

# Revisiting Incentivism Theory —Testing Barriers to Riches on post-war panel data

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# Introduction

- It aims to test classes of growth theory: one was the Incentivist theory in Barriers to Riches (Parente & Prescott, 2000).
- Growth depends on the freedom of business to innovate; this freedom could be withdrawn by regulations, taxes, or government restrictions.
- We set out the whether 'Incentivism' growth theory can explain post-war growth across the world and investigate causal effect of taxes on growth.
- The empirical evidence in a 'reduced form' relationship has the drawback of poor 'identification' of the underlying causality.
- We follow Lucas (1988) and Gillman and Kejak (2005) to use indirect inference to estimate the a structural DSGE model of growth in its ability to match a large panel data of 76 countries from 1970 to 2019

# Households

- The utility function for representative households is given by:

$$U = E_0 \sum_{t=0}^{\infty} \beta^t (\log C_t + \varepsilon_t \log x_t) \quad (1)$$

subject to the household constraints:

$$(1 + \tau_t)c_t + k_t - (1 - \delta)k_{t-1} + b_{t-1} \leq y_t + (1 + r_{t-1})b_t + \Gamma_t - \pi_t z_t \quad (2)$$

$$1 = x_t + n_t + z_t$$

- $\tau_t$  is the tax rate on consumption. this is assumed to be the sole general tax (so that dividends and wages are taxed indirectly through consumption)
- $\pi_t$  is tax levied on entrepreneurial innovative activity  $z_t$
- consumption ( $c$ ), capital stock ( $k$ ), foreign bonds ( $b$ ), leisure ( $x$ ), productivity-enhancing/entrepreneurship activity ( $z$ ) and government transfers ( $\Gamma$ ) are all expressed per capita
- $\delta$  is depreciation and  $r$  is the real rate of interest on foreign bonds.

# Households and firms productivities

- Individuals (and firms) have a Cobb-Douglas production function

$$y_t = A_t k_t^\gamma X_t^\zeta (1 - x_t - z_t)^{1-\gamma-\zeta} \quad (3)$$

- $X_t$  represents other exogenous production factors — such as 'land/natural resources' — assumed to be owned by households.
- We write the non-stationary growth of productivity depends on time spent on entrepreneurship innovation as well as the productivity shock  $u_t$

$$\frac{A_{t+1}}{A_t} = a_0 + a_1 z_t + u_t \quad (4)$$

- Through loglinearisation (algebra skipped), we reduce the structural model to four equations after much manipulation:

# Model calibration from reduced form

- Production function:

$$\ln y_t = \left( \frac{1}{1-\gamma} \right) \ln A_t + \psi \ln(1 - x_t - z_t) + (1 - \psi) X_t + \epsilon_t^y, \psi = \frac{1-\gamma-\zeta}{1-\gamma}$$

- Productivity growth process:  $\Delta \ln A_{t+1} = \phi'_0 - \phi_1(\tau_t + \pi'_t) + \epsilon_t^A$

- Labour supply function:

$$\ln(1 - x_t - z_t) \approx \ln(1 - x_t) = \ln(1 - \tau_t) + \ln c_t - \ln y_t + \epsilon_t^x$$

- To obtain initial estimates of the parameters of these functions we regressed them on our panel data, fixed country and time effects are included in both.
- For the Barriers model we obtained:

$$\ln y_{i,t} = c_1 + 0.38 \ln(1 - x_{i,t}) - 0.017(\tau_{i,t} + \pi'_{i,t})$$

(0.085)                      (0.0015)

$$\ln(1 - x_{i,t}) = c_2 + 0.0128 \ln(1 - \tau_{i,t})$$

(0.01)

# Indirect Inference Estimation

- The business tax rate in the production function has the right sign and is highly significant, while the general tax rate in the labour supply function also has the right sign, though at a low level of significance.
- One cannot be sure of a reverse causation or joint causation by some third unmeasured factor.
- We then estimated these parameters by indirect inference on an auxiliary model consisting of a panel VARX in output and growth, with X including the tax rates of interest.
- Still working on it...