The Role of Finance in the Process of Development: Improving Access versus Reducing Frictions

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Research Questions

- Which forms of alternative financial frictions really matter?
  - For example, should we expand microfinance, should we do asset transfer, should we do bank expansion, should we improve titling and debt collection?
- Which ones are more important and what are their inter-relationships (complements or substitutes)?
- Can GE effects via labour markets and occupational choice dominate standard PE effects?
  - The effects of some financial intervention programmes may be greater as in Bandiera et al (2017) as well as Papp and Imbert (2015)
  - Similarly, macro policies that raise wages by raising the outside options of entrepreneurs and improving their average quality may have an impact on resource allocation in the credit market.

Motivation

Huge and extensive literature on finance and development.

- What are the gains from the extension of financial services? Access
- What are the gains from reducing various kinds of financial frictions? For example, there is a large development literature that shows the consequences of credit market frictions - misallocation to poverty traps.
- What decisions are affected and how do credit contracts change?
- What are partial vs. general equilibrium effects?

Key issue we are interested in is how different imperfections interact (complements or substitutes):

1. poor **property rights**,
2. little **financial access**,
3. lack of **competition**.

$\rightarrow$ Effects could potentially be heterogenous depending on context.

Key Contribution

The key contribution of our paper is highlighting different channels through which credit access affects development and their relative roles

- Capital deepening – how to relax borrowing constraints.
- Financial inclusion - make credit available to those who are excluded from the credit.
- Misallocation – how better functioning capital markets would allocate capital to higher productivity entrepreneurs.
- General equilibrium effect – how labour markets are affected, in particular by raising labour demand and wages.
  - In our model this happens through higher labour demand increasing the wage rate, which in turn has a selection effect on who becomes an entrepreneur (in terms of wealth and productivity), and it further affects the functioning of credit markets through the outside option.

Key Contribution

- We look at three types of financial frictions:
  - Financial access – not everyone has access to banking services
  - Moral hazard due to limited wealth/collateral, exacerbated by frictions related to collateralizability of assets (as in de Soto).
  - Imperfect competition in the credit market.
- We find strong complementarity between different types financial frictions.
- Improving financial access helps unconditionally, though the marginal gains are more the lesser are the other frictions
- Therefore financial access is complementary with alleviating these other frictions
- For any given level of financial access, starting with bad financial markets (high levels of the both types of financial frictions), alleviating any one friction tends to have a large effect, but alleviating both does not have much more of an additional effect - i.e., no strong complementarity between competitiveness and improved collateralizability.

Key Mechanisms

- Increased capital market competition has two effects on firm capital: it increases capital access, and in general equilibrium it also increases wages.
- Since labour and capital are complementary in our setting the latter effect depresses capital usage.
- For some entrepreneurs this latter effect more than offsets the positive effect of increased capital access.

Key Mechanisms

- As wages rise, there is stronger selection of entrepreneurs from the pool of those who have higher ability which, in turn, leads the size distribution of firms to shift towards larger employers as capital-deepening takes place in the economy, resulting in higher wages.
- As the financial market access expands further, we get only a small fraction of the population running their own firms with the vast majority relying on supplying labour, but this is good for the workers as wages are higher.
- While this general equilibrium aspect of the analysis and the labour market channel is in line with the broad thrust of the recent macrodevelopment literature (see Buera et al 2015 for a review), our paper is distinguished by its effort to disentangle the effects of financial access, credit market frictions, and the degree of competition in the credit market.

Related Literature

- Older economic history literature
  - e.g. Geshenkron, Goldsmith
- Macro-implications of financial frictions literature
  - e.g. Banerjee-Newman, Galor-Zeira, Townsend et al, Buera et al, Moll
- Macro-regression based literature
  - e.g. Levine, Cihak et al
- Capital Misallocation literature
  - e.g. Hsieh-Klenow

Macro Implications of Financial Frictions: Literature

- Understanding quantitatively the macro impact of micro financial frictions.
- Types of Financial Frictions
  - Collateral constraint: Buera et al. (2020), Itskhoki and Moll (2019), Midrigan and Xu (2014), Moll (2014), Buera et al. (2011).
  - Fixed entry cost of using financial services (financial access): Ahrang (2011), Bruhn and Love (2014).
  - Multiple frictions: Dabla-Norris et al. (2020), Moll et al. (2017).
- Some common ingredients: heterogenous agent, occupation choice, firms facing common interest rate, competitive market, forward looking saving decision.

Macro Implications of Financial Frictions: Literature

- Ahrang Lee (2011) considers both the collateral constraint and a fixed cost to using financial services.
- Dabla-Norris, Ji, Townsend and Unsal (2020) might be the closest to our paper which considers three financial frictions: an entry cost for credit (as measure of financial inclusion), collateral constraint, as well as intermediation inefficiency. And they are able to deliver differential interactions of these frictions in partial equilibrium, which can be substitutes or complements on extensive or intensive margin.

Related Literature - Our Contribution

- In line with the broader research agenda of quantitatively understanding the macro impact of micro frictions, we consider multiple financial frictions and explicitly model the moral hazard problem in credit contract for heterogenous agents.
- Instead of parameterizing all financial frictions, we write down explicitly the credit contract with moral hazard.
- This allows us to generate equilibrium default, and heterogenous agents may face different net interest rates especially when lenders have market power (as opposed to the common interest rate among all agents in previous research).

Related Literature - Our Contribution

- Writing down explicitly the credit contract also allows us to explore the role of credit market competition in the effect of financial frictions on development, which generally assume competitive credit markets.
- Find that GE effects can be quite important and overturn some of the standard intuitions in the context of a standard financial contracting model in development that show strong wealth effects - main channels are labour demand, wages affecting outside options endogenously, and selection of pool of entrepreneurs
- One limitation of our paper is it is static and overall supply of capital is fixed and so the dynamic incentives and forward-looking savings decisions, which are featured in the common framework of previous research is absent here

This Paper

1.a Builds a specific model of financial frictions:
- moral hazard due to limited wealth/collateral,
- competition between borrowers can be limited,
- and financial access can be limited.

1.b Embeds this in general equilibrium model.

2. Quantitatively assesses the gains from financial reform.
- Explores how context matters and interdependence between frictions.

$\rightarrow$ Evaluating gains from removing one friction at a time likely misleading.

Model Overview

- Our starting point is the standard model of lending under *ex ante* moral hazard and limited liability as in Besley, Burchardi, and Ghatak (2012), which is also related to the model of tenancy in Banerjee, Gertler, and Ghatak (2002) and several other development applications.
- In the benchmark model - which we extend here - there is one lender and one borrower (entrepreneur).
- One major aspect of the extension is occupational choice - you can choose to be an entrepreneur or a worker who works in a firm created by the entrepreneur.

Model Set Up

- The economy is populated by a continuum of agents who are endowed with a unit of time which they supply as labour inelastically regardless of their occupation.
- All agents are risk neutral and each individual makes a discrete occupational choice, whether to become an entrepreneur and set up a firm, or to become an employee, i.e. work for a firm.
- The entrepreneur (borrower) supplies unobservable effort e and project outcome is $g(e;\theta)$ where θ is a measure of productivity.

Model Set Up

- We are agnostic about how $g(e;\theta)$ depends on θ:
  - More able entrepreneurs could potentially enhance the productivity of managerial input.
  - However, if high θ entrepreneurs use more complex technologies or spread themselves more thinly over larger firms, then all else equal, this could lower the probability of creating a successful firm.
- In our quantitative analysis we use

$$g(e;\theta) = \lambda \left[e/\theta^{\mu}\right]^{\alpha} \text{ with } \mu \geq 0.$$

- The parameter μ governs the dependence of the cost of managerial input on θ, i.e. the link between this and firm size.
- If $\mu = 0$, then the cost of securing a given level of default does not depend on firm size whereas $\mu > 0$ means that achieving the same default in a large firm requires more managerial input.

Model Set Up

- Every agent is characterized by (a, θ) where a is the capital they own (assumed liquid).
- Static model and everyone is risk neutral but borrowers have limited wealth but there is limited liability.
- Also, static model with no savings.
- Lending as an occupation is given exogenously and they are assumed to have unlimited supply of capital at opportunity cost $\gamma > 1$.

Model Set Up

- Conditional on success, output is $f(k, l; \theta)$ where k is the capital employed and l is wage labour employed.
- In our quantitative analysis we use the production function, $f(k, l; \theta)$ is Cobb-Douglas with diminishing returns:

$$f(k, l; \theta) = \theta^{1-\eta-\alpha} \left(l^{1-\beta} k^{\beta} \right)^{\eta}.$$

- Here θ is the firm specific productivity parameter and α, β,and η, all of them belonging to the interval $(0, 1)$, are parameters governing the shape of the production function.
- A classic Lucas-style "span of control" model η representing the extent of diminishing returns and pure profits can be thought of as payment to an untraded factor such as technology or ability.

