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Banking Competition and the Optimal Development Policy

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Discussion Paper

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Abstract

Governments in developing countries pursue various sets of policy interventions to industrialize their economies. A combination of taxes and subsidies in both product and factor markets is employed as a development policy. Given the characteristic of firms in developing economies relying substantially on commercial banks for funding, this paper conducts policy exercises, using a canonical growth model with financial frictions and exogenous banking sector, to study the optimal policy intervention in an emerging economy. We find that, to optimally industrialize the economy, policymaker can promote banking competition in an economy with the inherent higher success rate of any investment project or high credit efficiency, while restrict banking competition in an economy with low credit efficiency.

Keywords: Collateral Constraint, Credit Efficiency, Banking Competition, Optimal Development Policy

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1 Introduction

Industrial policies are prevalently implemented in both emerging economies in the past and even the developed countries nowadays. Some countries like South Korea, Taiwan, Malaysia, and Singapore, to name a few, imposed wage suppression strategy to promote entrepreneurs and industrialize their economy in 1950s and 1960s (Galenson 1992, Kim and Topel 1995, Song 1997, Kuruvilla 1996, and Huff 1997). From the theoretical perspective, Itskhoki and Moll (2019) suggest that pro-business policy such as wage suppression or credit subsidy to firms helps cure misallocation in capital goods and inefficiency in the financial market.

Nevertheless, tax policies are not the only available toolkits for policymakers in macroeconomic management. Rules and regulation in banking sector are another policy choice for the government. Free entry and exit of financial establishments can be promoted without taxpayer's money but comes at a cost of stability or instability of the financial market.

Using a canonical growth model with financial frictions (Moll, 2014 and Itskhoki and Moll, 2019) and exogenous banking sector¹, this paper studies how banking competition will affect the optimal development policy. This lesson can serve as a guideline for policymakers to either nurture or obstruct banking competition in their pursuit of optimal development policies.

We model the exogenous banking sector as follows. When financial intermediaries compete, they will offer a a pleasing financial contract to borrowers, relaxing any collateral needed to be pleaded in the process. With higher number of banks, borrowing firms find it easier to borrow with a better term and covenants (Ongura, 2006). On the other hand, if banks have market power, they will lend up to the limit of the collateral value so that when default they can cover all the losses. Firms then face a tightening borrowing constraints as a result (Wattanakoon, 2020)

On the other hand, screening and monitoring tasks will also be affected by a greater level of competition. Marinc (2008) provides an analysis that more competition leads to a lower monitoring efforts by banks. Caminal and Matutes (2002) suggest that banks with market power tend to raise loan rates and monitor borrowers' activities more. We then impose credit transformation technology on firms similar to Cetorelli and Peretto (2012) in the sense that

¹We define and proxy banking sector as the number of banks in the market. The higher the number of banks operate in the market, the more competitive the banking sector becomes.

firms obtain credit from banks and need to transform it to capital used in their production process. There is a probability of success in that transformation. If there is greater degree of banking competition, then the success rate of such technology will fall, since banks monitor investment project less accordingly. Therefore, we will study how these two opposite effects of banking competition affect the optimal development policy.

The paper finds that the policy mixes in promoting or restricting banking competition depend on the inherent nature of the economy. More competitive banking landscape is good for the economy with political stability and adequate infrastructure. With higher success rate of any investment project, entrepreneurs with relaxed collateral constraint can accumulate more wealth, resulting higher aggregate output. Nevertheless, less competitive banking market is good for economy with political instability and inadequate infrastructure. Lower success rate of investment projects needs banks with more monitoring efforts to ensure more entrepreneurs' wealth accumulation and thus economic growth.

The paper is organized as follows. Section 2 outlines the continuous-time growth model with financial frictions. Then introduce taxes and solve for optimal Ramsey policy functions in section 3. We conclude in section 4.

