Optimal Development Policies with Financial Frictions

Oleg Itskhoki & Benjamin Moll

汇报人：翁丽影

Optimal Development Policies with Financial Frictions

- Introduction
- An Economy with Financial Frictions
- Optimal Policy in a One-Sector Economy
- Optimal Policy in a Multi-Sector Economy
- Discussion of Assumptions
- Conclusions

Introduction

- Motivated by the observation that many emerging economies pursue active development and industrial policies, we study optimal dynamic Ramsey policies in a standard growth model with financial frictions.

- In our framework, forward-looking heterogeneous producers face borrowing (collateral) constraints which result in a misallocation of capital and depressed productivity.

Introduction

- uniform policies: affect the economy as a whole, including the economy-wide suppression of factor prices, in particular wages.
- targeted policies: target particular sectors or firms, including subsidies to presumed comparative advantage sectors and subsidized credit to particular firms.
- From a neoclassical perspective such policies are, of course, unambiguously detrimental. In this paper we argue that, under particular circumstances, some of these policies may instead be beneficial.

Introduction

- Caballero and Lorenzoni (2014) analyze the Ramsey-optimal response to a preference shock in a two-sector small open economy with financial frictions in the tradable sector.
- Ours studies long-run development policies whereas theirs studies cyclical policies.

Introduction

- Song, Storesletten, and Zilibotti (2014) study the effects of capital controls, and policies regulating interest rates and the exchange rate.

- Our normative analysis shows that policies leading to compressed wages not only foster productivity growth but may, in fact, be optimal in the sense of maximizing welfare. Furthermore, we argue that the optimal use of such policy tools may be stage-dependent, requiring a policy reversal along the transition path.

An Economy with Financial Frictions

- We consider a one-sector small open economy populated by two types of agents: workers and entrepreneurs.

- We first describe the problem of workers, followed by that of entrepreneurs.

- We then characterize some aggregate relationships and properties of the decentralized equilibrium in this economy.

An Economy with Financial Frictions

- Workers:

$$\int_0^{\infty} e^{-\rho t} u\big(c(t), l(t)\big) dt$$

$$\mathrm{c} + \dot{b} \leq wl + r^* b$$

An Economy with Financial Frictions

- Entrepreneurs:
- Heterogeneous in their wealth a and productivity z, and denote the joint distribution at time t by $G_t(a, z)$. In each time period, entrepreneurs draw a new productivity from a Pareto distribution $G_z(z) = 1 - z^{-\eta}$ with shape parameter $\eta > 1$.

$$E_0 \int_0^\infty e^{-\delta t} log c_e(t) dt$$

$$\dot{a} = \pi(a, z) + r^* a - c_e$$

$$\pi(a, z) = \max_{\substack{n \geq 0 \\ 0 \leq k \leq \lambda a}} \left(A(zk)^\alpha n^{1-\alpha} - wn - r^* k\right)$$

An Economy with Financial Frictions

- Entrepreneurs:

- Solve $\pi(a,z) = \max_{\substack{n\geq 0 \\ 0\leq k\leq \lambda a}} \left(A(zk)^{\alpha} n^{1-\alpha} - wn - r^{*}k\right)$, we have :

$$k(a,z) = \lambda a I_{\{z\geq \underline{z}\}}$$

$$n(a,z) = ((1-\alpha)A/w)^{1/\alpha} zk(a,z)$$

$$\pi(a,z) = \left(\frac{z}{\underline{z}} - 1\right) r^{*} k(a,z)$$

where $\underline{z}$ satisfies $\alpha\left(\frac{1-\alpha}{w}\right)^{\frac{1-\alpha}{\alpha}} A^{\frac{1}{\alpha}} \underline{z} = r^{*}$

An Economy with Financial Frictions

- Entrepreneurs:
- Solve

$$E_0 \int_0^\infty e^{-\delta t} log c_e(t) dt$$

$$\dot{a} = \pi(a, z) + r^* a - c_e$$

$$\pi(a, z) = \left(\frac{z}{\underline{z}} - 1\right) r^* k(a, z)$$

We have $c_e = \delta a$, and therefore the evolution of wealth satisfies $\dot{a} = \pi(a, z) + (r^* - \delta) a$

An Economy with Financial Frictions

- Aggregation:

$$\kappa = \int k_t(a,z)dG_t(a,z) = \lambda x \underline{z}^{-\eta}$$

$$l = \int n_t(a,z)dG_t(a,z) = \frac{\eta}{\eta-1}((1-\alpha)A/w)^{1/\alpha}\lambda x \underline{z}^{1-\eta}$$

where $x(t) = \int a dG_t(a,z)$ is aggregate (or average) entrepreneurial wealth.

