_g$$

$$z_t = \rho_z z_{t-1} + \epsilon_z$$

$$l_t = \rho_l l_{t-1} + \epsilon_l$$

$$a_t = \rho_a a_{t-1} + \epsilon_a$$

$$[e_g, e_z, e_l, e_a]' \sim \mathbf{N}(\mathbf{0}, \mathbf{\Sigma})$$

IRFs I

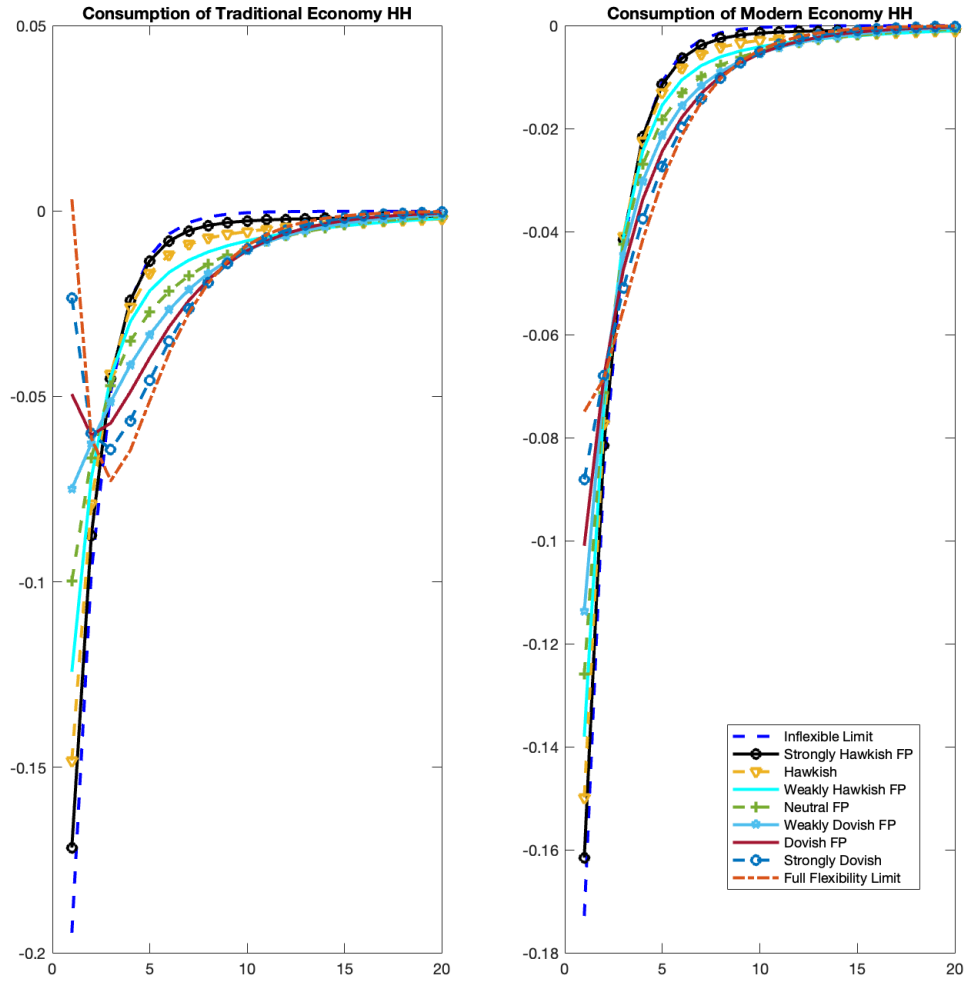

Figure: IRFs for consumption in Strongly Dualist economy ($\mu = 0.3$)