2 The Model

We will first outline a small open economy with exogenous interest rate determined by the world financial market following Itskhoki and Moll (2019) and add exogenous banking sectors. We argue that, on the one hand, with higher degree of banking competition, banks will allow financially constrained firms to have a loosening borrowing conditions, similar to Wattanakoon (2020). On the other hand, banks facing fiercer competition will fail to monitor risky project and end up with many project failure. We present this story by introducing a firm with a transformation technology from credit to capital, similar to Cetorelli and Peretto (2012). With higher number of banks in the financial markets, firms have a lower success rate in credit transformation since banks do not have enough resources to monitor all the project. More detailed set-up will be subsequently discussed.

2.1 Workers

A representative household in the small open economy will maximize the following problem:

$$\int_0^{\infty} e^{-\rho t} u(c(t), l(t)) dt \quad (2.1)$$

subject to

$$c + \dot{b} \leq wl + r^*b \quad (2.2)$$

Households have ρ as discount rate, and choose c (consumption goods as a numeraire), l (labor supply) with a increasing and concave utility function in consumption and decreasing and convex in labor supply. We also assume a positive and finite Frisch elasticity of labor supply, following Itskhoki and Moll (2019). For budget constraint, workers take market wage (w) as given. They borrow and save by purchasing and selling non-state-contingent bonds with a constant risk-free interest rate r^* . The optimality conditions for household are standard. We skip time index t for notational simplicity.

2.2 Entrepreneurs with Exogenous Banking

A unit mass of entrepreneurs produces homogenous tradable goods. We assume that entrepreneurs are heterogenous in their wealth (a) and productivity (z) with a joint distribution $\mathcal{G}(a, z)$. In our continuous time frame, entrepreneurs face a new productivity from a Pareto distribution $G_z(z) = 1 - z^{-\eta}$ with $\eta > -1$, which follows i.i.d. over time.

Firms have the following preference:

$$\mathbb{E} \int_0^{\infty} e^{-\delta t} \log c_e(t) dt \quad (2.3)$$

Entrepreneurs discount present value with a factor of δ and have the following production function:

$$m \cdot A(zk)^\alpha n^{1-\alpha} \quad (2.4)$$

We denote A as the aggregate productivity, $\alpha \in (0, 1)$, n as the number of banks in the economy, and $m = \bar{m}^{1-\frac{1}{n}}$ as the success rate of the investment project or credit efficiency²

²We interpret lower credit efficiency m in the economy facing challenges such as weak governance, political instability, underdeveloped financial markets, and poor infrastructure. These issues lead to delays, cost overruns, and inefficient project execution, hindering the success of investment projects.

in a similar but different fashion as Cetorelli and Paretto (2012), given $\bar{m} \in (0, 1)$. When n increases, it implies a more competing environment in the financial market³, and lower success rate of the investment project, since banks have less attention to perform their screening and monitoring tasks.

Entrepreneurs also face the following financial constraint:

$$k \leq \lambda a, \quad (2.5)$$

where $\lambda = \bar{\lambda}^{1-\frac{1}{n}}$, and $\bar{\lambda} \geq 1$, which explains the degree of financial development with $\bar{\lambda} = 1$ implying self-financing or using own assets to purchase capital. The higher λ , the loosening financial constraint the firms confront with. We assume that the higher degree of banking competition leads to lessening borrowing standards and allows firms to extend more of their credit line since banks need to compete to get more clients. Furthermore, entrepreneurs' asset evolve as following:

$$\dot{a} = \pi(a, z) + r^*a - c_e, \quad (2.6)$$

where

$$\pi(a, z) = \max_{n \geq 0, 0 \leq k \leq \lambda a} m \cdot A(zk)^\alpha n^{1-\alpha} - wn - r^*k \quad (2.7)$$

Firms choose labor n , and capital k , given the above financial constraint. We have the following factor demands and profits

$$k(a, z) = \lambda a \cdot \mathbb{I}_{z \geq \underline{z}} \quad (2.8)$$

$$n(a, z) = \left[(1 - \alpha) m \frac{A}{w} \right]^{\frac{1}{\alpha}} z k(a, z) \quad (2.9)$$

$$\pi(a, z) = \left[\frac{z}{\underline{z}} - 1 \right] r^* k(a, z), \quad (2.10)$$

with a productivity cutoff \underline{z} given by

$$\alpha \left(\frac{1 - \alpha}{w} \right)^{\frac{1-\alpha}{\alpha}} (mA)^{\frac{1}{\alpha}} \underline{z} = r^* \quad (2.11)$$