$$y = A\left(\frac{\eta}{\eta-1}\underline{z}\kappa\right)^{\alpha} l^{1-\alpha}$$

An Economy with Financial Frictions

- Equilibrium:

- $y = \Theta x^{\gamma} l^{1-\gamma}$, where $\Theta = \frac{r^*}{\alpha}\left[\frac{\eta\lambda}{\eta-1}\left(\frac{\alpha A}{r^*}\right)^{\eta/\alpha}\right]^{\gamma}$ and $\gamma = \frac{\alpha/\eta}{\alpha/\eta+(1-\alpha)}$

$$\underline{z}^{\eta} = \frac{\eta\lambda}{\eta-1}\frac{r^*}{\alpha}\frac{x}{y}$$

$$wl = (1-\alpha)y$$

$$r^*\kappa = \alpha\frac{\eta-1}{\eta}y$$

$$\Pi = \frac{\alpha}{\eta}y$$

An Economy with Financial Frictions

$$\dot{x} = \frac{\alpha}{\eta} y(x, l) + (r^* - \delta)x$$

- Therefore, greater labor supply increases output, which raises entrepreneurial profits and speeds up wealth accumulation.

- The key to understanding the rationale for policy intervention in our economy is that entrepreneurs earn an excess return relative to workers.

- $R(Z) = r^* \left(1 + \lambda \left(\frac{z}{\underline{z}} - 1\right)^+\right) > r^*$ and $E_z R(Z) = r^* \left(1 + \frac{\lambda \underline{z}^{-\eta}}{\eta - 1}\right) = r^* + \frac{\alpha}{\eta}\frac{x}{y} > r^*$

Optimal Policy in a One-Sector Economy

- We start our analysis with two tax instruments, a labor income tax and a savings tax.

- We then extend our analysis to include additional tax instruments directly affecting the decisions of entrepreneurs, such as a credit subsidy and a subsidy to the cost of capital.

Optimal Policy in a One-Sector Economy

- income tax $\tau_l(t)$ and a savings tax $\tau_b(t)$
- the budget constraint of the households changes to

$$c + \dot{b} \leq (1 - \tau_l)wl + (r^* - \tau_b)b + \mathrm{T}$$

where T are the lump-sum transfers from the government, and the government budget constraint is: $\mathrm{T} = \tau_l wl + \tau_b b$

- In the presence of taxes, the optimality conditions of households become:

$$\frac{\dot{u_c}}{u_c} = \rho - r^* + \tau_b$$

$$-\frac{u_l}{u_c} = (1 - \tau_l)w$$

Optimal Policy in a One-Sector Economy

- We can replace the problem of choosing a time path of the policy instruments subject to a corresponding dynamic equilibrium outcome by a simpler problem of choosing a dynamic aggregate allocation satisfying the implementability constraints. planner maximizes the welfare of households and puts zero weight on the welfare of entrepreneurs.

$$\max_{\{c,l,b,s\}_{t\geq 0}} \int_0^\infty e^{-\rho t} u(c,l) dt$$

$$\mathrm{c} + \dot{b} \leq (1-\alpha) y(x,l) + r^* b$$

$$\dot{x} = \frac{\alpha}{\eta} y(x,l) + (r^* - \delta) x$$

Optimal Policy in a One-Sector Economy

- we denote the corresponding co-state vector by $(\mu, \mu v)$
- The optimality conditions for the planner's problem are given by