Model Set Up

- If a project fails, the k has been sunk but workers l have not been hired yet, and the potential collateral value from liquidating the capital invested in the firm is $\delta(x+a)$.
- Let τ be the fraction of the liquidated value of the capital invested in the firm that the bank can seize as collateral which is one of the frictions that we study and so lenders receive $\tau\delta(x+a)$ in the event of a default.
- Let x be the loan size.
- The total capital invested in the project is $k := x + a$. If the project succeeds (with probability $g(e;\theta)$), the lender receives a gross *payment* of r (which means that the implied net interest rate is $\frac{r}{x} - 1$). If the project fails (with probability $1 - g(e;\theta)$) the lender captures c.

The Sequence of Activity

- There is an entrepreneur who hires some labour (referred to as managerial labour) in the first stage and chooses non-contractible effort e.
- All of physical capital k is also invested in the first stage (for which the loan plus own capital is used up).
- Unobservable effort e plus a shock (and ability θ) determines whether the "firm" is successful or not.
- If it is not, managerial workers are not paid, the entrepreneur gets nothing, lenders collect any collateral from the firm's capital.

The Sequence of Activity

- If the project succeeds then workers are hired in the second stage (if that stage comes, i.e., the project succeeds in the first stage) and they are paid deterministic wages, output is certain and from that everyone is paid – the managers, workers, and the lender, and the entrepreneur keeps the residual.
- Managerial labour is used by the entrepreneur to produce e but there is no moral hazard between entrepreneurs and managers.
- Managers are no different from ordinary labour and receive the same expected wage (they have to be paid a higher acutal wage as the firm could fail).

Potential Modification

Credit Contract

- A lender's expected profit when agreeing to lend to an entrepreneur with collateral c:

$$g\left(e;\theta\right)r+\left[1-g\left(e;\theta\right)\right]c-\gamma x.$$

- Lenders choose credit contracts (x,r,c) to maximise profits.
- Interest payment r paid in event of success (with probability $g\left(e;\theta\right)$).
- The opportunity cost per unit of capital for the lender is $\gamma\geq 1$.
- An entrepreneur's *ex ante* expected payoff:

$$g\left(e;\theta\right)\left(\pi(x+a;\theta,\mathbf{p})-r\right)+\left[1-g\left(e;\theta\right)\right](\delta\left(x+a\right)-c)-p_{m}e.$$

- An entrepreneur's *ex post* payoff is:

$$f\left(k,l^{*}(k;\theta,\mathbf{p});\theta\right)-p_{l}l^{*}(k;\theta,\mathbf{p})$$

- $\mathbf{p}\equiv(p_{l},p_{m})$ with p_{l} being the (certain) wage of workers at the second stage, and $p_{m}=\frac{p_{l}}{g(e;\theta)}$ is the stochastic wage of managerial workers.

Credit Contract

- Some standard effects of these class of models (as in Besley, Burchardi, and Ghatak, 2012)
  - Rent-extraction vs incentives trade off and so e is higher the higher is a and also the higher is the outside option, as the lender has to give up more rents and it is best to give it up as lower interest as that relaxes the incentive constraint (IC).
  - Collateral is set at the highest possible level $\tau\delta\left(x+a\right)$.
  - With competitive credit markets (high outside options) and/or high levels of a one could get the first-best.
  - With monopolistic credit markets and/or low levels of a the participation constraint may not bind (efficiency utililty).

Competition, Outside Option and Entrepreneur Payoff

- The final part of the partial equilibrium analysis is to determine the entrepreneur's outside option endogenously.
- This will be the maximum of (i) what she can obtain by borrowing from another lender $\hat{u}$; (ii) self-financing $V^{self}(a, \theta, \mathbf{p})$; (iii) working as wage laborer $p_l + \gamma a$.
- Let the second-best total surplus be defined as:

$$\hat{S} = g(e;\theta)\,\pi(k;\theta,\mathbf{p}) + [1 - g(e;\theta)]\,\delta k - \gamma k - p_m e.$$

- Let $\hat{u}(\phi;\theta,\mathbf{p})$ be defined by:

$$\phi \cdot \hat{S}(\hat{u};\theta,\mathbf{p}) = \hat{u}(\phi;\theta,\mathbf{p}).$$

- This implicitly defines the equilibrium payoff of an entrepreneur if the only outside option is to receives a share ϕ of the surplus in a lending relationship.
- ϕ is the second friction that we consider in addition to τ.

Competition, Outside Option and Entrepreneur Payoff

- We show that the entrepreneur's expected payoff increases with more competition (ϕ) and greater wealth (a).
- We argue that the effect of productivity (θ) on entrepreneur's expected profit is indeterminate (examples of functional forms can be constructed for either direction).
- The reason is, increasing productivity has competing effects which explains the ambiguous effect on total surplus.
- On the one hand, profits are higher as firms are more productive but the effect on the repayment probability is ambiguous since the cost of managerial input is larger in larger firms.

Optimal Contract in Partial Equilibrium

- Lender maximizes profits subject to participation constraint and incentive constraint on managerial inputs.
  - $\rightarrow$ Determines the equilibrium default probability and capital allocation.
- Optimal contract satisfies:

$$\begin{aligned} g_e(e;\theta)\left[\pi(k;\theta,\mathbf{p}) - \delta k\right] &= \left[1 + g(e;\theta)\epsilon(e,\theta)\left(1+\lambda(a,\theta)\right)\right]p_m \\ g(e;\theta)\left[\pi_k(k;\theta,\mathbf{p}) - \delta\right] &= \gamma - \left[\tau - \lambda(a,\theta)(1-\tau)\right]\delta \end{aligned}$$

where $\lambda(a,\theta)$ is Lagrange multiplier on the participation constraint which equals zero if the participation constraint is not binding and $\epsilon(e,\theta) := -\frac{g_{ee}(e;\theta)}{(g_e(e;\theta))^2}$.

- Competition and assets enter indirectly through $\lambda(a,\theta)$.
  - Participation constraint may not bind if assets/outside option are low.
  - Competition has real effects due to moral hazard.

Optimal Contract in Partial Equilibrium

- We show that the optimal lending contract is characterized as follows: there exist $\underline{u}(\theta;\mathbf{p}), \overline{u}(\theta;\mathbf{p})$ such that
  - For low level of outside option $u(\theta;\mathbf{p}) < \underline{u}(\theta;\mathbf{p})$ (for which the participation constraint is slack), optimal managerial input $e^* = e_0(\theta;\mathbf{p})$ and capital level $k^* = k_0(\theta;\mathbf{p})$.
  - For medium level of outside option $u(\theta;\mathbf{p}) \in [\underline{u}(\theta;\mathbf{p}), \overline{u}(\theta;\mathbf{p})]$ (for which the participation constraint binds), optimal managerial input and capital level are increasing functions of $u(\theta;\mathbf{p})$: $e^* = \xi(u,\theta;\mathbf{p})$, $k^* = \varsigma(u,\theta;\mathbf{p})$.
  - For high level of outside option $u(\theta;\mathbf{p}) > \overline{u}(\theta;\mathbf{p})$, optimal managerial input and capital level achieves first best: $e^* = e_{FB}(\theta;\mathbf{p})$, $k^* = k_{FB}(\theta;\mathbf{p})$.

Financial Access and Occupational Choice

- Financial market access
  - A fraction $z(a,\theta) \in [0,1]$ of agents of type (a,θ) has access to financial markets.
  - Total financial inclusion in the economy is defined by

$$\bar{\chi} \equiv \int \int z(a,\theta)\, h(a,\theta)\, da\, d\theta.$$

- Individual decides whether to start a firm or work as an employee.
  - If she has credit market access, then she will be an entrepreneur if lender's expected profits $\hat{\Pi}(u(a,\theta,\mathbf{p}),a,\theta,\mathbf{p}) \geq 0$; or become a self-financed entrepreneur if $V^{self}(a,\theta,\mathbf{p}) \geq p_I + \gamma a$.
  - If she does not have credit market access, then she will be a self-financed entrepreneur iff $V^{self}(a,\theta,\mathbf{p}) \geq p_I + \gamma a$.

General Equilibrium

- Takes $\{\tau, \phi, z(\cdot), h(\cdot)\}$ as given.
- Find equilibrium prices that that
  - there are equal payoffs to being worker or manager,
  - wages clear the labor market.
- Determines
  - the terms of credit market contracts,
  - profits,
  - who becomes an entrepreneur,
  - endogenous defaults,
  - endogenous firm-size distribution.
- We explore how these vary with underlying fundamentals, in particular complementarities between $\tau, \phi, z(\cdot)$ for aggregate outcomes.