Labor demand is determined by (2.9), which depends on marginal product of capital. En-

³In a monopolistic banking market ($n = 1$), the success of the investment project (m) is equal to 1. Banks are assumed to help bypass all the obstacles with monitoring efforts and unlimited credit lines. In a perfectly competitive banking market ($n \rightarrow \infty$), m approaches a inherent level of success rate \bar{m} instead

trepreneurs with a productivity cutoff at \underline{z} will make a zero profit, while those with $z > \underline{z}$ will obtain profit follow (2.10). For those with productivity below cutoff, they can choose to become inactive. This indicates a capital misallocation as those with higher productivity, constrained by their collateral, cannot produce up to their full potential.

Entrepreneurs will choose consumption, c_e and saving, a to maximize (2.3) subjected to (2.6) and (2.10). Analytical solution for consumption policy function of the entrepreneurs' problem is $c_e = \delta a$, and the entrepreneurs' wealth follows:

$$\dot{a} = \pi(a, z) + (r^* - \delta)a \quad (2.12)$$

2.3 Aggregation and Equilibrium

For aggregation of capital, labor and output at the equilibrium, we combine individual entrepreneur's capital and labor demands and yield the following aggregate capital and labor:

$$\kappa = \lambda x \underline{z}^{-\eta} \quad (2.13)$$

$$l = \frac{\eta}{\eta - 1} \left[(1 - \alpha) m \frac{A}{w} \right]^{\frac{1}{\alpha}} \lambda x \underline{z}^{1-\eta}, \quad (2.14)$$

where $x \equiv \int ad\mathcal{G}(a, z)$ is an aggregate entrepreneurial wealth. We assume an i.i.d. productivity shock overtime, meaning wealth and productivity are independent for entrepreneurs. (2.13) implies that aggregate capital is equal to aggregate collateralized wealth of a fraction of entrepreneurs with a productivity cut-off at higher or equal to \underline{z} or $\underline{z}^{-\eta} = \mathbb{P}\{z \geq \underline{z}\}$ using Pareto distribution properties.

Aggregate output can also be derived as the following equation:

$$y = Z \kappa^\alpha l^{1-\alpha}, \text{ where } Z \equiv m \cdot A \left(\frac{\eta}{1-\eta} \underline{z} \right)^\alpha, \quad (2.15)$$

Z is treated as the endogenous aggregate total factor productivity, which is a product of successful aggregate technology mA , and the average productivity of active entrepreneurs, $\mathbb{E}(z|z \geq \underline{z}) = \frac{\eta}{\eta-1}\underline{z}$. Using labor market clearing condition, productivity cutoff, and aggregate level of capital, labor and output, the equilibrium relationship of the small open economy

yields:

$$y = y(x, l) \equiv \Theta x^\gamma l^{1-\gamma}, \quad (2.16)$$

$$\underline{z} = \frac{\eta\lambda}{\eta-1} \frac{r^* x}{\alpha y}, \quad (2.17)$$

where $\Theta \equiv \frac{r^*}{\alpha} \left[\frac{\eta\lambda}{\eta-1} \left(\frac{\alpha mA}{r^*} \right) \right]^\gamma$, and $\gamma \equiv \frac{\alpha/\eta}{\alpha/\eta+(1-\alpha)}$. Equation 2.16 represents equilibrium output, while equation 2.17 shows a productivity cutoff. Aggregate output is shared between factors of production following:

$$wl = (1 - \alpha)y \quad (2.18)$$

$$r^* \kappa = \alpha \frac{\eta - 1}{\eta} y \quad (2.19)$$

$$\Pi = \frac{\alpha}{\eta} y, \quad (2.20)$$

where $\Pi \equiv \int \pi_t(a, z) d\mathcal{G}_t(a, z)$ as aggregate entrepreneurs' profit. We find that aggregate output evolves around entrepreneurs' wealth x and labor supply l with a parameter γ . When the economy becomes capital-intensive (higher α) and has higher degree of heterogeneity of entrepreneurs' productivity (lower η), parameter γ then increases. It captures entrepreneurs' profit (2.20) and represents how far the economy is from the frictionless world.