$$\frac{\dot{u_c}}{u_c} = \rho - r^* = 0$$

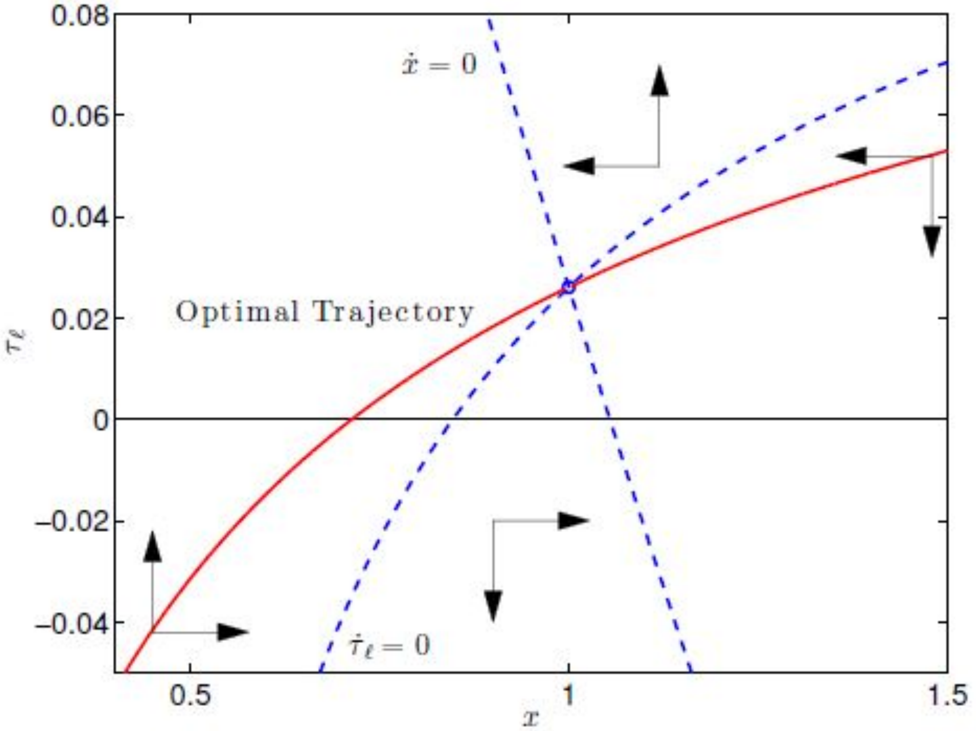
$$-\frac{u_l}{u_c} = (1 - \gamma + \gamma v)(1 - \alpha)\frac{y}{l}$$

$$\dot{v} = \delta v - (1 - \gamma + \gamma v)\frac{\alpha}{\eta}\frac{y}{x}$$

An immediate implication is that the planner does not distort the intertemporal margin $\tau_b = 0$. We also have $\tau_l = \gamma(1 - v)$, and v is the shadow value of entrepreneurial wealth.

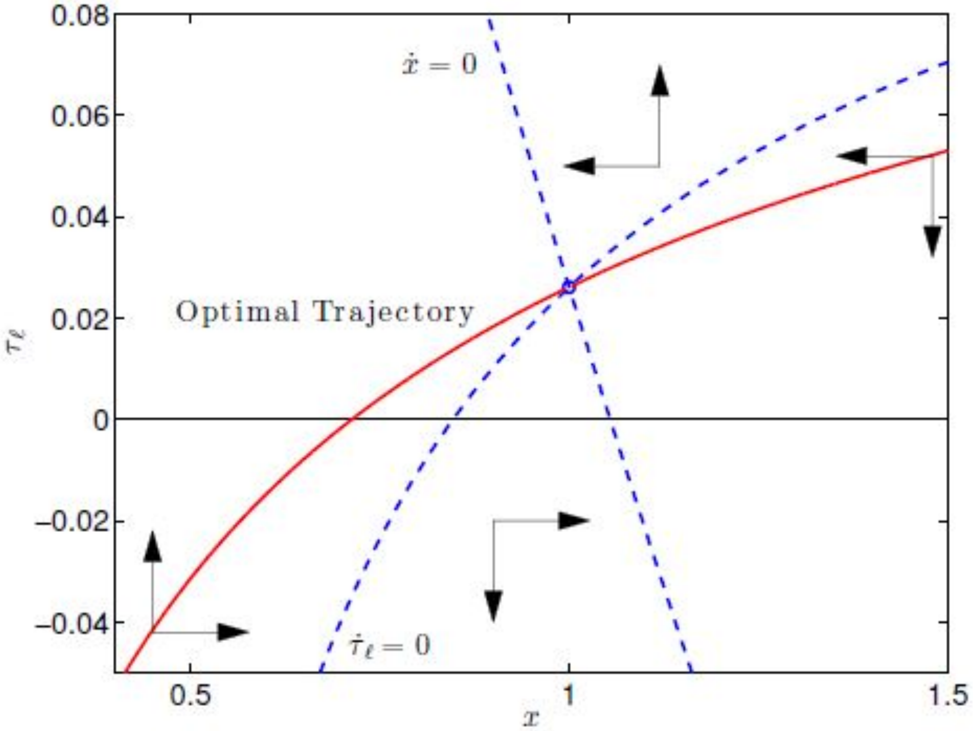
Optimal Policy in a One-Sector Economy

- $\dot{\tau_l} = \delta(\tau_l - \gamma) + \gamma(1 - \tau_l)\frac{\alpha}{\eta}\frac{y(x,l)}{x}$
- $\dot{x} = \frac{\alpha}{\eta}y(x,l) + (r^* - \delta)x$
- in steady state:
- $\overline{\tau_l} = \frac{\gamma}{\gamma+(1-\gamma)(\delta/p)} > 0$