Production: Cobb-Douglas with diminishing returns:

$$f(k, l; \theta) = \theta^{1-\eta-\alpha} \left(l^{1-\beta} k^{\beta} \right)^{\eta} \quad (1)$$

$$g(e; \theta) = \lambda \left[e/\theta^{\mu} \right]^{\alpha} \text{ with } \mu \geq 0. \quad (2)$$

Calibration:

- We set $\beta = 1/3$, $\gamma = 1.02$, $\eta = 3/4$, $\lambda = 1.05$, $\delta = 0.711$.
- Remaining parameters (α, μ, marginal θ distribution) are chosen jointly such that model matches US data, assuming that this is an example of "perfectly" functioning credit markets (assets do not matter). Target firm size distribution and default probabilities across firm sizes. Normalize US wage to be one.

Target:

- Target default probability of SMEs of 10.5% and large firms of 6.2%.
- Firm size is well approximated by a (upper truncated) Pareto distribution, with shape parameter $\sigma_l = 1.059$ (Axtell, 2001). Assume the same is true for set of (unobserved) potential firms.

Intuition:

- α and μ predict pattern of corporate default rates across firm sizes, conditional on the distribution of θ.
- Distribution of θ predicts firm size distribution, conditional on (α, μ). Choose $\underline{\theta}$ to clear labour market, i.e. solve $L^S(\mathbf{p}) = L^D(\mathbf{p})$ at $p_l = 1$.

Parametrization and Calibration

Distribution of Wealth

- Choose the marginal distribution of assets to approximate the wealth distribution in India.
  - Uses Global Wealth Report 2015 (Credit Suisse, 2015).
  - Fraction of the population in four wealth classes: 0-10k, 10k-100k, 100k-1m and over 10m USD.
  - Median wealth in India is 1.75% of median wealth in the US, and the mean wealth is 1.24% of mean wealth in the US.
  - Assume wealth distribution is of Pareto family.
- Can specify a pattern of dependency between a and θ as a copula. In what follows set correlation to 0.

Parametrization and Calibration

Summary

Parameter	Value	Source
β	0.333	standard
η	0.750	Bloom (2009)
δ	0.711	Federal Reserve Board (2017)
γ	1.02	Yi and Zhang (2016)
α	0.028	*calibration*
μ	0.699	*calibration*
$h_\theta()$	...	*calibration*
$h_\alpha()$	...	Global Wealth Report (2015)
ρ	$\rightarrow$ consider range of values (Baseline: 0.0)	
λ	1.05/1.00	Bloom and Van Reenen (2010)
τ	$\rightarrow$ consider range of values (Baseline: 1.0)	
ϕ	$\rightarrow$ consider range of values (Baseline: 1.0)	
$z(a, \theta)$	$\rightarrow$ consider range of values (Baseline: 1.0)	

Simulation

Approximate distribution of a and θ by a distribution with 1000 and 5000 discrete values at percentiles of marginal distributions.

Results:

- Credit Contracts across ϕ and τ:
  - interest rates,
  - default rates,
  - amount borrowed.
- General Equilibrium across ϕ ,τ, $z(\cdot)$:
  - wages,
  - occupational structure,
  - size distribution of firms,
  - sharing of surplus.

Credit Contracts and Firm Outcomes

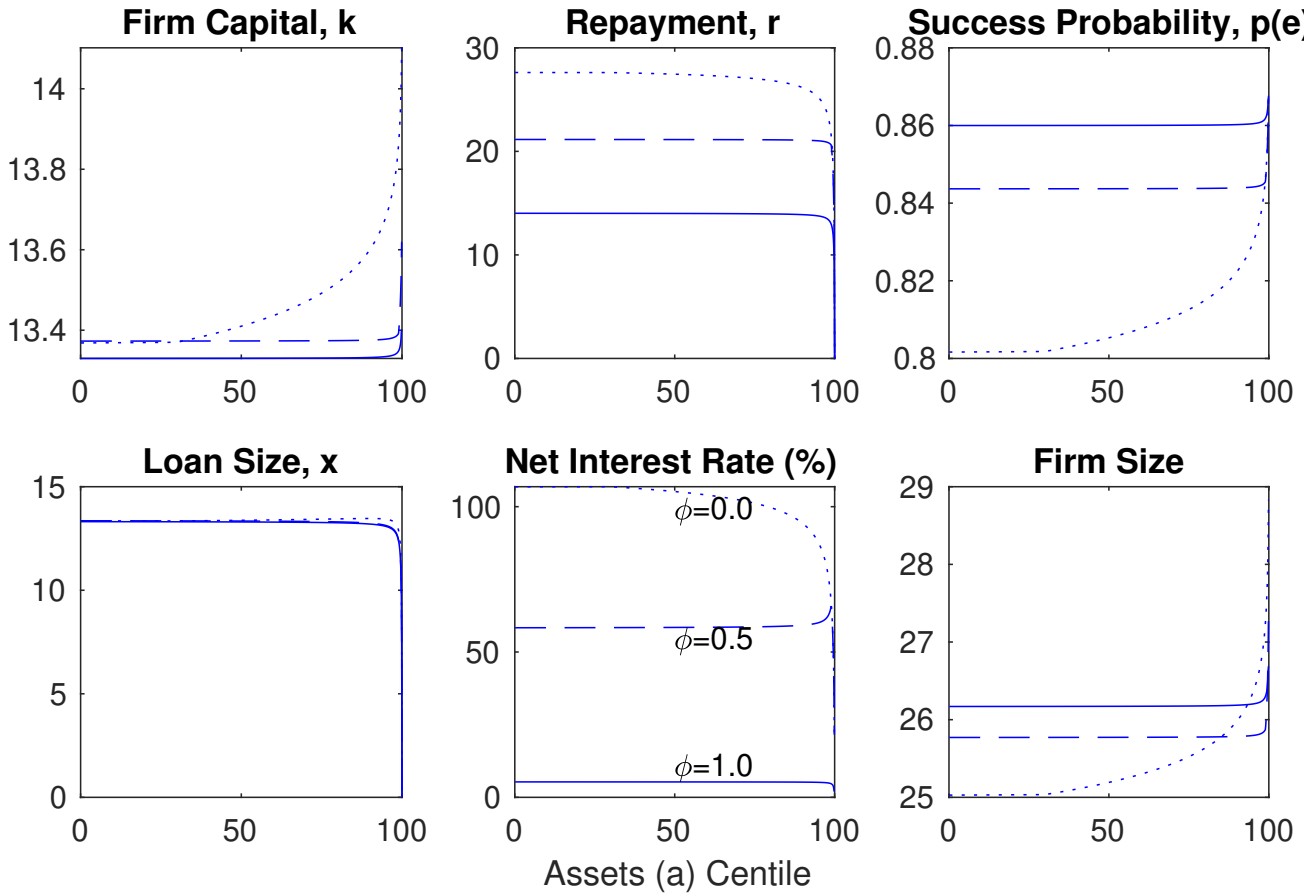


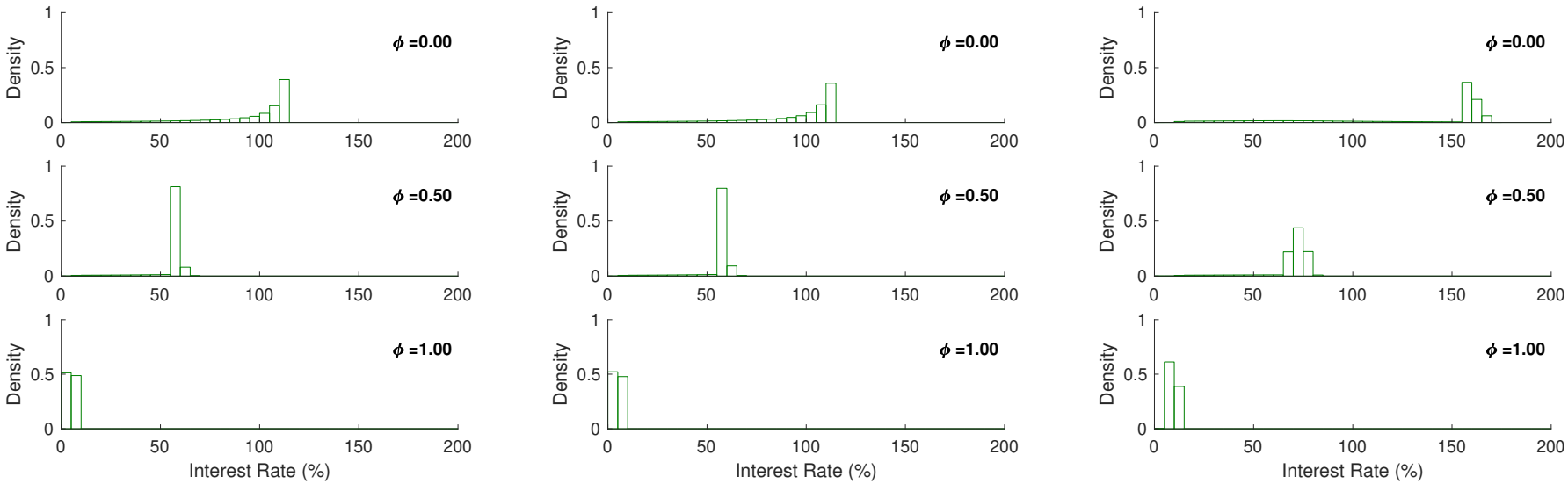
Figure 1 (A) (Panel B, C, D are in the appendix)