Equilibrium income (2.16) is an increasing function of x/l , so do labor wage (2.18) and productivity cutoff (2.17). When entrepreneurs' wealth rises, firms have more incentive to hire more capital and labor by both the marginal entrepreneurs near the cutoff and the rest, raising the average productivity of entrepreneurs and labor productivity and wage. Furthermore, aggregate income is shared by labor of a fraction $1 - \alpha$, and active entrepreneurs. Income of labor and active entrepreneurs is increasing in y , which depends on entrepreneurs' wealth x and labor supply l .

When aggregating (2.12) across all entrepreneurs, the aggregate entrepreneurs' wealth evolve:

$$\dot{x} = \frac{\alpha}{\eta} y(x, l) + (r^* - \delta)x, \quad (2.21)$$

The first term of (2.21) indicates aggregate profit Π , and the second term shows the return from current wealth. With (2.21), more labor supply leads to higher aggregate output, which contribute to higher entrepreneurial wealth and accelerate wealth accumulation. In turn it raises higher level of labor productivity y/l by raising productivity cutoff \underline{z} .

In this frictional small open economy, workers and entrepreneurs obtain different return due to financial friction. An optimal policy to redistribute wealth from labor to entrepreneurs could yield a Pareto improvement (Itskhoki and Moll 2019). We can define a competitive equilibrium of the small open economy as following:

Definition 1: A *competitive equilibrium* in the small open economy satisfies: workers and entrepreneurs' problems or (2.1) and (2.2), respectively, taking prices as given. Wages clears the labor market at any point in time, and capital is exogenously determined by the world interest rate at r^* . A time path for aggregate variables $\{c, l, y, x, w, z\}_t$ satisfying (2.2), standard household optimality, given an initial household asset position b_0 , initial entrepreneurial wealth x_0 , and a path of exogenous productivity A . Individual entrepreneur will demand capital, labor and yield profit following (2.8)-(2.10), respectively, while accumulate wealth following (2.12).

3 Optimal Policy with Banking Competition

3.1 Taxes

We study the economy with labor and saving taxes (τ_l and τ_b , respectively) by transforming household's budget constrain in (2.2) to:

$$c + \dot{b} \leq (1 - \tau_l)wl + (r^* - \tau_b)b + T, \quad (3.1)$$

where T is a government lump-sum transfer. We impose a period-by-period government budget balance constraint:

$$T = \tau_l wl + \tau_b b \quad (3.2)$$

Given labor and saving taxes, households' optimality conditions become:

$$\dot{u}_c / u_c = \rho - r^* + \tau_b \quad (3.3)$$

$$\dot{u}_l / u_c = (1 - \tau_l)w, \quad (3.4)$$

while wage w follows (2.18) The following differential equations pin down the aggregate

allocation of $\{c, l, b, x\}_{t \geq 0}$:

$$c + \dot{b} = (1 - \alpha)y(x, l) + r^*b \quad (3.5)$$

$$\dot{x} = \frac{\alpha}{\eta}y(x, l) + (r^* - \delta)x, \quad (3.6)$$

where $y(x, l)$ is determined by (2.16). Given the tax policies of $\{\tau_l, \tau_b, T\}_{t \geq 0}$, the competitive equilibrium can still be met, clearing labor markets and policy functions of entrepreneurs, similar to Itskhoki and Moll 2019.