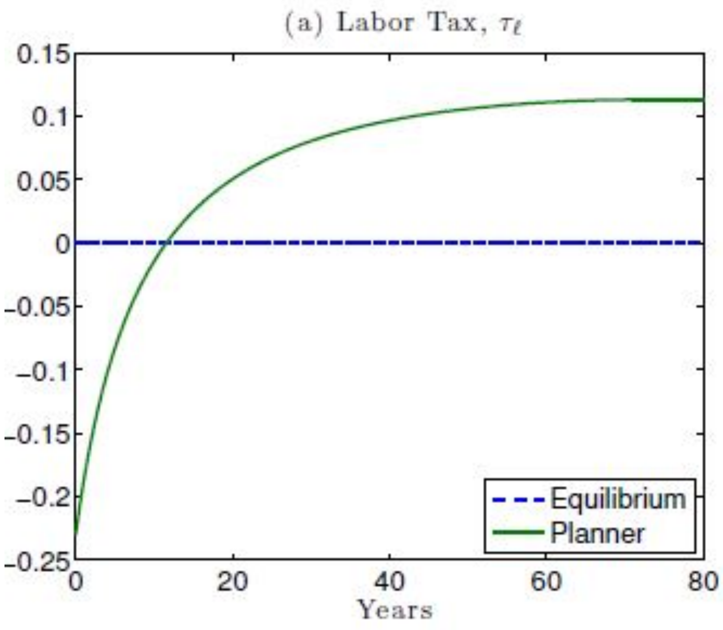


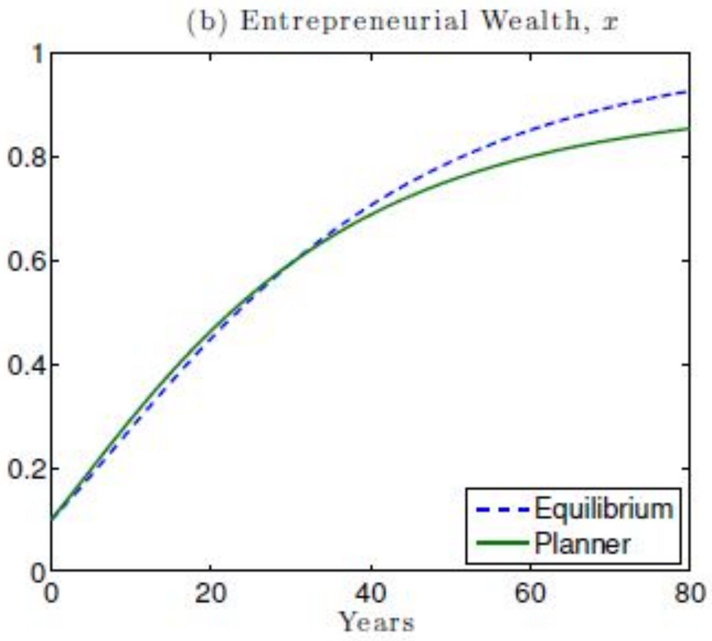
Optimal Policy in a One-Sector Economy

- when entrepreneurial wealth is low enough, labor supply is subsidized.
- The optimal steady state labor wedge is strictly positive meaning that in the long-run the planner suppresses labor supply rather than subsidizing it.

