Comments on

"Analyzing Fiscal Sustainability"
by Huixin Bi and Eric N. Leeper

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- Very interesting, informative, and nice to read paper

- Extremely timely (assessment of reforms from Feb. 2012)

Topic

- Macroeconomic view on sustainability
  - General equilibrium analysis of fiscal policies' sustainability
  - Impact of more or less credible reforms on sustainable debt levels
- Relates sustainability to default risk premia
  - Default expectations based on sustainability of current debt
  - Impact of fiscal policy reforms on default risk premia

Huixin and Eric's paper

- Applies a closed economy RBC model (Bi, 2011) with
  - various fiscal policy instruments and feedback rules
  - technology & government spending shocks and shifts in transfer regime
- Government without commitment to repay debt
  - Sovereign default depends on current debt and fiscal limit
  - Fiscal limit $\equiv$ maximum sum of discounted future surpluses
- Calibration of the model for Greek and Swedish data

The model

- Risk averse households
  - supply labor, consume, pay labor income taxes, receive transfers
  - invest in government bonds in all periods
  - demand a risk premium on bonds

    $$q_t = \beta E_t \left[(1 - \Delta_{t+1}) \frac{u_{c,t+1}}{u_{c,t}} \right]$$

    where Δ is the default rate.

The model (con't)

- Non-optimizing government
  - purchases goods g_t according to an exogenous rule A_t

$$\ln(g_t/g) = \alpha_g \ln(A_t/A) + \rho_g \ln(g_{t-1}/g) + \varepsilon_t^g$$

  - transfers goods z_t to households either stationary or non-stationary

$$z_t = z(A_t/A)^{\alpha_z} \quad \text{or} \quad z_t = \mu^z z_{t-1} + z\left[(A_t/A)^{\alpha_z} - 1\right]$$

  - and raises taxes according to a feedback rule

$$\tau_t - \tau = \gamma\left(b_t^p - b\right)$$

where b_t^p equals end-of-period debt net of defaulted debt $(1 - \Delta_t)b_{t-1}$

The model (con't)

- Sovereign default
  - Distribution of fiscal limits $\mathcal{B}^*(A_t, g_t, rs_t)$: sum of discounted surpluses under the Laffer curve maximizer

$$\mathcal{B}_t^*(A_t, g_t, rs_t) = E_t \sum_{k=0}^{\infty} m_{t,t+k}^{\max} \cdot surpluses_{t+k}^{\max}$$

  - Default occurs if b_{t-1} exceeds the *effective* fiscal limit, drawn from $\mathcal{B}^*(A_t, g_t, rs_t)$

$$b_t^* \sim \mathcal{B}^*(A_t, g_t, rs_t)$$

  - If $b_{t-1} \geq b_t^*$, default rate δ_t is drawn from a distribution of default rates Ω

$$\delta_t \sim \Omega$$

  - No credit market exclusion or other costs of default

Two concepts

- Conditional fiscal limits $\mathcal{B}_t^*$ vs. *un*conditional $\mathcal{B}^*$

$$\mathcal{B}^* = E \sum_{k=0}^{\infty} m_{t,t+k}^{\max} \cdot surpluses_{t+k}^{\max}$$

  - Unconditional fiscal limits more useful for long-run analysis
  - Conditional fiscal limits can explain soaring risk premia, e.g. of Greece.

Two applications

- Calibration for Greece 2012
  - Increase in transfers and bad technology have led to large risk premia
  - Regime shift can substantially reduce risk premia only if its credible
- Calibration for Sweden in the 90's
  - Credible long-run reforms with spending ceiling
  - Shift in the *un*conditional fiscal limit toward risk-free debt regions