3.2 Optimal Ramsey Policies

The planner chooses tax policies to maximize households' welfare instead of entrepreneurs. The Ramsey problem becomes maximizing household utility (2.1) subjected to the competitive equilibrium allocation with taxes. We write:

$$\begin{aligned} & \max_{\{c, l, b, x\}_{t \geq 0}} \int_0^\infty e^{-\rho t} u(c, l) dt \\ & \text{subject to } c + \dot{b} = (1 - \alpha)y(x, l) + r^*b, \\ & \dot{x} = \frac{\alpha}{\eta}y(x, l) + (r^* - \delta)x, \end{aligned}$$

given initial household's saving b_0 , and entrepreneurs' wealth x_0 . This is a standard optimal control problem with (c, l) controls and (b, x) states. Denote $(\mu, \mu\nu)$ as corresponding co-state vectors. Planner, in this case, can allocate policy functions for all agents in the economy, given their budget and financial constraints and the number of banks in the financial markets. The optimality conditions for the planner's problem is derived:

$$\frac{\dot{u}_c}{u_c} = \rho - r^* = 0 \quad (3.7)$$

$$-\frac{u_l}{u_c} = (1 - \gamma + \gamma\nu) \cdot (1 - \alpha) \frac{y}{l} \quad (3.8)$$

$$\dot{\nu} = \delta\nu - (1 - \gamma + \gamma\nu) \frac{\alpha y}{\eta x} \quad (3.9)$$

Equation (3.7) implies that saving tax should not be imposed, $\tau_b = 0$, since consumption does not have a direct impact on output $y(x, l)$ and wealth accumulation (3.6). Nonetheless, planner's optimal policy on labor tax is

$$\tau_l = \gamma(1 - \nu) \quad (3.10)$$

Planner needs to tax or subsidize labor supply due to the following reasons. First, labors take wage as given and have no direct control on the level of wage (2.18). Planner can control wage and boost workers' welfare. Reducing labor supply can increase wage and end up with higher welfare for workers. Second, individual household does not take into account how labor supply can affect entrepreneurs' profit, wealth accumulation, and future outputs and wages. The solution to the planner's problem for labor tax can be described as, given initial low level of wealth $x_0 < \bar{x}$:

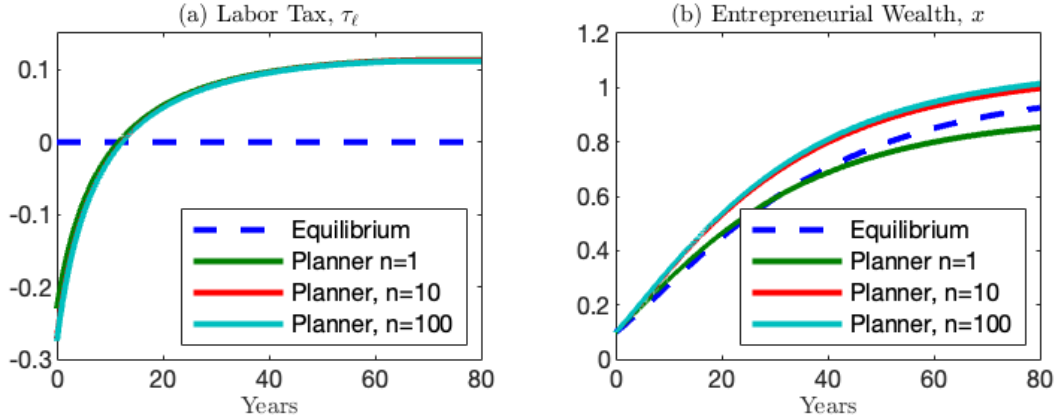
$$\bar{\tau}_l = \frac{\gamma}{\gamma + (1 - \gamma)(\delta/\rho)} > 0 \quad (3.11)$$

In this paper, we introduce banking competition into the small open economy version of Itskhoki and Moll (2019). When the initial entrepreneurial wealth is well below steady-state level, undercapitalized entrepreneurs will find it hard to produce. Planner can subsidize labor supply at the very initial stage of development until the entrepreneurs' wealth is large enough.