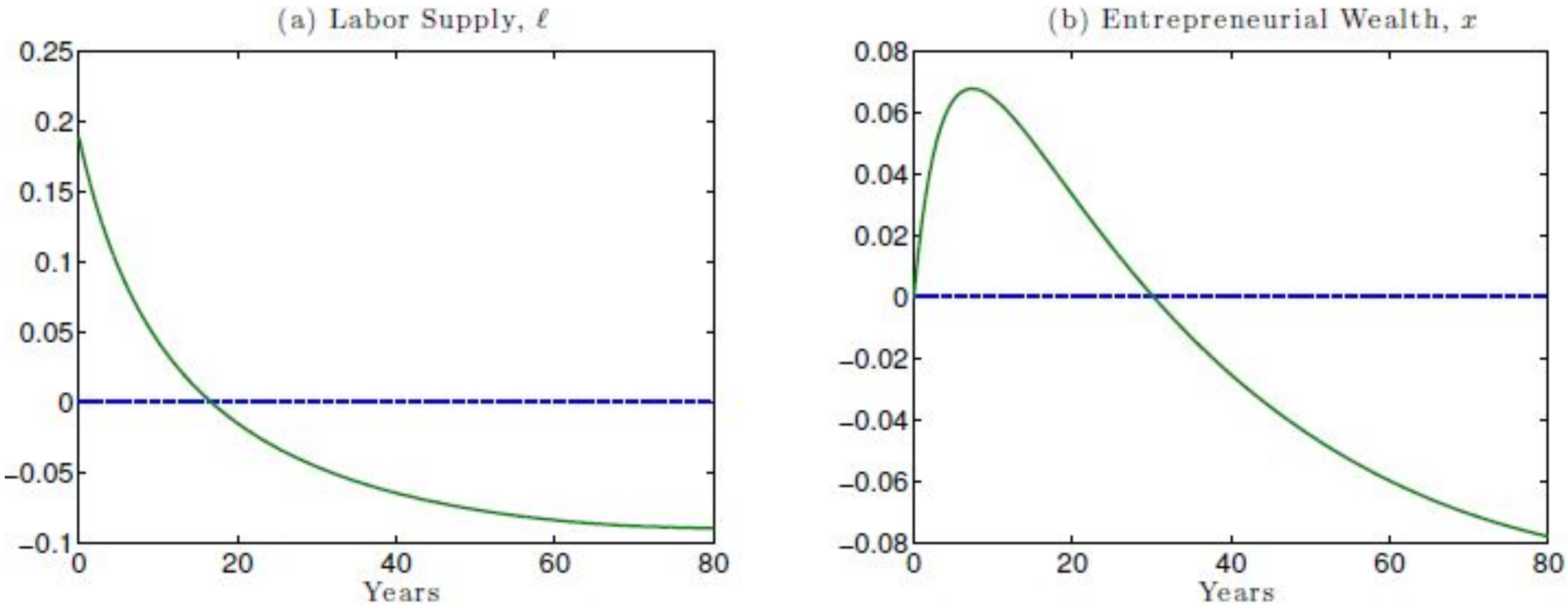


Optimal Policy in a One-Sector Economy

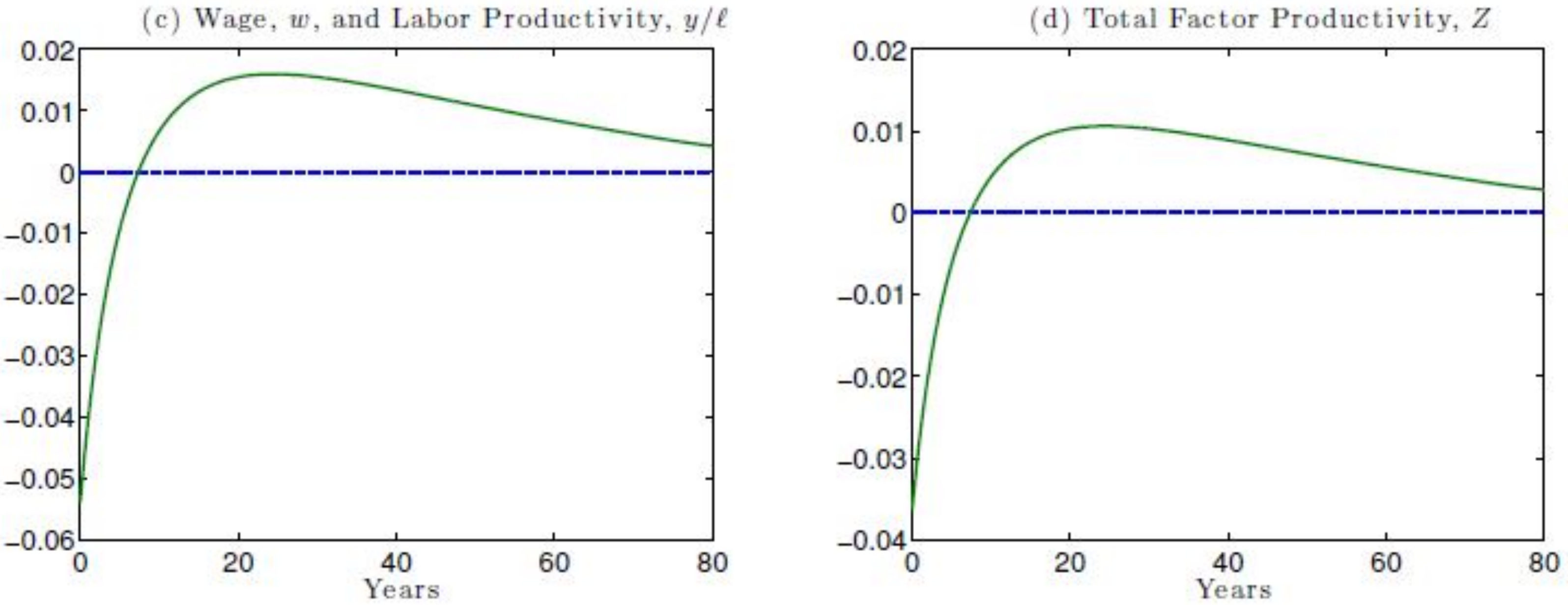




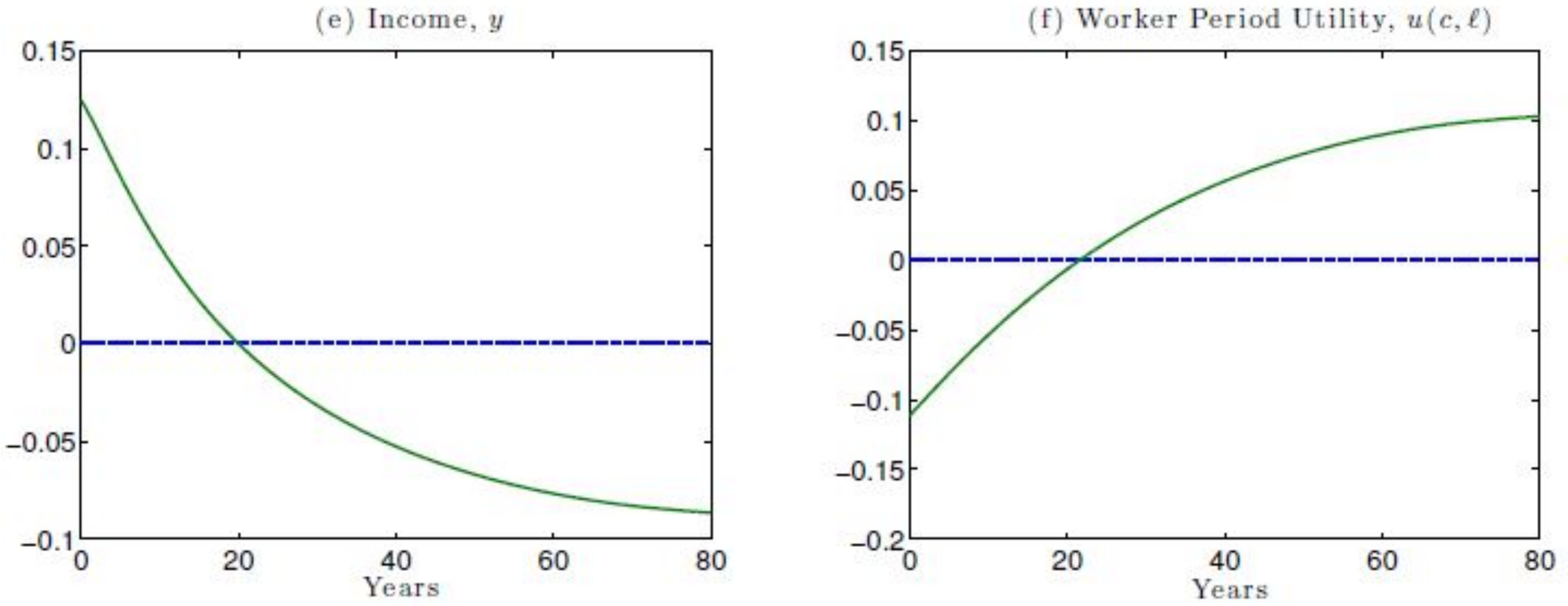
Optimal Policy in a One-Sector Economy



Optimal Policy in a One-Sector Economy



Optimal Policy in a One-Sector Economy



Optimal Policy in a One-Sector Economy

- wagebill subsidy ς_w and capital subsidy ς_k

$$\pi(a,z) = \max_{\substack{n\geq 0\\ 0\leq k\leq \lambda a}} \left(A(zk)^{\alpha} n^{1-\alpha} - (1-\varsigma_w)wn - (1-\varsigma_k)r^* k\right)$$

$$y = (1-\varsigma_k)^{-\gamma(\eta-1)}\Theta x^{\gamma} l^{1-\gamma}$$

Similarly, the optimal Ramsey policy is to use both of them in tandem, and set them according to

$$\frac{\varsigma_w}{1-\varsigma_w} = \frac{\varsigma_k}{1-\varsigma_k} = \frac{\alpha}{\eta} v$$

Optimal Policy in a One-Sector Economy

- The key result of this section is that, even though this much more direct policy instrument is available, it is nevertheless optimal to distort workers' labor supply decisions by suppressing wages early on during the transition and increasing them in the long-run.

- Such pro-business development policies are optimal even when the planner puts zero weight on the welfare of entrepreneurs.

