

Well-Intended Policies

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Abstract

Market failures provide a rationale for policy intervention. But policies are often hard to alter once in place. We argue that this inertia can result in well-intended policies having sizable negative long-run effects on aggregate output and productivity. In our theory, financial frictions provide a rationale for subsidizing productive entrepreneurs to alleviate the credit constraints they face. In the short run, such targeted subsidies have the intended effect and raise aggregate output and productivity. In the long run, however, individual productivities mean-revert while individual-specific subsidies remain fixed. As a result, entry into entrepreneurship is distorted: The subsidies prop up entrepreneurs that were formerly productive but are now unproductive, while impeding the entry of newly productive individuals. Therefore aggregate output and productivity are depressed. Our theory provides an explanation for two empirical observations on developing countries: idiosyncratic distortions that disproportionately affect productive establishments, and temporary growth miracles followed by growth failures.

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1 Introduction

A recent literature has stressed the quantitative importance of resource misallocation across heterogeneous producers for explaining the large TFP differences across countries (Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009). The literature models the misallocation in a reduced-form fashion with abstract taxes and subsidies, and is silent about the origins of these distortions.

In this paper, we present a theory of idiosyncratic distortions that originate from policies that are well-intended but hard to alter once in place. In doing so, we provide a cautionary tale about the unintended consequences of industrial policies, which can also explain why many developing countries experience temporary growth miracles and failures (Easterly et al., 1993; Jones and Olken, 2008). Even when industrial policies can foster development by remedying market failures (Rodrik, 2008; Lin and Monga, 2010), they may deter long-run growth if governments are not able to adjust these policies over time.

Our theory has three important elements. First, heterogeneous producers face limited-commitment constraints on credit. While the credit constraints themselves generate misallocation, this direct source of misallocation is not what we focus on. The limited-commitment constraints provide a rationale for well-meaning policymakers to subsidize productive entrepreneurs. Second, we assume that policies exhibit inertia. Subsidies are chosen in the first period and are fixed for each producer thereafter, while a uniform tax is levied to satisfy the government's budget constraint. This assumption captures the fact that policies that favor particular groups become entrenched, and therefore, are hard to revoke. Effectively, while subsidies are given to the most productive individuals initially, they become an individual-specific attribute beyond the first period. Finally, individual productivities are stochastic and mean-reverting. Over time, as the productivity of the most productive entrepreneurs reverts to the mean, subsidized entrepreneurs will tend to be mediocre individuals who would exit in the absence of the entrenched policies.¹

In our model a subsidy increases the creditworthiness of an entrepreneur in the sense that his limited commitment problem is relaxed. Policymakers therefore choose to subsidize productive entrepreneurs. In the short run, this policy reallocates capital from unproductive towards productive entrepreneurs, and boosts per-capita income, TFP, and capital accumulation. Over time, as the productivities of entrepreneurs revert to the mean, subsidized individuals are not necessarily the most productive entrepreneurs, while newly entering, productive entrepreneurs are taxed. Therefore, in the long run, the initial policy results

¹This effect will be present whenever subsidies are more persistent than individual productivities. Our assumption of subsidies being completely fixed over time could therefore be relaxed along these lines.

in idiosyncratic taxes and subsidies that contribute to the misallocation of resources from productive entrepreneurs towards unproductive ones who stay in business only because they are subsidized. Because of mean reversion, in the stationary equilibrium, subsidies are uncorrelated with the productivities of the overall population. However, subsidies are *negatively* correlated with the productivity of individuals who choose to be active entrepreneurs, because of distorted entry decisions. This endogenous correlation between idiosyncratic distortions and entrepreneurial productivity leads to lower per-capita income, TFP, and capital accumulation in the long-run.

Our theory provides a rationale for two distinct features of developing countries. First, we rationalize, with well-intended policies, the existence of idiosyncratic distortions that affect productive entrepreneurs disproportionately more (Restuccia and Rogerson, 2008): idiosyncratic distortions as the legacy of well-intended industrial policies. In addition, our model can account for the fact that most developing countries experience temporary growth miracles and failures at a frequency of about ten years (Easterly et al., 1993; Jones and Olken, 2008). This fact holds for all but the very richest countries and the few persistent growth miracles, e.g., Asian miracle economies. Indeed, for a large fraction of countries, decades of fast growth are followed by failures, consistent with our theory.

The next section develops our theory, which we then use in Section 3 to study the impact of industrial policies. Section 4 concludes the paper.

2 Model

In this section, we introduce the basic model with which we evaluate the aggregate and distributional impact of industrial policies that are implemented through taxes and subsidies.