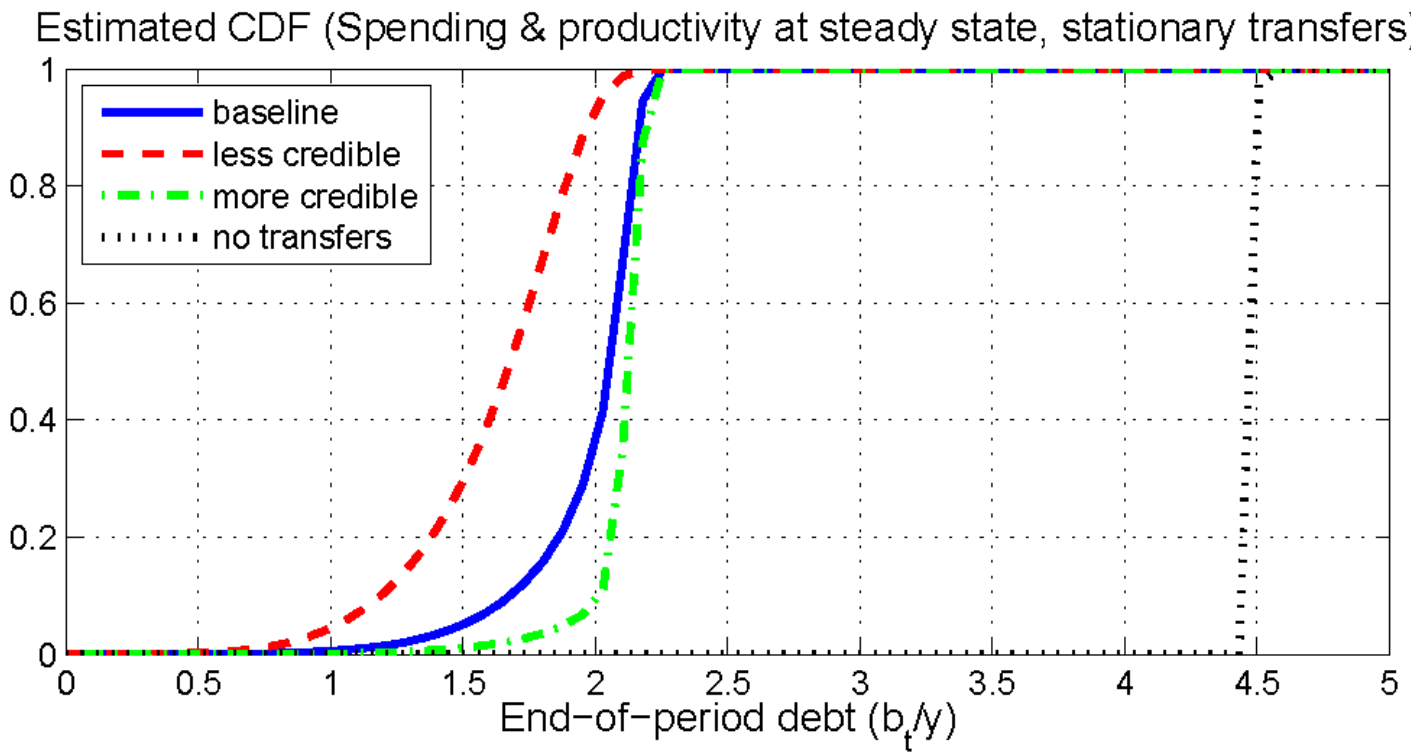


Figure 7 (Bi and Leeper, 2012)

I SUMMARY

II COMMENTS

Tax rule

- Fiscal policy instruments are state dependent in several respects
  - Contingent on productivity and debt

- Labor income tax rate increases with debt
  - Feedback parameter γ set to "ensure existence of a unique equilibrium"
  - Commitment to make *post-default* debt level sustainable

- All policy rules except of the tax rule are estimated
  - Why not estimating γ ?

Tax rule (con't)

- When tax rate depends on ex-post debt
  - Tax rate and distortions decrease after default
  - Real activity increases in the post default period
- Broad evidence: Default typically leads to a fall in output, not a rise
  - Can the tax rule be adjusted to avoid this counterfactual result?