We assume $\tau = 1$, $\rho = 0$, and consider the 99.5th percentile of the productivity (θ) distribution. Panel B Panel C Panel D

Credit Contracts and Firm Outcomes: Result

- The default rates implied by the model are around 15% across the wealth distribution. Competition does have real effects since default is lower when there is more competition.
- The effect of competition on firm capital is non-monotonic for many wealth levels. Increased capital market competition has two effects on firm capital: it increases capital access, and in general equilibrium it also increases wages. Since labour and capital are complementary in our setting the latter effect depresses capital usage.
- The repayment level varies with the wealth level. High wealth entrepreneurs tend to be offered low interest rates. It varies quite a bit with competition, reflecting the division of surplus between the lenders and entrepreneurs.

Interest Rate Distribution



(a) Baseline (b) Corr(a,θ)= 0.3 (c) $\tau = 0.5$

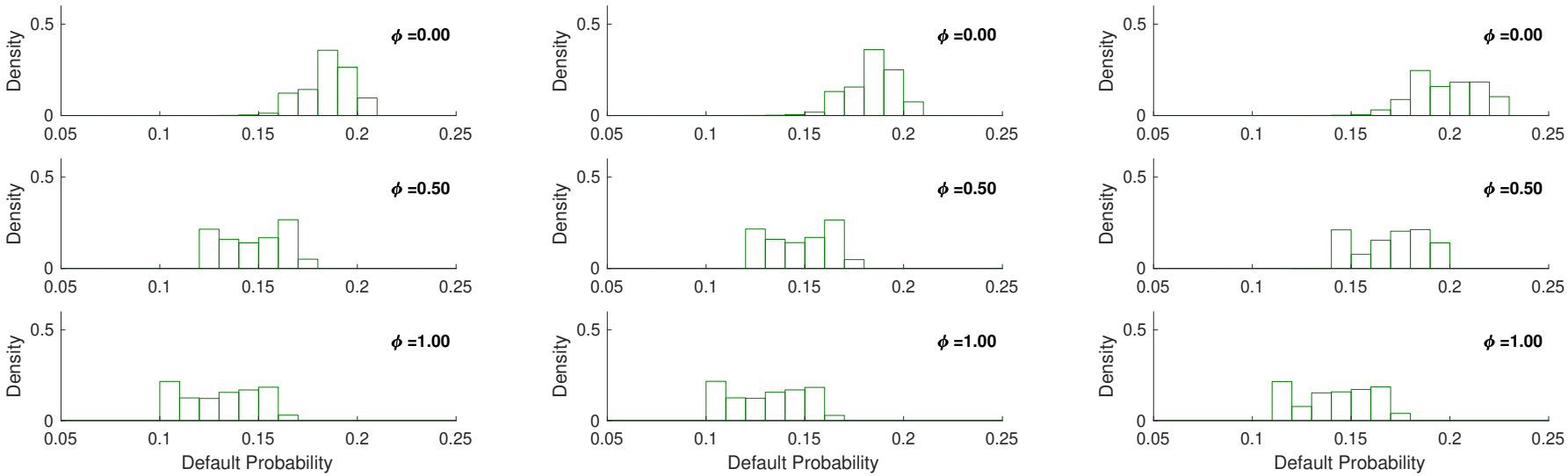
Figure 2: Interest Rate Distribution

In the baseline case, presented in figure (a), we assume $\tau = 1$ (perfect enforceability), no correlation between assets and productivity. Throughout we consider the 99.5th percentile of the productivity (θ) distribution.

Interest Rate Distribution: Result

- This figure looks at the distribution of interest rates across types of borrowers for different levels of competition.
- When competition is very high then there is no variation in interest rates at all. The spread of interest rates on offer starts to increase as competition is reduced.
- The effect of a lower τ is visible with higher, and more dispersed interest rates, especially with low credit market competition. This partly reflects that lower collateralizability of wealth leads to higher default rates, and partly that lenders with market power extract surplus through higher interest rates rather than collateral.

Default Probability Distribution



(a) Baseline (b) Corr(a,θ)= 0.3 (c) $\tau = 0.5$

Figure 3: Distribution of Default Probability

In the baseline case, presented in figure (a), we assume $\tau = 1$ (perfect enforceability), no correlation between assets and productivity. Throughout we consider the 99.5th percentile of the productivity (θ) distribution.

Distribution of Default Probability: Result

- This figure looks at the distribution of the credit market distortion across borrower types.
- When competition is highest, default probabilities are lowest but heterogeneous, with higher wealth borrowers having lower default probabilities.
- As competition is reduced, the distribution shifts to the right (higher default) as lenders increase the repayment burden r and firm capital k decreases for a broad range of borrowers, both triggering lower levels of managerial effort.
- Default rates are increasing with decreases in τ as the effective collateral value decreases and hence material effort decreases. This effect is – at least in partial equilibrium – amplified by the responses of the lender namely to increase r and decrease k.

Aggregate Implications

Wages

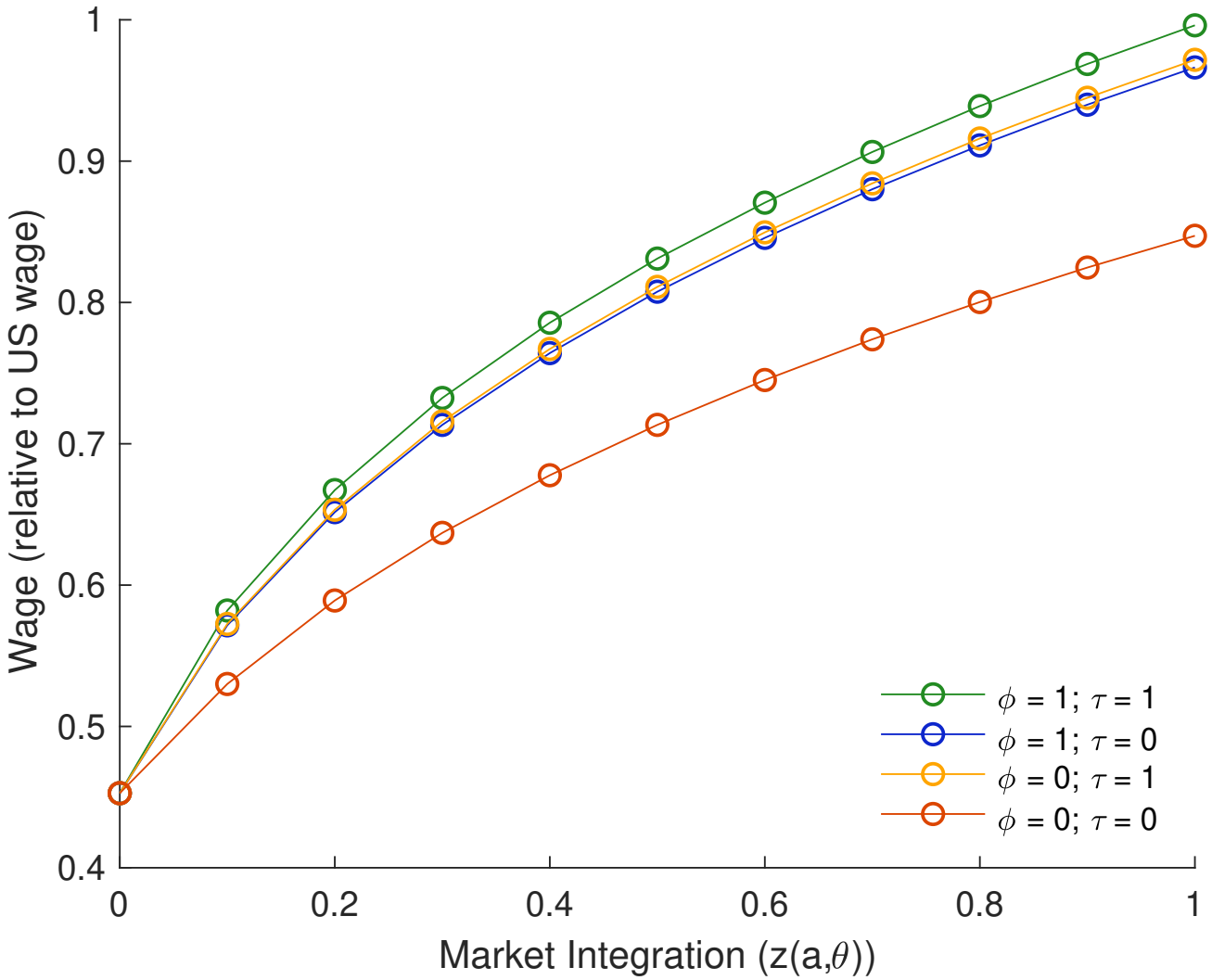


Figure 5 (A)