There is a unit measure of infinitely-lived individuals, who are heterogeneous in their wealth and the quality of their entrepreneurial idea or talent, z . Their wealth is determined endogenously by forward-looking saving behavior. The entrepreneurial idea is drawn from an invariant distribution $\mu(z)$. Entrepreneurial ideas “die” with a constant hazard rate of $1 - \gamma$, in which case a new idea is drawn from $\mu(z)$ independently of the quality of the previous idea; that is, γ controls the persistence of the entrepreneurial idea or talent process. The γ shock can be interpreted as changes in market conditions that affect the profitability of individual skills or business opportunities.

In each period, individuals choose their occupation: whether to work for a wage or to operate a business (entrepreneurship). Their occupation choices are based on their comparative advantage as an entrepreneur z and their access to capital. Access to capital is limited by their wealth through an endogenous collateral constraint, because of imperfect

enforceability of capital rental contracts.

One entrepreneur can operate only one production unit (establishment) in a given period. Entrepreneurial ideas are inalienable, and there is no market for managers or entrepreneurial talent.

2.1 Preferences

Individual preferences are described by the following expected utility function over sequences of consumption c_t :

$$U(c) = \mathbb{E} \left[\sum_{t=0}^{\infty} \beta^t u(c_t) \right], \quad u(c_t) = \frac{c_t^{1-\sigma}}{1-\sigma}, \quad (1)$$

where β is the discount factor, and σ is the coefficient of relative risk aversion. The expectation is over the realizations of entrepreneurial ideas (z), which depend on the stochastic death of ideas and draws from $\mu(z)$. We assume that entrepreneurial ideas are drawn from a Pareto distribution with tail parameter η ; that is, $\mu(z) = \eta z^{-\eta-1}$.

2.2 Technology

At the beginning of each period, an individual with entrepreneurial idea z and wealth a chooses whether to work for the market wage w or operate his own business. An entrepreneur with talent z produces using capital k and labor l according to:

$$zf(k, l) = zk^{\alpha}l^{\theta},$$

where α and θ are the elasticities of output with respect to capital and labor, and $\alpha + \theta < 1$, implying diminishing returns to scale in variable factors at the establishment level.

Given factor prices w and R (rental rate of capital), the profit of an entrepreneur is:

$$\pi(k, l; R, w) = zk^{\alpha}l^{\theta} - Rk - wl.$$

2.3 Taxes and Subsidies

The government may set individual-specific subsidies, financed by uniform taxes. Individual-specific subsidies are denoted by $\varsigma_i \geq 0$, where the subscript indexes individuals in the economy. The uniform tax rate is denoted by $\tau \geq 0$. Following Restuccia and Rogerson (2008), we assume that these taxes and subsidies are levied on the revenue of an entrepreneur. For entrepreneur i , his revenue after taxes and subsidies is $(1 - \tau)(1 + \varsigma_i)z_i k^{\alpha} l^{\theta}$.

We further assume that taxes and individual-specific subsidies are constant over time. This assumption captures the fact that it is hard to change policies that favor particular groups once they are instituted (Sowell, 1990; Krueger, 1993; Bridgman et al., 2009).²

2.4 Credit (Capital Rental) Markets

Individuals have access to competitive financial intermediaries, who receive deposits and rent out capital at rate R to entrepreneurs. We restrict the analysis to the case where credit transactions are within a period—that is, individuals’ financial wealth is restricted to be non-negative ($a \geq 0$). The zero-profit condition of the intermediaries implies $R = r + \delta$, where r is the deposit rate and δ is the depreciation rate.

Capital rental by entrepreneurs is limited by imperfect enforceability of contracts. In particular, we assume that, after production has taken place, entrepreneurs may renege on the contracts. In such cases, a defaulting entrepreneur can keep a fraction $1 - \phi$ of the undepreciated capital and the after-tax revenue net of labor payments: $(1 - \phi)[(1 - \tau)zf(k, l) - wl + (1 - \delta)k]$, $0 \leq \phi \leq 1$. The punishment is the garnishment of their financial assets (a) deposited with the financial intermediary and the loss of subsidy (ς_i) for the period. In the following period, the entrepreneur in default regains access to financial markets and his subsidy, and is not treated any differently, despite his history of default. As we show below, this assumption delivers the intuitive result that an entrepreneur with a higher subsidy is more creditworthy in the sense that his limited commitment problem is relaxed.³

Note that ϕ indexes the strength of an economy’s legal institutions that enforce contractual obligations. This one-dimensional parameter captures the extent of frictions in the financial market owing to imperfect enforcement of credit contracts. This parsimonious specification allows for a flexible modeling of limited commitment that spans economies with no credit ($\phi = 0$) and those with perfect credit markets ($\phi = 1$).