Rational investors and default

- Default rate is positive if $b_{t-1} \geq b_t$ and randomly chosen from Ω
  - Fiscal limit is also randomly chosen from $\mathcal{B}_t^*(A_t, g_t, rs_t)$
  - Decisions when and how much the government defaults are unexplained

- What is no reason for the government to default?
  - Households are willing to rolled over debt in every period
  - If tax reduction makes default attractive, why not defaulting in all periods?

Borrowing decision

- Bi and Leeper (page 1):

  "*Understanding how fiscal policies determine a country's sovereign risk requires explicit modeling of fiscal behavior.*"

- Government issues more debt when the default rate is higher
  - Households are willing to roll-over debt in every state of the economy
  - Isn't it more difficult to borrow when expected default rate is high?

- Decision rule for end-of-period debt $b_t(b_{t-1})$ in Figure 5

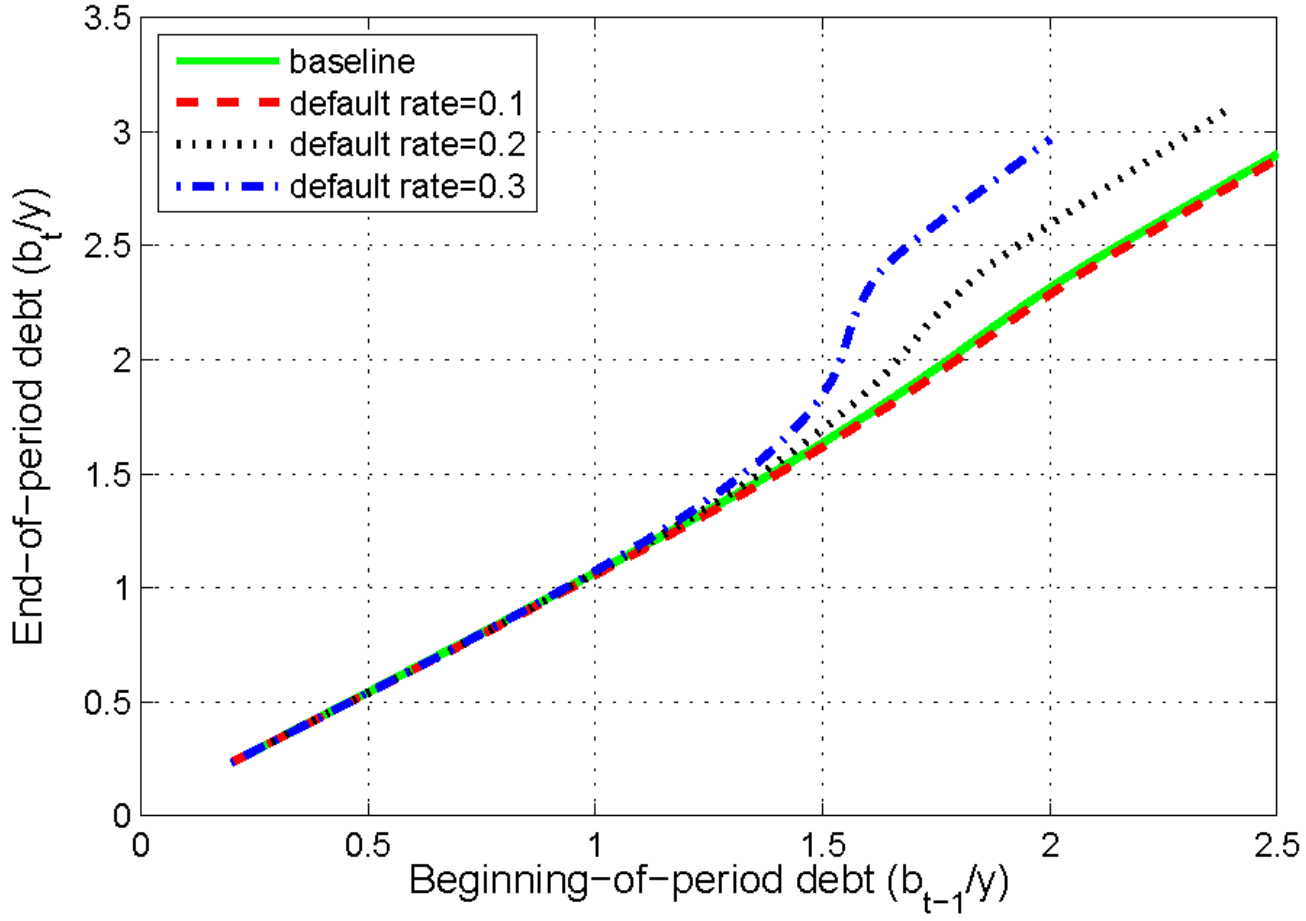


Figure 5 (Bi and Leeper, 2012)

Borrowing decision

