Policy Distortions and Aggregate Productivity with Heterogeneous Establishments

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Summary

Neoclassical growth model: commonly used to understand cross-country differences in per capita income.

Thesis: not only the level of factor accumulation that matters, but also how these factors are allocated across heterogeneous production units.

Approach: calibrate a version of neoclassical growth model that incorporate heterogeneous production units a la Hopenhayn (1992). Need for *idiosyncratic distortions*.

Model

Household: infinite-lived representative household, endowed with one unit of labor every period, and K_0 units of initial capital, maximizes

$$\sum_{t=0}^{\infty} \beta^t u(C_t)$$

subject to

$$\sum_{t=0}^{\infty} p_t(C_t + K_{t+1} - (1-\delta)K_t) = \sum_{t=0}^{\infty} p_t(r_t K_t + w_t N_t + \Pi_t - T_t)$$

Model (cont.)

Incumbents: a finite number of firms indexed by TFP s, maximizing

$$\pi(s,\tau) = (1-\tau)sk^{\alpha}n^{\gamma} - wn - rk - c_f$$

where $\alpha, \gamma \in (0,1)$ and $0 < \alpha + \gamma < 1$

Establishment-level TFP s is assumed constant.

After production takes place, each establishment faces a constant probability of death equal to λ.

Value of the incumbent: $W(s,\tau) = \pi(s,\tau)\frac{1+R}{R+\lambda}$, where $R = \frac{1}{\beta} - 1$.

Model (cont.)

With NO idiosyncratic distortions: capital to labor ratio (k/n) are the same across plants.

Policy distortions: $\tau \in \{\tau_{-}, 0, \tau_{+}\}$, unknown at time of entry and remain fixed onwards.

Probability the establishment s face policy τ: $P(s, \tau)$

Assumption: government budget balance is achieved every period through taxation or redistribution T to the representative consumer.

Model (cont.)

Entrants: after paying a fixed cost of entry c_e, $s \in \{s_1, ..., s_{n_s}\}$ is drawn from a pdf $h(s)$, i.i.d. across entrants.

Value of the entrant:

$$W_e = \sum_{(s,\tau)} \max_{\bar{x} \in \{0,1\}} \{\bar{x}(s,\tau) W(s,\tau) h(s) P(s,\tau) - c_e\}$$

Law of motion: $\mu'(s,\tau) = (1-\lambda)\mu(s,\tau) + \bar{x}(s,\tau) h(s) P(s,\tau) E$

Invariant distribution: $\mu(s,\tau) = \frac{\bar{x}(s,\tau)}{\lambda} h(s) P(s,\tau) E$

Equilibrium

Focus: steady-state competitive equilibrium.

(i) Consumer optimization;

(ii) Plant optimization;

(iii) Free entry: $W_e = 0$;

(iv) Market clearing;

(v) Government budget balance;

(vi) μ is an invariant distribution.

Calibration

Growth model: standard procedures.

$\alpha + \gamma = 0.85$

Benchmark economy: U.S. without distortions.

$$\frac{n_i}{n_j} = \left(\frac{s_i}{s_j}\right)^{\frac{1}{1-\gamma-\alpha}}$$

$h(s)$ is chosen to match the distribution establishment per employment.

Idea: choose taxes and subsidies such that there is no effect on aggregate capital accumulation (isolate the distribution effect).

Two exercises:

(1) τ is uncorrelated with s.

(2) τ is positively correlated with s.

Results

Table 3: Effects of Idiosyncratic Distortions – Uncorrelated Case

	τ_t			
Variable	0.1	0.2	0.3	0.4
Relative Y	0.98	0.96	0.93	0.92
Relative TFP	0.98	0.96	0.93	0.92
Relative E	1.00	1.00	1.00	1.00
Y_s/Y	0.72	0.85	0.93	0.97
S/Y	0.05	0.08	0.09	0.10
τ_s	0.06	0.09	0.10	0.11

Results (cont.)

Table 4: Relative TFP – Uncorrelated Distortions

Fraction of Establishments Taxed (%):	τ_t 0.1	0.2	0.3	0.4
90	0.92	0.84	0.78	0.74
80	0.95	0.89	0.84	0.81
60	0.98	0.94	0.91	0.89
50	0.98	0.96	0.93	0.92
40	0.99	0.97	0.95	0.94
20	1.00	0.99	0.98	0.97
10	1.00	0.99	0.99	0.99

Results (cont.)

Table 5: Effects of Idiosyncratic Distortions – Correlated Case

	τ_t			
Variable	0.1	0.2	0.3	0.4
Relative Y	0.90	0.80	0.73	0.69
Relative TFP	0.90	0.80	0.73	0.69
Relative E	1.00	1.00	1.00	1.00
Y_s/Y	0.42	0.67	0.83	0.92
S/Y	0.17	0.32	0.43	0.49
τ_s	0.40	0.48	0.52	0.53

Low TFP firms receive a subsidy; high TFP firms are taxed.

Results (cont.)

Table 6: Relative TFP – Correlated Distortions

Fraction of Establishments Taxed (%):	τ_t 0.1	0.2	0.3	0.4
90	0.81	0.66	0.56	0.51
80	0.84	0.70	0.62	0.57
60	0.88	0.77	0.69	0.65
50	0.90	0.80	0.73	0.69
40	0.92	0.82	0.76	0.72
20	0.95	0.89	0.84	0.81
10	0.97	0.92	0.88	0.86