We consider equilibria where the borrowing and capital rental contracts are incentive-compatible and are hence fulfilled. In particular, we study equilibria where the rental of capital is quantity-restricted by an upper bound $\bar{k}(a, z, \varsigma; \phi)$, which is a function of the individual state (a, z, ς) . We choose the rental limits \bar{k} to be the largest limits that are consistent with entrepreneurs choosing to abide by their credit contracts. Without loss of generality, we assume $\bar{k}(a, z, \varsigma; \phi) \leq k^u(z, \varsigma)$, where k^u is the profit-maximizing capital inputs in the unconstrained static problem.

²See Fernandez and Rodrik (1991) and Coate and Morris (1999) for models of the persistence of policies.

³The only purpose of assuming that defaulting entrepreneurs regain their subsidy in the future is to keep the rental limit tractable. A more natural assumption may be that defaulting entrepreneurs lose their subsidy forever. This would result in rental limits being even more responsive to the subsidy level.

The following proposition, proved in Buera et al. (2011), provides a simple characterization of the set of enforceable contracts and the rental limit $\bar{k}(a, z, \varsigma; \phi)$.

Proposition 1 *Capital rental k by an entrepreneur with wealth a , talent z , and individual-specific subsidy ς is enforceable if and only if*

$$\begin{aligned} \max_l \{ (1 - \tau)(1 + \varsigma)zf(k, l) - wl \} - Rk + (1 + r)a \\ \geq (1 - \phi) \left[\max_l \{ (1 - \tau)zf(k, l) - wl \} + (1 - \delta)k \right]. \end{aligned} \quad (2)$$

The upper bound on capital rental that is consistent with entrepreneurs choosing to abide by their contracts can be represented by a function $\bar{k}(a, z, \varsigma; \phi)$, which is increasing in a , z , ς , and ϕ .

Condition (2) states that an entrepreneur must end up with (weakly) more economic resources when he fulfills his credit obligations (left-hand side) than when he defaults (right-hand side). This static condition is sufficient to characterize enforceable allocations because we assume that defaulting entrepreneurs regain full access to financial markets in the following period.

This proposition also provides a convenient way to operationalize the enforceability constraint into a simple rental limit $\bar{k}(a, z, \varsigma; \phi)$. Rental limits increase with the wealth and the subsidy rate of entrepreneurs, because the punishment for defaulting (loss of collateral and subsidy) is larger. Similarly, rental limits increase with the talent of an entrepreneur because defaulting entrepreneurs keep only a fraction $1 - \phi$ of the output.

2.5 Recursive Representation of Individuals' Problem

Individuals maximize (1) by choosing sequences of consumption, financial wealth, occupations, and capital/labor inputs if they choose to be entrepreneurs, subject to a sequence of period budget constraints and rental limits.

At the beginning of a period, an individual's state is summarized by his wealth a , talent z , and individual-specific subsidy rate ς . He then chooses whether to be a worker or to be an entrepreneur for the period. The value for him at this stage, $v(a, z, \varsigma)$, is the maximum over the value of being a worker, $v^W(a, z, \varsigma)$, and the value of being an entrepreneur, $v^E(a, z, \varsigma)$:

$$v(a, z, \varsigma) = \max \{ v^W(a, z, \varsigma), v^E(a, z, \varsigma) \}. \quad (3)$$

Note that the value of being a worker, $v^W(a, z, \varsigma)$, depends on his entrepreneurial idea z , which may be implemented at a later date. We denote the optimal occupation choice by $o(a, z, \varsigma) \in \{W, E\}$.

As a worker, an individual chooses consumption c and the next period's assets a' to maximize his continuation value subject to the period budget constraint:

$$\begin{aligned} v^W(a, z, \varsigma) &= \max_{c, a' \geq 0} u(c) + \beta \{ \gamma v(a', z, \varsigma) + (1 - \gamma) \mathbb{E}_{z'} [v(a', z', \varsigma)] \} \\ \text{s.t. } c + a' &\leq w + (1 + r) a, \end{aligned} \quad (4)$$

where w is his labor income. The continuation value is a function of the end-of-period state (a', z', ς) , where $z' = z$ with probability γ and $z' \sim \mu(z')$ with probability $1 - \gamma$. We are assuming that ς is fixed over time for any given individual. In the next period, he will face an occupational choice again, and the function $v(a, z, \varsigma)$ appears in the continuation value.

Alternatively, an individual can choose to become an entrepreneur. The value function of being an entrepreneur is as follows.

$$\begin{aligned} v^E(a, z, \varsigma) &= \max_{c, a', k, l \geq 0} u(c) + \beta \{ \gamma v(a', z, \varsigma) + (1 - \gamma) \mathbb{E}_{z'} [v(a', z', \varsigma)] \} \\ \text{s.t. } c + a' &\leq (1 - \tau)(1 + \varsigma)zf(k, l) - Rk - wl + (1 + r)a \\ k &\leq \bar{k}(a, z, \varsigma; \phi) \end{aligned} \quad (5)$$

Note that an entrepreneur's income is given by after-tax profit $(1 - \tau)(1 + \varsigma)zf(k, l) - Rk - wl$ plus the return to his initial wealth, and that his choices of capital inputs are constrained by $\bar{k}(a, z, \varsigma; \phi)$.