- An optimizing government will borrow less not more when risk primia are high
  - Typical pattern in sovereign debt literature (Arellano, 2008)

- Example: Juessen and Schabert 2011, "Fiscal policy, sovereign default, and bailouts"
  - Fiscal policy under lack of commitment with default costs Ξ (Arellano 2008)
  - Default if $V_t^{default} > V_t^{repayment}$
  - Government borrows less when costs of borrowing increase

Government problem under debt repayment

$$V_t^{repayment}(b_{t-1}, a_t) = \max_{\tau_t, g_t, b_t} \left\{ u(c_t, g_t, l_t) + \widetilde{\beta} \sum_{a_{t+1}} V(b_t, a_{t+1}) \pi(a_{t+1}|a_t) \right\}$$

subject to

$$\begin{aligned}
-u_l(c_t, g_t, l_t) &= a_t f'(l_t) u_c(c_t, g_t, l_t)(1 - \tau_t), \\
q(b_t, a_t) u_c(c_t, g_t, l_t) &= \beta E_t \left[(1 - \delta_{t+1}) u_c(c_{t+1}, g_{t+1}, l_{t+1}) \right], \\
c_t + g_t &= a_t f(l_t) \\
E_t(1 - \delta_{t+1}) &= \sum_{a_{t+1} \in \Theta(b_t)} \pi(a_{t+1}|a_t) \\
g_t &= \tau_t a_t f'(l_t) l_t
\end{aligned}$$