Optimal Policy in a Multi-Sector Economy

- savings tax, sector-specific consumption taxe, sector-specific labor income taxes
- Households

$$\int_0^\infty e^{-\rho t} u\big(c_0(t), c_1(t), \cdots, c_N(t)\big) dt$$

$$\sum_{i=0}^{N} (1 + \tau_i^c) p_i \, c_i + \dot{b} \leq \left(\mathrm{r} - \tau^b\right) b + wL + \mathrm{T}$$

$$\textstyle\sum_{i=0}^{N} l_i = L \quad \left(1 - \tau_i^l\right) w_i = w$$

Optimal Policy in a Multi-Sector Economy

- The solution to the household problem is given by the following optimality conditions:

$$\frac{\dot{u}_0}{u_0} = \rho + \tau_b + \frac{\dot{\tau}_0^c}{1 + \tau_0^c} - \mathrm{r}$$

$$\frac{u_i}{u_0} = \frac{1 + \tau_i^c}{1 + \tau_0^c} p_i$$

Optimal Policy in a Multi-Sector Economy

- Production
- $y_i = p_i^{\gamma_i(\eta_i-1)} \Theta_i x_i^{\gamma_i} l_i^{1-\gamma_i}$, where $\Theta_i = \frac{r}{\alpha_i}\left[\frac{\eta_i\lambda_i}{\eta_i-1}\left(\frac{\alpha_i A_i}{r}\right)^{\eta_i/\alpha_i}\right]^{\gamma_i}$ and $\gamma_i = \frac{\alpha_i/\eta_i}{\alpha_i/\eta\eta_i+(1-\alpha_i)}$
- A higher sectoral price allows a greater number of entrepreneurs to profitably produce, affecting both the production cutoff $\underline{z_i}$ and the amount of capital κ_i used in the sector.
- And aggregate consumption of sector i entrepreneurs is δx_i,

$$\dot{x_i} = \frac{\alpha_i}{\eta_i} p_i y_i(x_i, l_i; p_i) + (\mathrm{r} - \delta) x_i$$

$$w_i l_i = (1 - \alpha_i) p_i y_i(x_i, l_i; p_i)$$

Optimal Policy in a Multi-Sector Economy

- Government

$$\sum_{i=0}^{N}\left(\tau_i^c p_i c_i + \tau_i^l w_i l_i\right) + \tau^b b = \mathrm{T}$$

- In non-tradable sectors, we have

$$c_i = y_i(x_i, l_i; p_i), i = k+1, \cdots, N$$

Optimal Policy in a Multi-Sector Economy

- Planner’ s problem

$$\int_0^{\infty} e^{-\rho t} u\big(c_0(t), c_1(t), \cdots, c_N(t)\big) dt$$

$$\dot{b} = r^* b + \sum_{i=0}^{N} [(1-\alpha_i) p_i y_i(x_i, l_i; p_i) - p_i c_i]$$

$$\dot{x_i} = \frac{\alpha_i}{\eta_i} p_i y_i(x_i, l_i; p_i) + (r^* - \delta) x_i, i = 0,1, \cdots, N$$

$$c_i = y_i(x_i, l_i; p_i), i = k+1, \cdots, N$$

$$\sum_{i=0}^{N} l_i = L$$

Optimal Policy in a Multi-Sector Economy

- The optimal policies

$$\tau^b = 0$$

$$\tau_i^c = \begin{cases} 0, i = 0,1,\cdots,k \\ \dfrac{1 - v_i}{\eta_i - 1}, i = k + 1,\cdots,N \end{cases}$$

$$\tau_i^l = \begin{cases} \gamma_i(1 - v_i), i = 0,1,\cdots,k \\ -\tau_i^c, i = k + 1,\cdots,N \end{cases}$$

Optimal Policy in a Multi-Sector Economy

- The planner does not use the intertemporal tax as long as static sectoral taxes (labor and/or consumption) are available.
- The planner does not tax consumption of tradables, but does tax the consumption of non-tradables.
- Define the overall labor wedge for sector i

$$1+\tau_i = \frac{(1-\alpha_i)\frac{u_i y_i}{l_i}}{(1-\alpha_0)\frac{u_0 y_0}{l_0}} = \left(1-\tau_0^l\right)\frac{1+\tau_i^c}{1-\tau_i^l}$$

When the overall labor wedge is positive, the planner diverts the allocation of labor away from sector i

Optimal Policy in a Multi-Sector Economy

- Define the overall labor wedge for sector i

$$1+\tau_i = \frac{(1-\alpha_i)\frac{u_i y_i}{l_i}}{(1-\alpha_0)\frac{u_0 y_0}{l_0}} = \left(1-\tau_0^l\right)\frac{1+\tau_i^c}{1-\tau_i^l}$$