2.6 Small Open Economy

We assume a small open economy, with the interest rate exogenously given by a large economy with perfect credit markets (See Section 2.7). A competitive equilibrium in our economy without taxes and subsidies is then defined in the usual way. That is, individuals solve (3)–(5) taking as given the wage and interest rate, and the labor market clears.

2.7 Calibration

We first calibrate preference and technology parameters so that the perfect-credit benchmark matches key aspects of the US, a relatively undistorted economy. Our target moments pertain to standard macroeconomic aggregates, and establishment size distribution and dynamics, among others.

We need to specify values for seven parameters: two technological parameters, α , θ , and the depreciation rate δ ; two parameters describing the process for entrepreneurial talent, the survival probability of entrepreneurial ideas γ and the Pareto tail parameter η ; the subjective discount factor β , and the coefficient of relative risk aversion σ . Of these seven parameters, η will be re-calibrated below for our analysis of developing countries.

One preference parameter, σ , and two technological parameters, $\alpha/(1/\eta + \alpha + \theta)$ and δ , can be set to standard values in the literature. We let $\sigma = 1.5$. The one-year depreciation rate is set at $\delta = 0.06$, and we choose $\alpha/(1/\eta + \alpha + \theta)$ to match the aggregate capital income share of 0.30.

Target Moments	US Data	Model	Parameter
Top 10-percentile employment share	0.69	0.69	$\eta = 4.84$
Top 5-percentile earnings share	0.30	0.30	$\alpha + \theta = 0.79$
Establishment exit rate	0.10	0.10	$\gamma = 0.89$
Interest rate	0.04	0.04	$\beta = 0.92$
Target Moments	Indian Data	Model	Parameter
Top 10-percentile employment share	0.58	0.58	$\eta = 5.56$

Table 1: Calibration

We are thus left with the four parameters that are more specific to our study. We calibrate them to match as many relevant moments in the US data shown in Table 1: the employment share of the top decile of establishments; the share of earnings generated by the top five percent of earners; the annual exit rate of establishments; and the annual real interest rate. Given the returns to scale, $\alpha + \theta$, we choose the tail parameter of the entrepreneurial talent distribution, $\eta = 4.84$, to match the employment share of the largest ten percent of establishments, 0.69. We can then infer $\alpha + \theta = 0.79$ from the earnings share of the top five percent of earners. Top earners are mostly entrepreneurs (both in the US data and in the model), and $\alpha + \theta$ controls the fraction of output going to the entrepreneurial input. The parameter $\gamma = 0.89$ leads to an annual establishment exit rate of ten per cent in the model. This is consistent with the exit rate of establishments reported in the US Census Business Dynamics Statistics. Finally, the model requires a discount factor of $\beta = 0.92$ to match the annual interest rate of four per cent.

We use the above parameter values calibrated to the US data for our analysis, with two important exceptions. First, we consider industrial policies implemented in countries with underdeveloped financial markets. We set $\phi = 0.085$ to generate a time-averaged external finance to GDP ratio of 0.3, which is the average among non-OECD countries (Beck et al., 2000). Second, the establishment size distribution in less developed countries are vastly different from that of the US. Using detailed data available for India, we compute the employment share of the largest ten percent of establishments to be 0.58, which is obtained in the model with $\eta = 5.56$.

3 Impact of Industrial Policies

We study the development dynamics of an economy where the government chooses subsidies and taxes to increase short-run output, by subsidizing productive entrepreneurs who face capital rental constraints. We assume that subsidies get entrenched once given out, and therefore remain in place independently of the future productivity of the subsidized entrepreneur.

In our model, the government has an advantage over the private sector as it can freely redistribute resources across periods and across individuals. This provides a simple rationale for government interventions. While this framework abstracts from other frictions that make a less compelling case for government interventions, we adopt it because it allows us to clearly highlight the negative long-run consequences of well-intended policies that cannot be adjusted over time.⁴

We assume that governments are short-sighted and choose taxes and subsidies to boost short-term economic outcomes, reflecting the fact that politicians do not expect to remain in power for long periods of time, and the fact that politicians tend to have different preferences (Alesina and Tabellini, 1990). An alternative assumption yielding similar results is that politicians are “naïve” and do not understand that policies will be hard to alter once implemented. A politician who thinks he can completely re-optimize a given policy—ie, selecting different subsidy recipients—every year will act as if he plans for a time horizon of only one year.⁵ In this sense, “myopia” and “naïveté” on the side of politicians are equivalent assumptions. The distinction matters only for whether we can talk of “unintended consequences of well-intended policies.” If politicians are naïve, a policy’s long-run effects are truly unintended; if instead they are myopic, any negative long-run effects are fully intentional and only due to the politicians’ short time horizon.