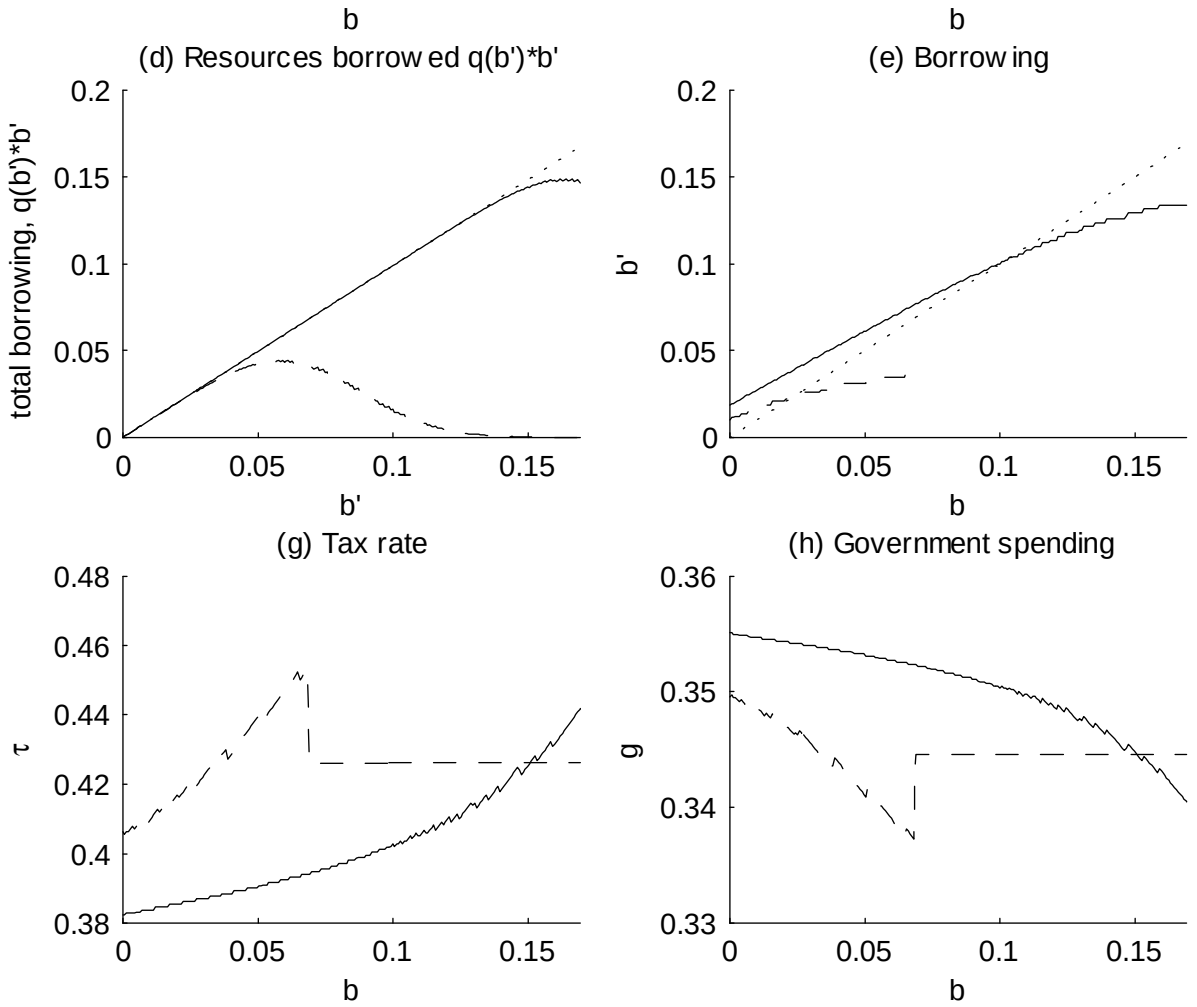
where $V_t = \max\{V_t^{default}, V_t^{repayment}\}$