Aggregate Implication: Wages Result

- This figure shows the aggregate outcome of wage as a fraction of the US wage moving from Autarky through to full credit market access.
- Wage moves from around 40% of the US wage in autarky to over 90% when there is full credit market access.
- Financial access has a larger impact the lower are the other two frictions.
- Also, for the same level of financial access large gains from getting rid of any one of the two other frictions (lack of competition or imperfect collateralizability of wealth) starting from situation when both frictions are large.
- However, limited gains otherwise - not complementary

Aggregate Implications

Entrepreneurship

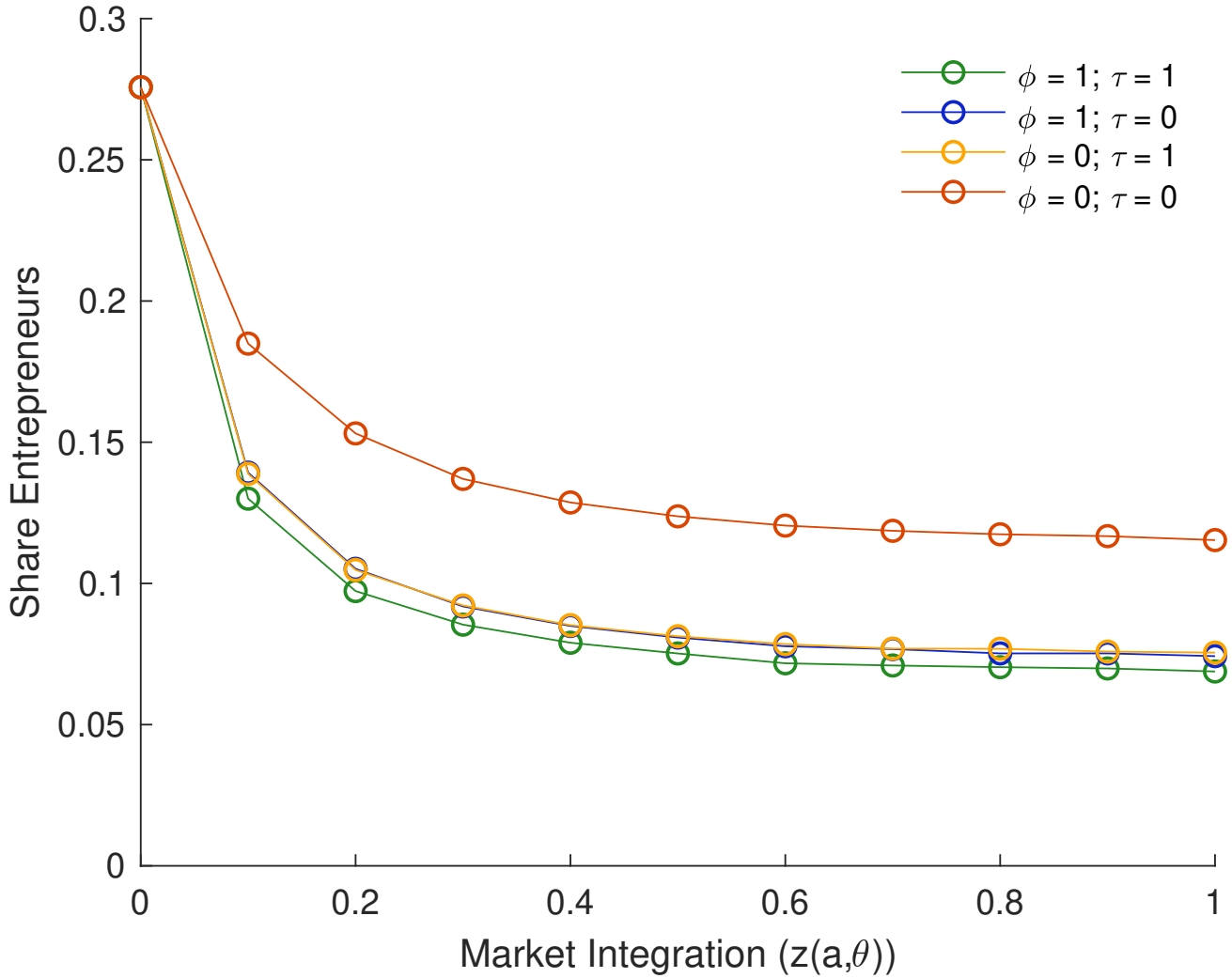


Figure 5 (B)

Aggregate Implication: Entrepreneurship Result

- This figure shows the aggregate outcome of the fraction of the population that become entrepreneurs moving form Autarky through to full credit market access.
- The proportion of entrepreneur is around 27% in autarky. However, it falls rapidly as credit market access expands and then levels off from around 40% access at a little above 7%.
- Individuals are driven out of self-employment by the increasing wage which makes becoming a wage labourer more attractive and squeezes the profits of marginal entrepreneurs.

Aggregate Implications

Aggregate Capital

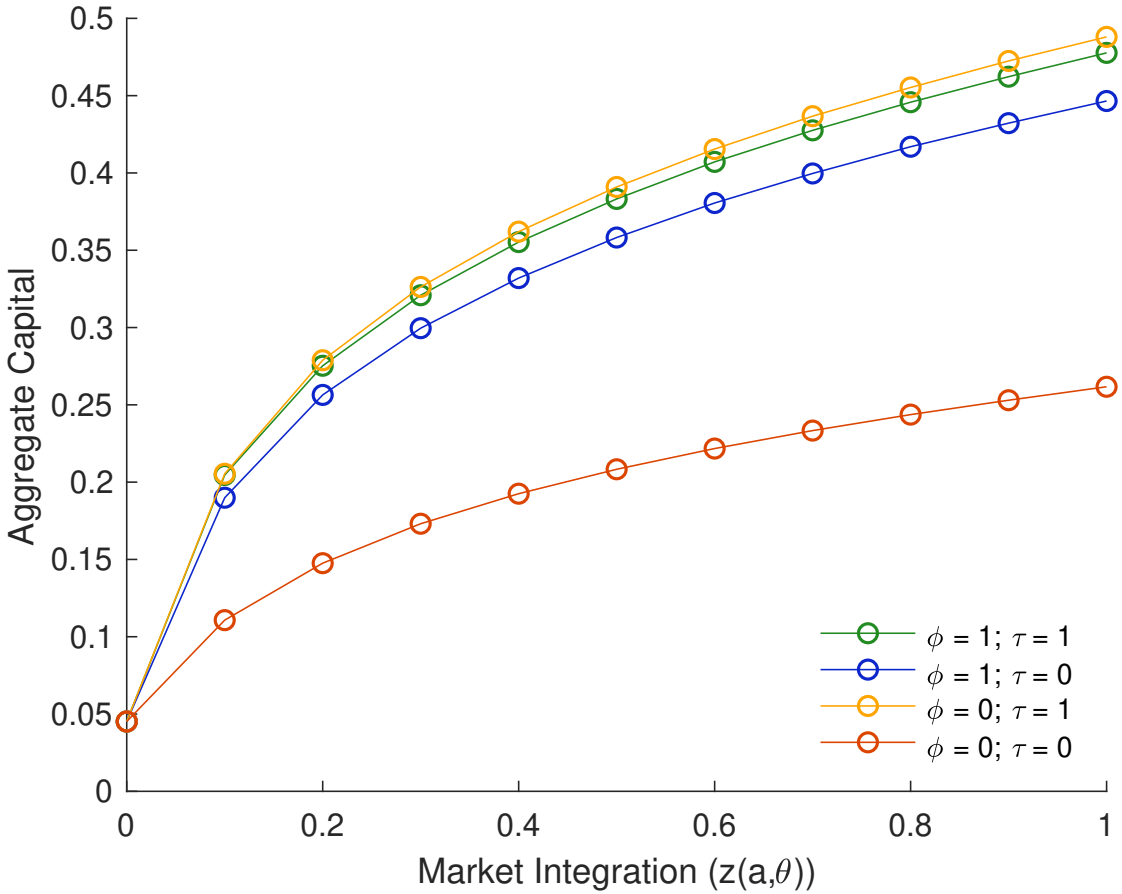


Figure 5 (C)

appendix

Aggregate Implications

Aggregate Capital

- Capital, output and surplus are all measured in units of the value of 1 year of labour income per worker in the US under the first best.
- We calculate capital for each (a, θ) tuple and then average across them using the population shares of the (a, θ) tuples as weights.
- As we have a population of size 1, the aggregate capital is obviously the same as the average.