3.1 Taxes and Subsidies

Initially, the economy is in a steady state with zero taxes and subsidies. At time 0, the government introduces individual-specific subsidies ς_i , financed by taxes τ . For the individuals in the economy, this is a completely unexpected shock, but they understand that it is a permanent policy change.

We make the following assumptions. First, the government subsidizes a fraction λ with

⁴A richer model of financial frictions would incorporate the fact that entrepreneurs have private information about their productivity, limiting the extent to which they can borrow to finance their project. In this case, it is natural to assume that government *do not* have an informational advantage over the private sector, and therefore, they cannot easily pick winners (Harberger, 1998).

⁵That is, he will solve a sequence of static optimization problems.

a subsidy rate $\bar{\varsigma}$. We set $\bar{\varsigma} = 0.4$. For the remaining $1 - \lambda$, their subsidy rate is zero. Once given, these individual-specific subsidy rates remain constant over time. Second, to pay for the subsidy, the government levies a uniform revenue tax at rate τ . The tax rate is chosen to satisfy the government budget constraint in present value, computed at the world interest rate $r = 0.04$. Third, the government chooses λ to maximize the time-0 GDP. In particular, we assume that the government gives subsidies to the fraction λ of individuals whose output will increase the most when subsidized. These are typically poor, high-ability individuals whose financial constraints are relaxed the most by the subsidy.

Given $\bar{\varsigma} = 0.4$, $\lambda = 0.041$ maximizes the time-0 GDP, which requires $\tau = 0.175$ to satisfy the government's intertemporal budget constraint.⁶

3.2 Economic Effects

Given our assumption on the financial constraint, subsidies relax capital rental limits, especially for the highly productive. In particular, one penalty of renegeing on the rental contract is the loss of that period's subsidy, and the amount of subsidy is proportional to the entrepreneurs' productivity z . On the left panel of Figure 1, we show this effect.

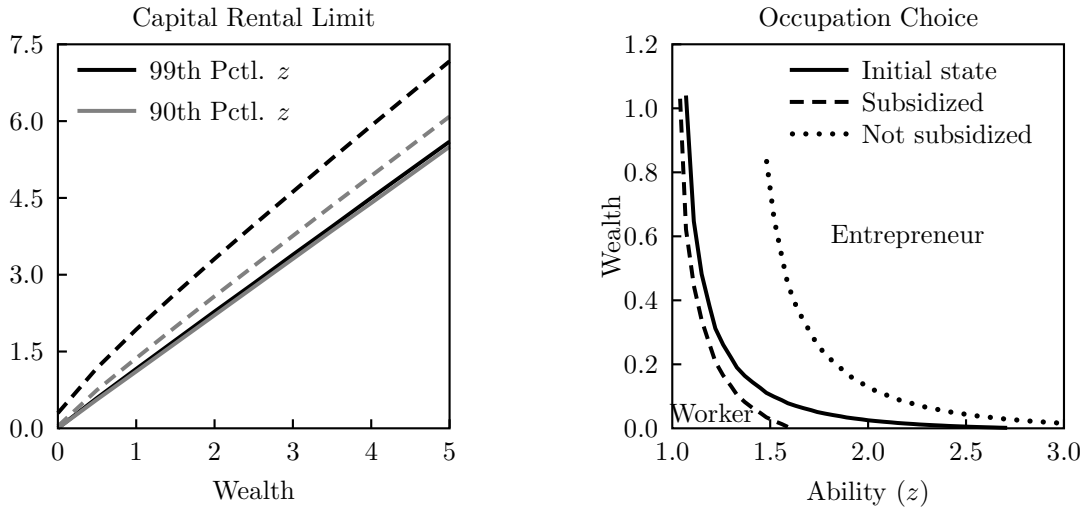


Fig. 1: Impact of Industrial Policy

There are two solid lines (almost on top of each other): one black and the other gray. These solid lines are the capital rental limit \bar{k} as a function of wealth in the initial steady state with no tax/subsidy: black for z in the ninety-ninth percentile and gray for z in the ninetieth percentile. Now, with the implementation of the tax/subsidy policy, the capital rental limit of those who are subsidized shifts upward. The higher z , the further out does

⁶While we have not done an exhaustive search over values of $\bar{\varsigma}$, we have tried a few and $\bar{\varsigma} = 0.4$ is the one for which time-0 GDP is highest.

the rental limit shift out. The two dashed lines are the new \bar{k} of subsidized entrepreneurs of the respective ability levels.