Figure 1 illustrates the transition dynamics of key variables in the small open economy for planner's allocation against that of a perfect competitive case without taxes. Left-side of figure 1 shows laissez-faire equilibrium with no change in labor tax as the government does not intervene in such economy. Consider another scenario which planner faces a different exogenous banking market structure. We plot a change in number of banks in the financial market from 1, 10 and 100 and investigate whether the optimal path for labor tax τ_l and entrepreneurial wealth x will be affected. The larger number of banks compete in the economy, the more loosening collateral constraint entrepreneurs are facing, and thus planner can lower level of subsidy at the initial stages of development as the constrained entrepreneur can be more active. Entrepreneurial wealth is also accumulated at a higher level compared to laissez-faire economy, except for the case with more number of competitive banks.

Figure 2 shows planner's allocation of key variables and its deviation from laissez-faire equilibrium. Labor subsidy can facilitate entrepreneur to accumulate wealth faster (panel b), raise output (panel e) and also boost labor productivity (panel c) in the medium run. As for the different degree of banking competition, we observe that more banks in the economy helps raise entrepreneurial wealth (panel b), wage (panel c), total factor productivity (panel d), and income (panel e) in the long run. This results confirms the effectiveness of relaxing entrepreneurs' financial constraints as one of the guideline for policymaker. Even if more banks leads to more risk-taking behavior (lower monitoring efforts by banks), more relaxed financial constraints for entrepreneurs are a good catalyst for growth.

Figure 1: Planner's Allocation: Labor tax $\tau_l(t)$ and Entrepreneurial Wealth $x(t)$