Aggregate Implications

Output

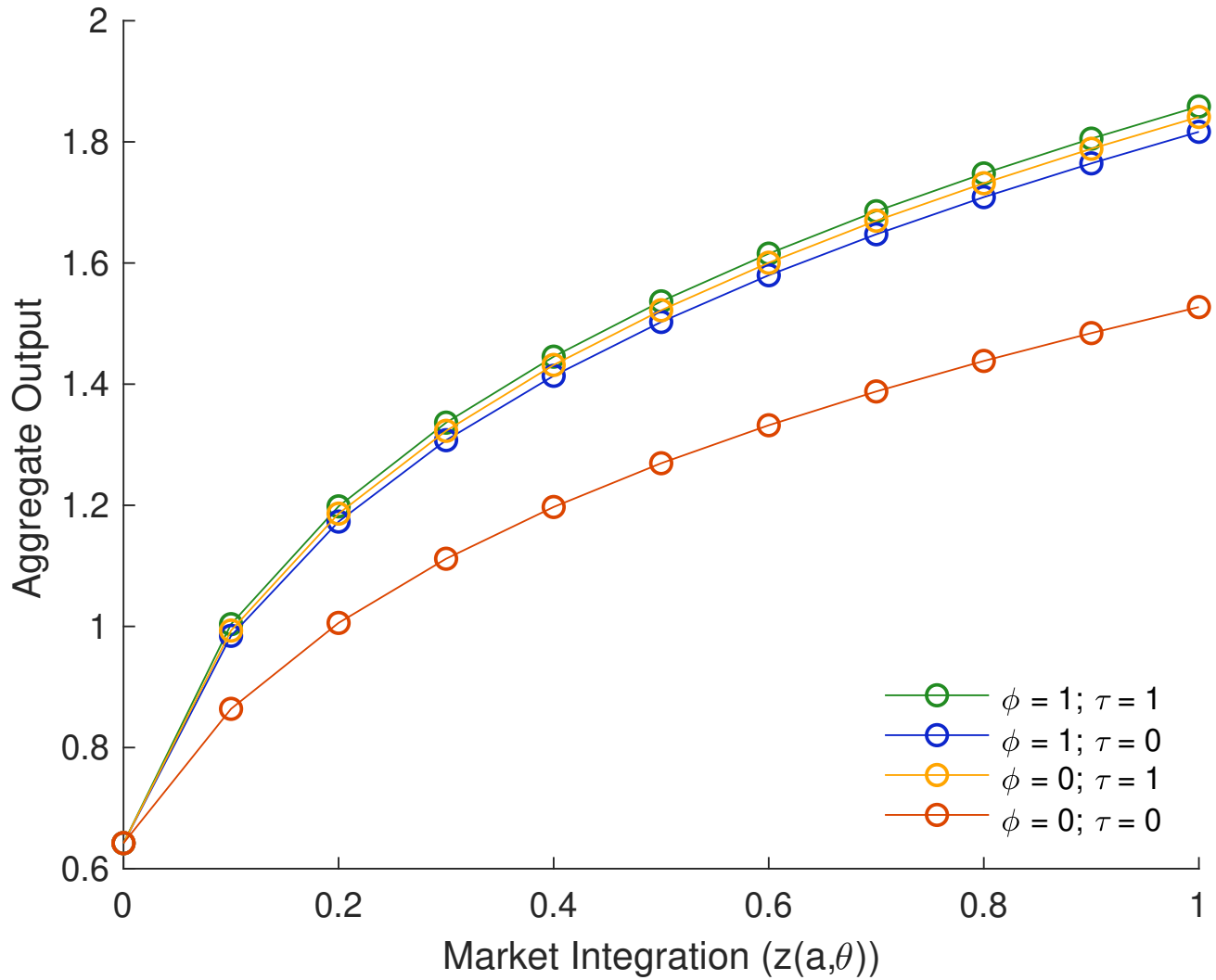


Figure 5 (D)

Aggregate Implications

Surplus

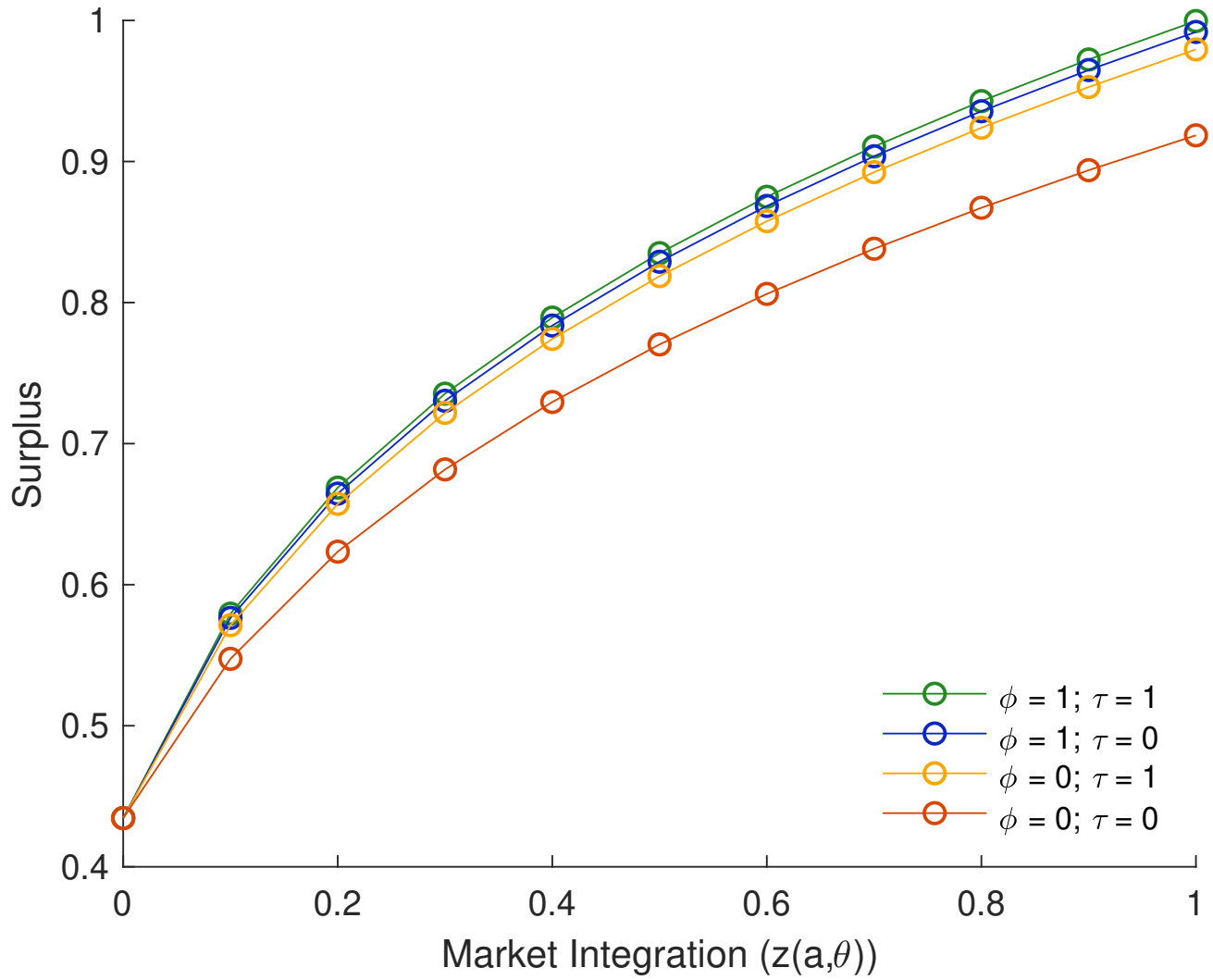


Figure 5 (E)