IRFs II

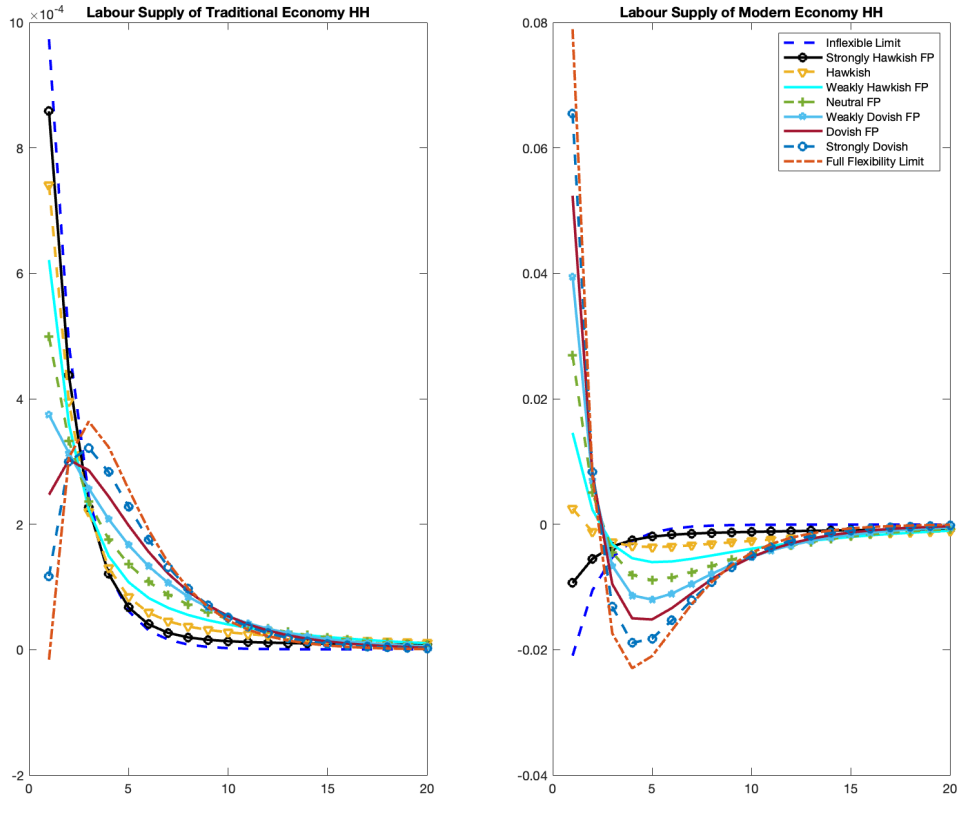

Figure: IRFs for labour supply in Strongly Dualist economy ($\mu = 0.3$)

IRFs III

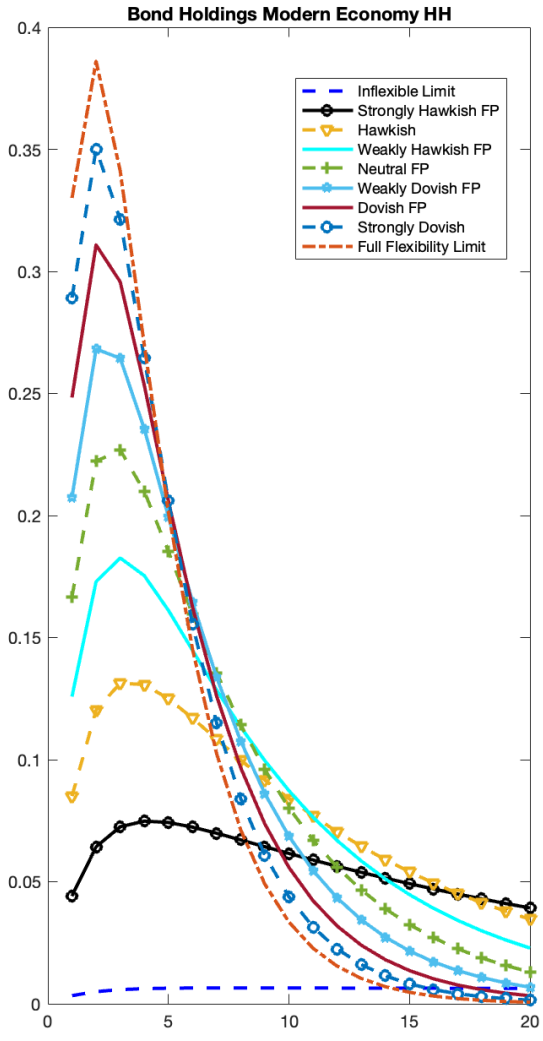

Figure: IRFs for debt in Strongly Dualist economy ($\mu = 0.3$)