Note that, with the policy, the equilibrium wage increases. The new capital rental limits are computed at this new higher wage. Because of this higher wage, the rental limits of those who are not subsidized contract, although they are not shown in the picture.⁷

The subsidy affects not only the capital rental limits, but also the profits from entrepreneurship directly. Through these two channels, occupation choices are affected. On the right panel of Figure 1, we show the occupation choice map in the initial steady state with the black solid line. Entrepreneurial talent is on the horizontal axis, and wealth is on the vertical axis.

With perfect credit markets, the occupation map will be divided by a vertical line: only entrepreneurial productivity matters for the occupation choice. With financial frictions, the map is divided by a downward-sloping line: Those to the northeast of the line choose to be entrepreneurs, and those to the southwest choose to be workers. There exist highly-talented individuals who have too little collateral to operate their business at a profitable scale. At the same time, there are rich, mediocre entrepreneurs, whose wealth confers upon them a comparative advantage in running businesses.

The dashed line is the occupation choice for those who are subsidized (again computed at the higher equilibrium wage). Not surprisingly, it lies to the left of the solid line: Subsidy increases profits from entrepreneurship, both directly through revenue and indirectly through the relaxation of capital rental limits.

To the contrary, those who are not subsidized are discouraged from entrepreneurship. First, the revenue tax, levied to pay for the subsidies to the chosen ones, reduces profits directly. Second, the higher wage not only lowers profits, but also represents a higher opportunity cost of entrepreneurship. This is shown with the dotted line, which lies far to the right of the initial solid line.

We now turn to the aggregate implications of the tax/subsidy policy. The policy is implemented at $t = 0$, and the government starts out by subsidizing individuals who are most productive and financially constrained as of $t = 0$. As shown in Figure 1, this relaxes the constraint of the productive entrepreneurs. In addition, it allows some productive, poor entrepreneurs, who would have remained a worker otherwise, to start business. As a result, the economy expands.

The left panel of Figure 2 shows the transitional dynamics of GDP and the aggregate productivity, both normalized by their respective levels in the pre-intervention steady state.

⁷In our exercise, initially, none in the ninetieth percentile in terms of z is subsidized. Among those with z in the ninety-ninth percentile, a very wealthy minority is not subsidized.

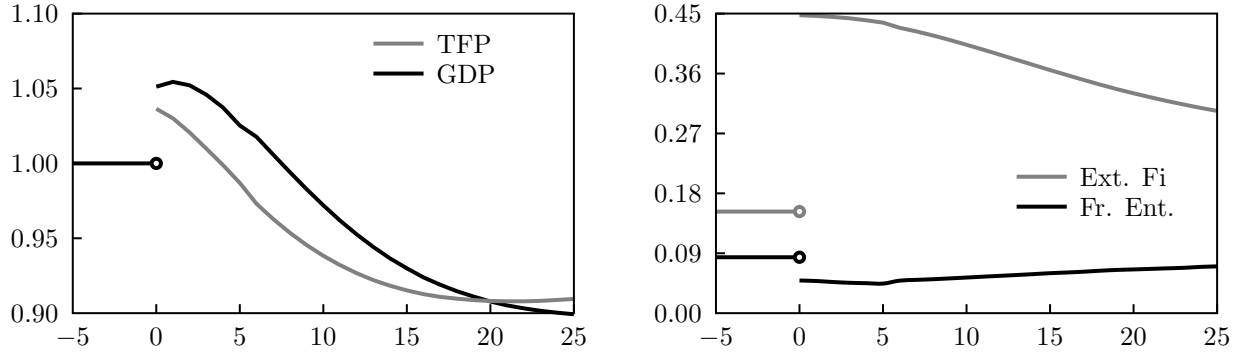


Fig. 2: Transition under Industrial Policy

Output (black line) jumps up upon impact, and rises further the next period, as the subsidized entrepreneurs who are now richer further push up the capital rental limit by accumulating wealth and hence expand their production.

Aggregate TFP (gray line) is also higher, reflecting the better allocation of resources toward the productive, constrained entrepreneurs. However, TFP declines over time monotonically. This is the result of, first, the mean-reversion in the entrepreneurial productivity process and, second, the assumption that the individual-specific subsidies are irreversible. By the fifth year of the policy, TFP falls below the pre-intervention level, as the subsidy recipients are now less likely to be more productive than other unsubsidized individuals. GDP stays above its initial level for another three years, because the subsidies relax the financial constraint and allow for larger capital input. Indeed, the effect of the policy on financial constraints are reflected on the ratio of external finance to GDP (gray line, right panel). This ratio almost triples from 0.16 to 0.45 initially, then falls along with the entrepreneurial productivity of the subsidized individuals over time to 0.27 in the new steady state.