Aggregate Implications

Misallocation

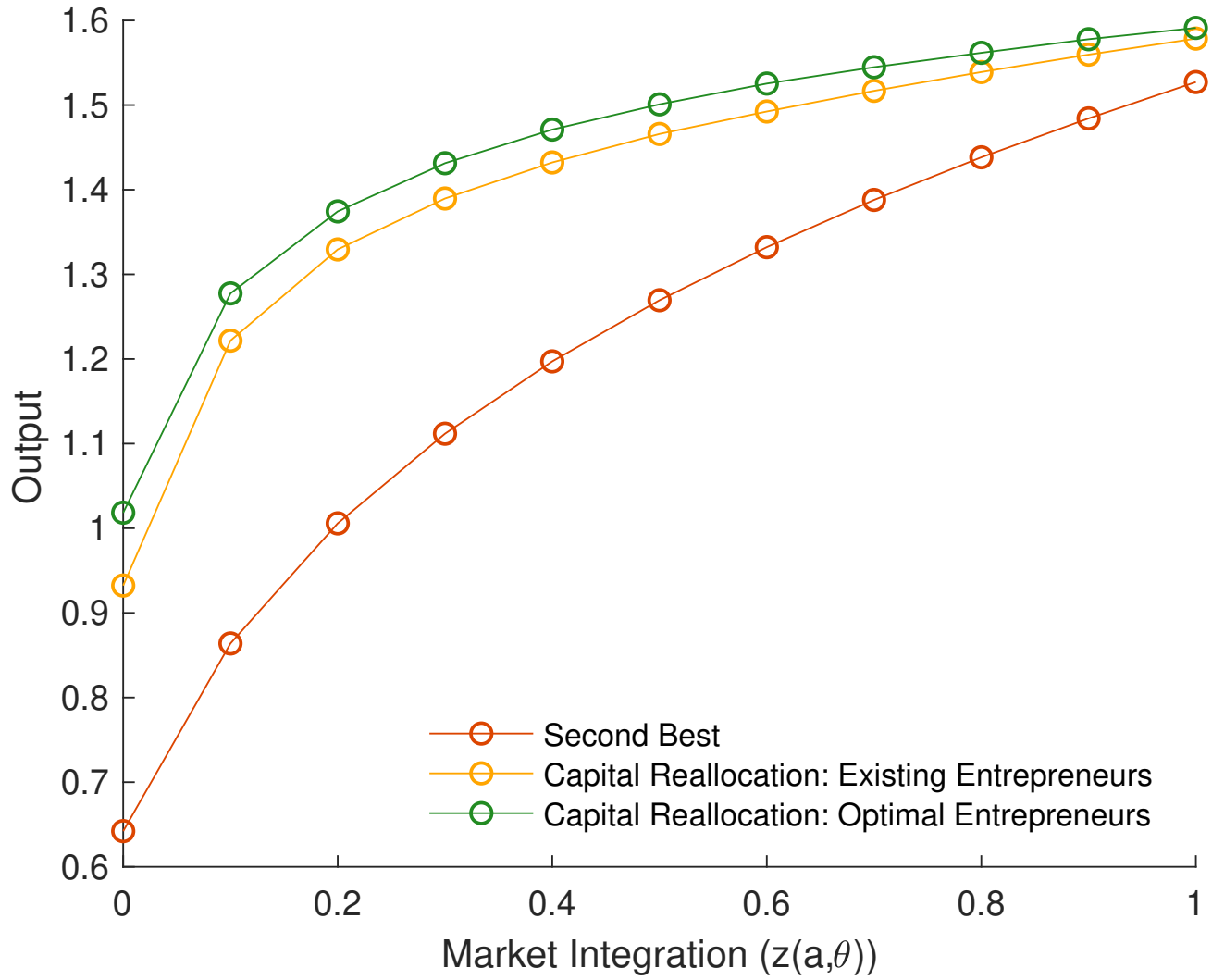


Figure 5 (F)

Aggregate Implications

Misallocation

- This figure presents the total output across different levels of market access (keeping constant τ and ϕ both at 0) across three scenarios: (i) second-best; (ii) reallocating optimally the aggregate capital stock found in second best, but keep occupational choice constant; (iii) reallocating optimally the aggregate capital stock found in second best, letting occupational choice adjust.
- This is expected output, i.e., $g(e) * f(.) + (1 - g(e)) * \delta * k$.
- And again we average across all (a, θ) pairs using their density as weights.