Government problem under default

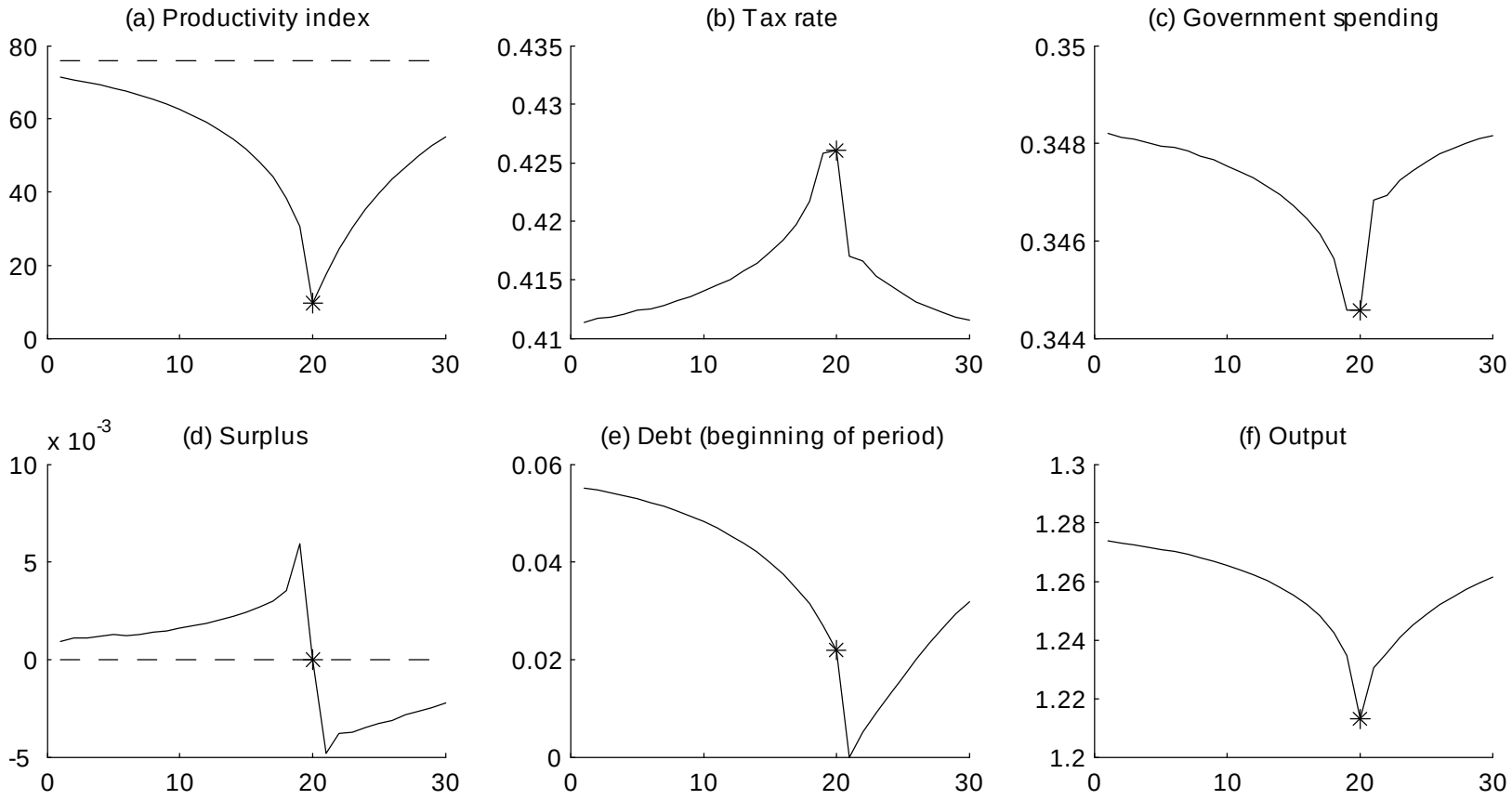
$$V_t^{default}(b_{t-1}, a_t) = \max_{\tau_t, g_t} \left\{ u\left(c_t, g_t, l_t\right) + \widetilde{\beta} \sum_{a_{t+1}} V(0, a_{t+1}) \pi(a_{t+1}|a_t) \right\}$$

subject to

$$\begin{aligned}
-u_l(c_t, g_t, l_t) &= \Xi\left(a_t\right) f'(l_t) u_c(c_t, g_t, l_t) \left(1 - \tau_t\right), \\
q\left(b_t, a_t\right) u_c(c_t, g_t, l_t) &= \beta E_t \left[\left(1 - \delta_{t+1}\right) u_c(c_{t+1}, g_{t+1}, l_{t+1})\right], \\
c_t + g_t &= \Xi\left(a_t\right) f(l_t) \\
E_t\left(1 - \delta_{t+1}\right) &= \sum_{a_{t+1} \in \Theta(b_t)} \pi(a_{t+1}|a_t) \\
g_t - \tau_t \Xi\left(a_t, d_t\right) f'(l_t) l_t &= q\left(b_t, a_t\right) b_t - b_{t-1}
\end{aligned}$$



Policy functions (from Juessen and Schabert, 2011)



Selected means before and after a default event (Juessen/Schabert, 2011)

- Step forward in modeling sustainability and sovereign default risk
  - But still a long way to go...