The right panel of Figure 2 also shows the times series of the fraction of active entrepreneurs in the economy. Upon impact, the fraction decreases from about 8 percent to 5 percent, with very few unsubsidized entrepreneurs remaining in business. This fact is not surprising given the occupation choice map for those unsubsidized (right panel, Figure 1). In other words, subsidies lead to an increase in the average size of establishments, as the most productive entrepreneurs are better capitalized at the expense of marginal entrepreneurs who would have operated at a smaller scale. Over time, as the productivity of the subsidized entrepreneurs mean-reverts, they accordingly downsize and the wage comes down. This leads to more entry among unsubsidized entrepreneurs, who are now more likely to have a high productivity z .

In the long run, the policy leaves sizable negative impacts on output and TFP alike, even though by aggregate measures the financial constraints remain relaxed—the ratio of external

finance to GDP is higher by 0.11 ($=0.27-0.16$) in the new steady state.

Although the subsidy is initially targeted toward the high- z individuals, in the long run, there is no correlation between an individual's z and subsidy. Among high-ability individuals, only a small fraction is subsidized ($\lambda = 0.041$). The unsubsidized high-ability individuals now face revenue taxes (τ) and a higher wage than in the pre-intervention periods. As a result, they operate at a smaller scale and, given smaller profits, they have a harder time overcoming financial constraint through self-financing over time. As shown in the right panel of Figure 1, the tax and subsidy further distort occupation choice. This is why GDP and TFP suffer in the long run.

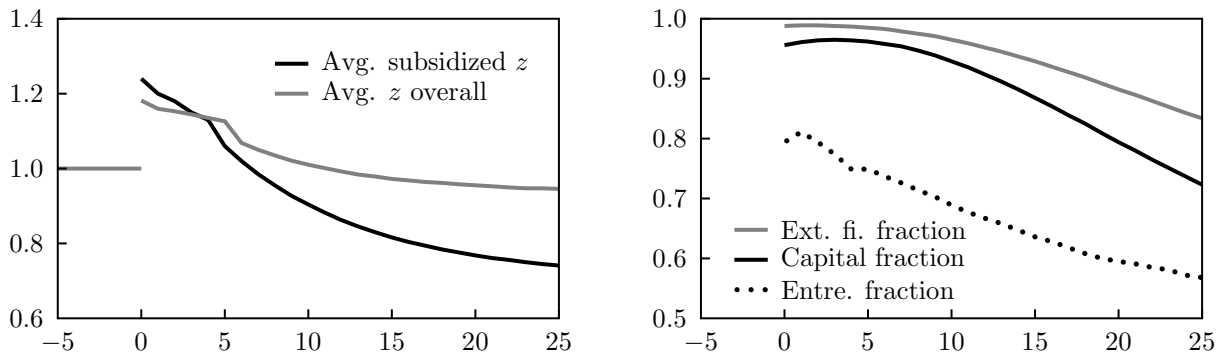


Fig. 3: Subsidy Recipients

The flip side is the disproportionate influence of the subsidized minority. While they are a small fraction of the population (again, $\lambda = 0.041$), they account for over 50 percent of active entrepreneurs in the new steady state. The dotted line in the right panel of Figure 3 shows what fraction of active entrepreneurs in each period is subsidized. For the most part, they are incompetent entrepreneurs propped up by the subsidy. The left panel of Figure 3 shows the average z among active entrepreneurs (gray line) and the average among active, subsidized entrepreneurs (black line). Both are normalized by the average entrepreneurial z in the pre-intervention period. Initially, the subsidized ones are more productive than the rest.⁸ However, over time, the average z among active, subsidized entrepreneurs falls far below the average among active, unsubsidized entrepreneurs.

The subsidized ones face more relaxed financial constraints. Thus, in the long run, they use almost 80 percent of all the external financing in the economy, and almost 70 percent of all the capital in the economy. (The black line in the right panel of Figure 3 shows what fraction of capital is used by subsidized entrepreneurs in each period. Similarly, the gray line shows the fraction of externally financed capital used by subsidy recipients.)

⁸The difference seems small, because, as shown in the right panel of Figure 2 (black line), very few unsubsidized entrepreneurs are active initially.

In summary, the subsidy props up incompetent entrepreneurs, and their excessive use of economic resources results in poor economic performances.

3.3 Measuring Idiosyncratic Distortions

To measure idiosyncratic distortions, we follow Hsieh and Klenow (2009) and introduce “wedges” $\tau_{y,i}$ and $\tau_{k,i}$ that transform the static profit-maximization problem of an entrepreneur into:

$$\max_{k_i, l_i} (1 - \tau_{y,i}) z_i k_i^\alpha l_i^{1-\alpha} - w l_i - (1 + \tau_{k,i}) (\delta + r) k_i.$$

Using the observed output and input choices, we back out $\tau_{y,i}$ and $\tau_{k,i}$, and then compute their weighted average:

$$\tau_{m,i} = \frac{(1 + \tau_{k,i})^\alpha}{(1 - \tau_{y,i})}.$$

We use $\log \tau_{m,i}$ as our measure of idiosyncratic distortions. Clearly, the distortions not only capture taxes and idiosyncratic subsidies, but also the financial frictions in the economy.