When the overall labor wedge is positive, the planner diverts the allocation of labor away from sector i

$$\tau_i = \frac{\tau_i^l - \tau_0^l}{1-\tau_i^l} = \frac{\gamma_0(v_0-1)-\gamma_i(v_i-1)}{1+\gamma_i(v_i-1)}, i = 1,\cdots,k$$

$$\tau_i = -\tau_0^l = \gamma_0(v_0-1), i = k+1,\cdots,N$$

Optimal Policy in a Multi-Sector Economy

- For simplicity, we focus on two tradable sectors
- $p_i y_i = p_i^{\varsigma} \Theta_i x_i^{\gamma} l_i^{1-\gamma}$, where $\varsigma = 1 + \gamma(\eta - 1)$

$$\tau_1 = \frac{\gamma(v_0 - v_1)}{1 + \gamma(v_1 - 1)}$$

- A sufficient condition for $v_0 > v_1$ is that sector 0 possesses a long-run comparative advantage. the planner shifts labor towards sector 0.

Optimal Policy in a Multi-Sector Economy

- two sectors: a tradable sector i = 0 and a non-tradable sector i =1
- all tax instruments

$$\tau_1 = \gamma_0 (v_0 - 1)$$

- The tradable sector is undercapitalized, that is $v_0 > 1$. Hence labor is diverted away from non-tradables to tradables and, since production features decreasing returns to labor, wages paid by tradable producers are compressed.
- CPI-based real exchange rate is appreciated relative to the competitive equilibrium when the tradable sector is sufficient undercapitalized.

Optimal Policy in a Multi-Sector Economy

- No sectoral labor taxes
- No tradable consumption tax, but only non-tradable consumption tax
- $\tau_1^c = \frac{1}{\eta_1/\alpha_1 - 1}\left[(1 - v_1) + \frac{1-\gamma_1}{\gamma_1}\kappa\right]$, where $\kappa = \frac{l_0(v_0-1) - \frac{1}{\eta_1/\alpha_1-1}(v_1-1)l_1}{l_0 + \frac{\eta_1-1}{\eta_1/\alpha_1-1}l_1}$
- κ captures the fact that the planner uses the consumption tax to also affect the labor.
- If the larger v_0, the smaller v_1, then the only way to improve the allocation is by taxing non-tradable consumption, thereby shifting labor to the tradable sector. and hence the wage-based real exchange rate depreciates, CPI-based real exchange rate appreciates.

Optimal Policy in a Multi-Sector Economy

- No sectoral taxes
- In the absence of any sectoral instruments (labor or consumption), the planner has to recur to intertemporal distortions by means of a savings subsidy.
- The effect of such policy on the allocation of labor across sectors is similar to that of a consumption tax on non-tradables. However, it comes with an additional intertemporal distortion on the consumption of tradables.
- Both CPI- and wage-based real exchange rates depreciate.

Optimal Policy in a Multi-Sector Economy

- We conclude that the (standard CPI-based) real exchange rate may not be a particularly useful guide for policymakers because there is no robust theoretical link between this variable and growth-promoting policy interventions.

Discussion of Assumptions

- Functional forms
- The three functional form assumptions that are essential for tractability are the constant returns to scale (CRS) in production, CRRA utility of entrepreneurs which implies linear savings rules, and the linearity of the collateral constraint in the wealth of entrepreneurs.
- Together they result in optimal production and accumulation decisions that are linear in the wealth of the entrepreneurs.

Discussion of Assumptions

- Heterogeneity
- Make our framework closer to the canonical model of financial frictions used in the macro-development literature.
- Allow us to capture misallocation and endogenous TFP dynamics, as well as their response to optimal policies, along the transition path.
- The model with a continuum of heterogeneous entrepreneurs is more tractable than its analogue without heterogeneity.

Discussion of Assumptions

- Financial frictions
- The key conceptual assumption, however, is that the use of capital and production require a certain minimal skin in the game, and thus the e ects generalize to a model with a richer set of available assets, including equity.

Conclusions

- In the one-sector economy, financial frictions justify a policy intervention that reduces wages and increases labor supply in the early stages of transition so as to speed up entrepreneurial wealth accumulation and to generate higher labor productivity and wages in the long-run.

Conclusions

- In a multi-sector economy, optimal policy subsidizes sectors with a latent comparative advantage.
- Furthermore, if tradables sectors are undercapitalized relative to non-tradables, optimal policy compresses wages thereby improving competitiveness, but this does not necessarily imply a depreciated real exchange rate.