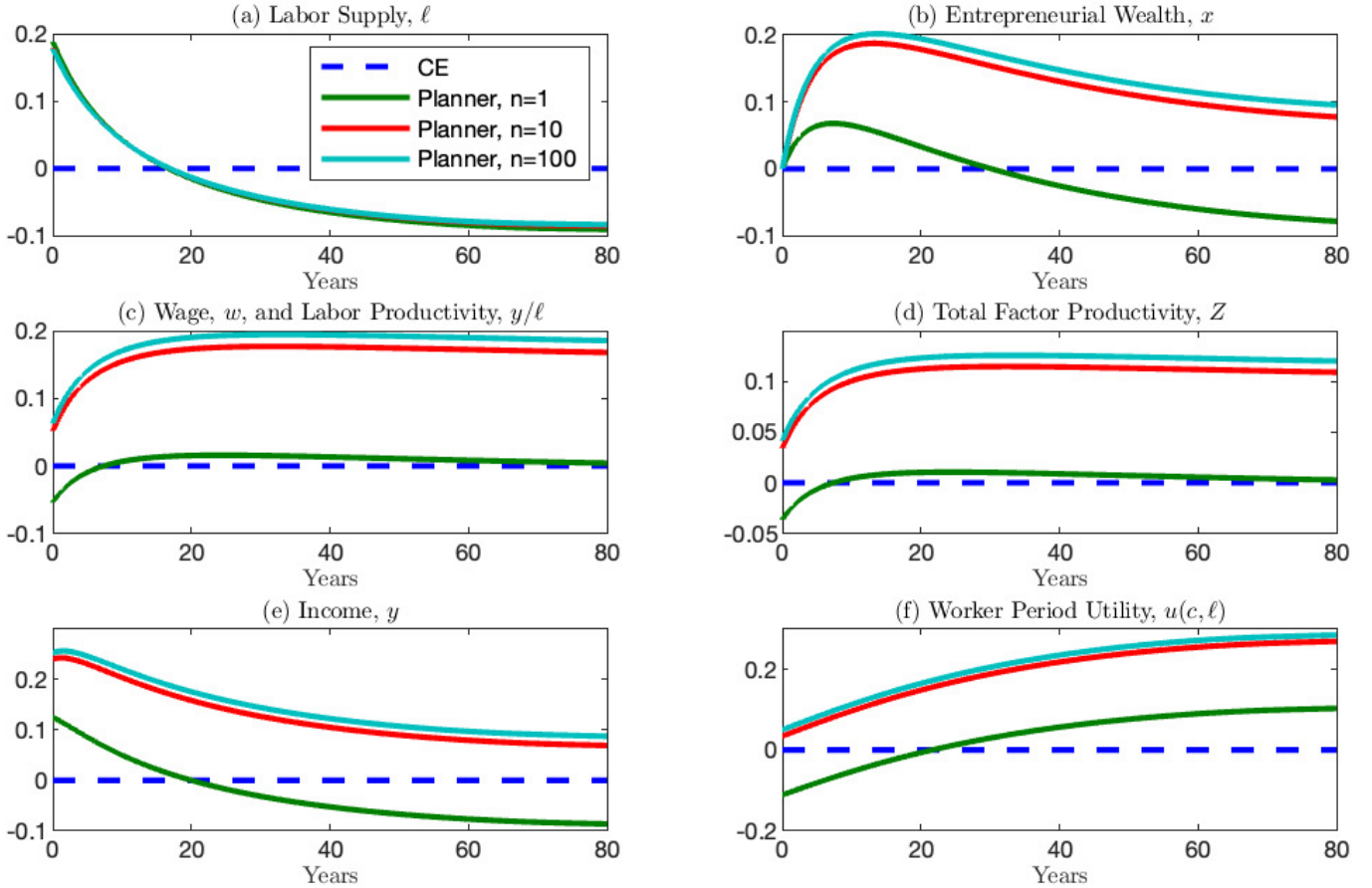


Note: In panel (b), the steady-state entrepreneurial wealth in the Laissez-Faire equilibrium is normalized to 1.

Figure 3, however, shed another story for the implication for banking competition. More competition leads to a lower wealth accumulation by entrepreneurs (panel b), lower wage and labor productivity (panel c), and lower aggregate income (panel e). When the success rate of an investment project (m) is inherently lower, the economy relies more on monitoring efforts of banks to nurture their firms. More banking competition hurts the economic growth instead.

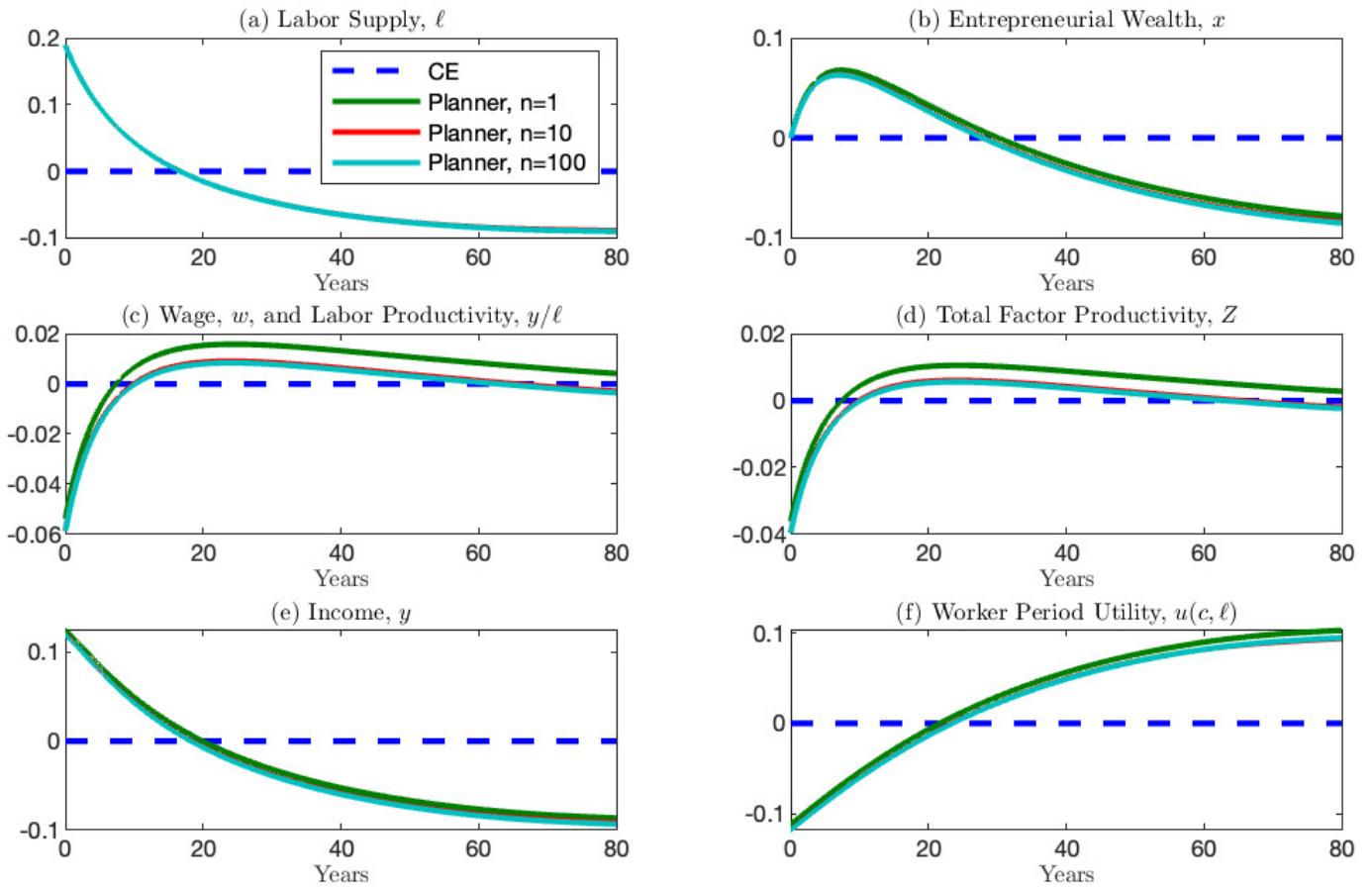
Therefore, apart from optimally subsidizing labor to encourage entrepreneurs' accumulation of wealth, supporting a competitive banking environment that allows entrepreneurs to borrow in a relaxed manner is good for growth if the economy has a strong infrastructure (higher level of credit efficiency). Nonetheless, in a country with weak governance and political instability (lower level of credit efficiency), the economy needs banks with certain degree of market power to industrialize.