$\log \tau_{m,i}$	$t = 0-$	$t = 0+$	$t = +\infty$
Variance	0.0375	0.0238	0.0919
Corr. w/ z_i	0.5916	0.0151	0.7511

Table 2: Measure of Distortions in the Economy

The moments reported in Table 2 are computed over the set of active entrepreneurs in the pre-intervention steady state ($\lambda = 0.041$), upon the implementation of the policy ($t = 0+$), and in the new steady state ($t = +\infty$).

In the initial steady state ($t = 0-$), there is no tax or subsidy on revenue—i.e., $\tau = \varsigma_i = 0$ and hence $\tau_{y,i} = 0$ for all i . There still are financial frictions, which are captured by $\tau_{k,i}$. The measured variance of $\log \tau_m$ is 0.0375, which is equal to the variance of $\alpha \log(1 + \tau_{k,i})$. In addition, $\tau_{m,i}$ is positively correlated with entrepreneurial productivity z_i . Although financial frictions are systematic and not individual-specific, they particularly bind for those with high z_i , whose optimal scale of production and hence external financing needs are large. This explains the positive correlation. Restuccia and Rogerson (2008) show that idiosyncratic distortions have large effects when they are positively correlated with individual productivity. While this positive correlation is exogenously imposed in Restuccia and Rogerson’s analysis, we obtain it endogenously with financial frictions that are common to all firms.

At time 0, the government implements the tax/subsidy policy. While the government subsidizes the most productive entrepreneurs initially, the subsidy will remain with these same individuals regardless of their future productivity.

Upon impact ($t = 0+$), the subsidy relaxes the financial constraints of productive entrepreneurs, and the dispersion of $\tau_{k,i}$ decreases. Although the dispersion of $\tau_{y,i}$ is now non-zero, the overall distortion measure, $\tau_{m,i}$, gets less disperse, with the variance down to 0.0238. Because it is the high- z_i entrepreneurs who get subsidized—which shows up as a lower $\tau_{m,i}$ —the correlation between $\tau_{m,i}$ and z_i weakens, from 0.5916 to 0.0151.

However, as time goes on, the productivity of the subsidized individuals gradually reverts to the mean. In the new steady state ($t = +\infty$), the majority of high- z individuals are not subsidized, and, because of the revenue tax τ , they face financial constraints that are more stringent than in the initial steady state.⁹ The subsidies prop up those with low productivity, who would have exited without the subsidy. This has two effects. First, the dispersion of $\tau_{m,i}$ is larger than in the initial steady state, as there is a fatter left tail in the $\tau_{m,i}$ distribution now. Second, because of the low- z entrepreneurs now remain active because of the subsidy (i.e., low $\tau_{m,i}$), the correlation between z_i and $\tau_{m,i}$ is now even more strongly positive than in the initial steady state. That is, the endogenous positive correlation between idiosyncratic distortions and z_i coming from the financial frictions is now further strengthened by the presence of subsidized low- z entrepreneurs with low $\tau_{m,i}$ who would exit without the subsidy.

4 Concluding Remarks

Rather than summarize our findings here, we refer the reader to the abstract and introduction. Instead, we conclude with some implications of our work for the design of industrial policies.

In our framework, the long-run negative effect of industrial policies is a consequence of policymakers' inability to adjust over time and to target the most productive entrepreneurs each period. An obvious implication of our result is that a design attribute of industrial policies should be some room for adjustment and re-optimization over time. In a similar spirit, Rodrik (2008) argues that industrial policies should be thought of more as a *process* rather than a fixed set of *rules*. The question is how this is best achieved in practice. Rodrik argues that industrial policies should be “embedded” within society, meaning that the government should maintain ties to the private sector that serve the purpose of continually renegotiating policies while at the same time updating the required information.

⁹Recall that from Proposition 1 the capital rental limit is increasing in z . With taxes, the relevant term in (2) is $(1 - \tau)z$: A higher τ means a tighter capital rental limit.

An alternative is to use policy instruments that are contingent on the productivity of entrepreneurs in each period. One example is provided by export promotion policies. These naturally target the most productive firms in any given period because only such firms will find it profitable to pay the fixed costs associated with exporting (Melitz, 2003).¹⁰ The successful industrial policies of Asian miracle economies share this orientation toward export—see Harrison and Rodríguez-Clare (2010) for references therein.

¹⁰One of the most common refrains against industrial policy is that governments cannot pick winners. In this sense, a subsidy contingent on exporting may be a way of automatically identifying most productive firms. In our model, subsidies to the most productive producers are justified on efficiency grounds, because these producers tend to be constrained the most by financial frictions.

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