Figure 2: Planner's Allocation: Deviation from the Laissez-Faire Equilibrium



Note: The parameters for our numerical example are similar to Itskhoki and Moll (2019) i.e. $\alpha = 1/3, \delta = 0.1, \rho = 0.03, \eta = 1.06, \psi = 1$, and $\varphi = 1$. We then set parameters related to banking competition as follows: $\bar{\lambda} = 2$, and $\bar{m} = 0.9$. In panel (d), the deviations in TFP are the same as the deviations in \bar{z}^η , as follows from (2.15). In panel (e), income deviations characterize simultaneously the deviations in output (y), wage bill ($w\ell$), profits (Π), capital*income ($r \cdot \kappa$), and hence capital (κ).

Figure 3: Planner's Allocation: Deviation from the Laissez-Faire Equilibrium



Note: Same set of parameters as figure 3 but $\bar{m} = 0.8$ to indicate lower level of credit efficiency. When credit efficiency is low enough, it outweighs the effect of relaxed collateral constraint.

4 Conclusion

We analyze the optimal development policy with banking competition. The different market structure for financial intermediaries delivers different tightening degree of collateral constraint and different level of monitoring efforts, which results in a different policy mixes for optimal development path.

We find that, on the one hand, the economy with strong governance and adequate infrastructure (higher credit efficiency) needs more competitive environment for banking sector, which helps relax collateral constraints and results in a better long-term growth path as a complementary policy, implemented along with labor subsidy at the initial stage of development. On the other hand, the economy with weak governance and inadequate infrastructure (lower credit efficiency) requires a lower degree of banking competition since raising investment project success matters and contributes to higher level of entrepreneurs' wealth accumulation, and thus higher aggregate output.

There are, however, a few limitations to our study. A full endogenous banking sector should be engineered to study its implications and how banking competition endogenously interacts with the optimal development policies. An empirical investigation on how banking competition influences long term growth path of the emerging countries with industrial policies should also be conducted to validate such theoretical model.

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