Aggregate Implications

TFP

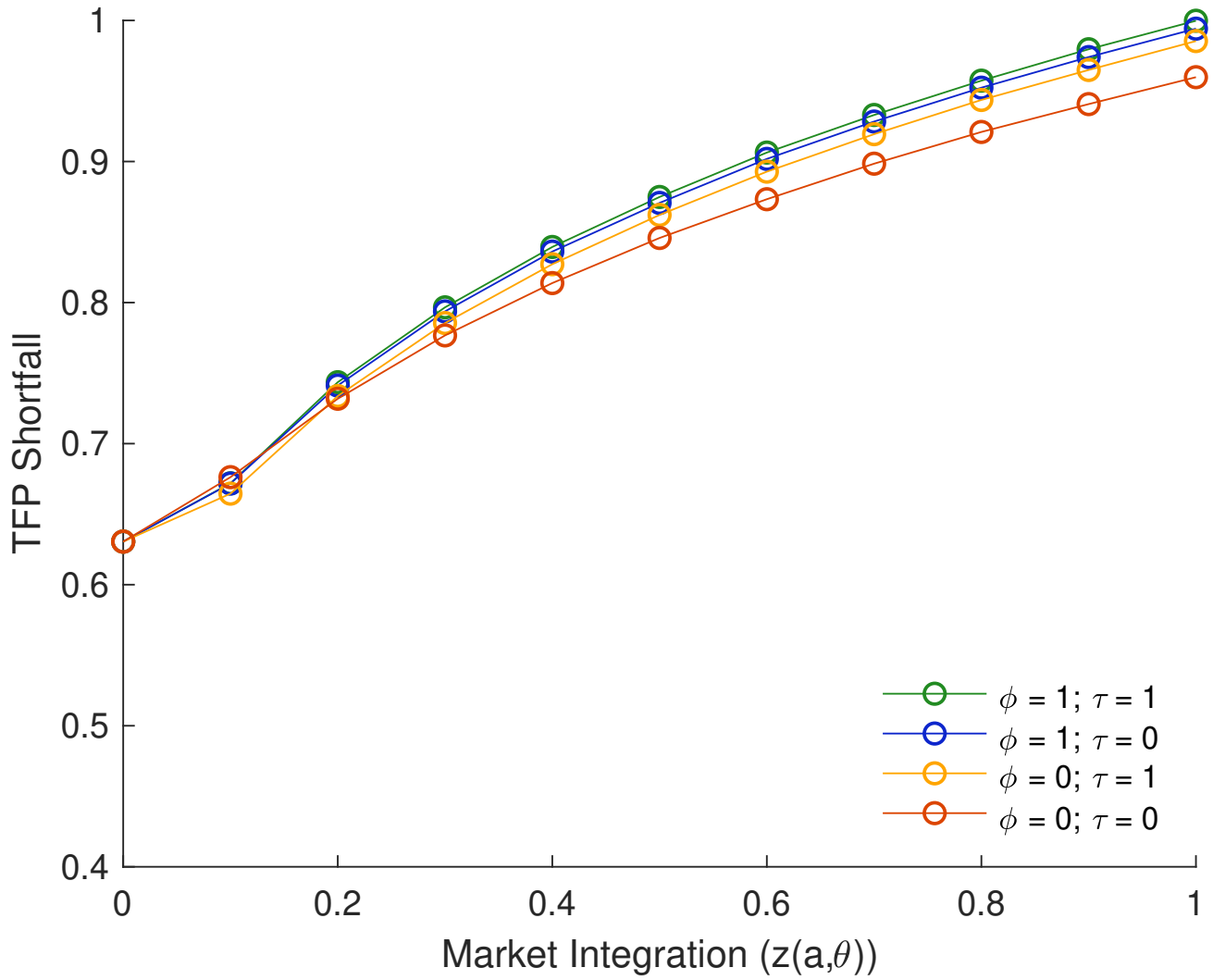


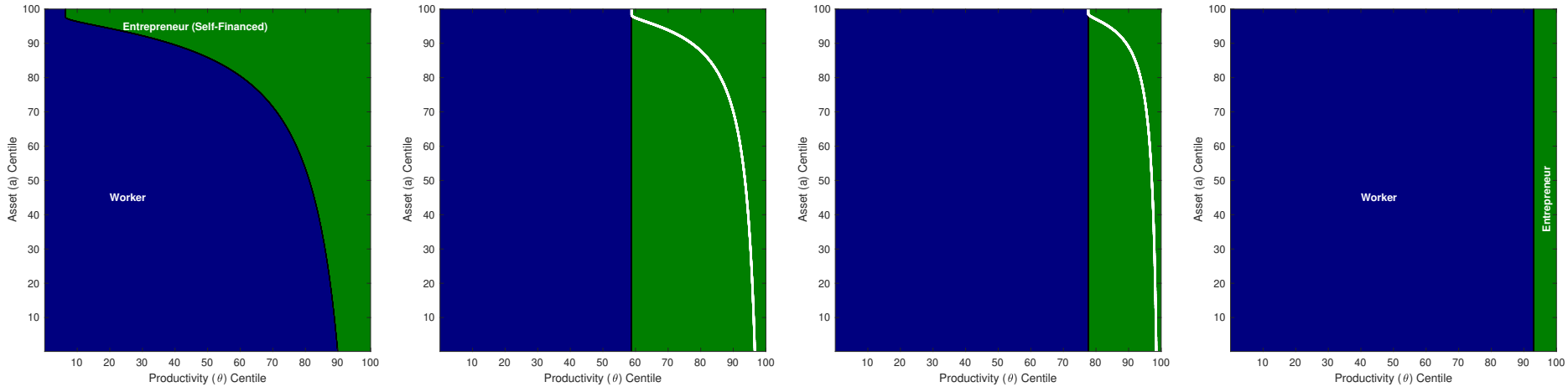
Figure 5(G)

Aggregate Implications

TFP

This is the expected output [defined above] in case total $\overline{k}$ is allocated efficiently (letting occupational choice adjust) over expected output in second best, where $\overline{k}$ is the aggregate capital in second-best.

Occupational Choice



(a) Autarky (b) $z(a, \theta) = 0.10$ (c) $z(a, \theta) = 0.25$ (d) First Best

Figure 6: Occupational Choice

Occupation Choice: Result

- This figure looks at the occupational choice at all points in the (a, θ) distribution. The blue shaded area illustrates the space in which individuals choose to be workers and the green shaded area where they choose to be entrepreneurs.
- Almost all of the entrepreneurs choose to borrow. However, those with very high wealth choose to self-finance. The low wealth and low productivity individuals are all workers.
- As credit market access expands, there are fewer entrepreneurs. Even with very limited access, there is switch away from low-productivity high wealth individuals choosing to become entrepreneurs. Hence, the selection effect is quite powerful.

Division of Surplus across Levels of Competitiveness

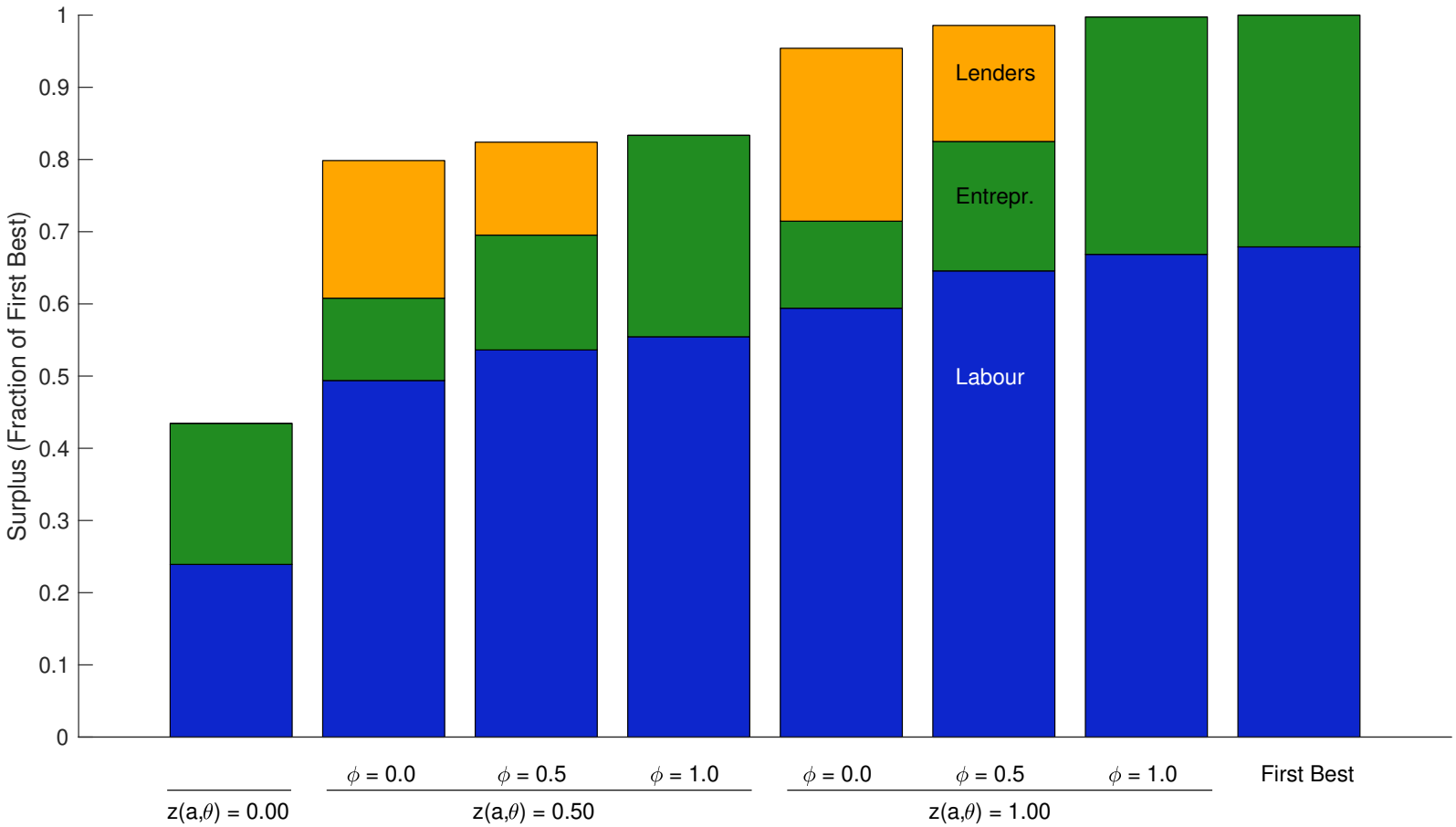


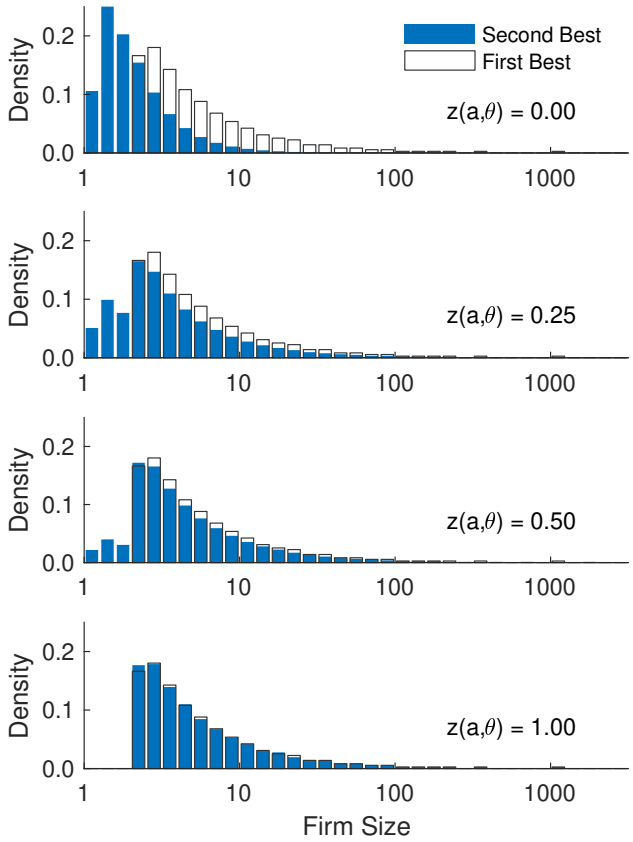
Figure 7: Distribution of Surplus across Levels of Competitiveness

Throughout we assume $\tau = 0.5$ and $\rho = 0$.

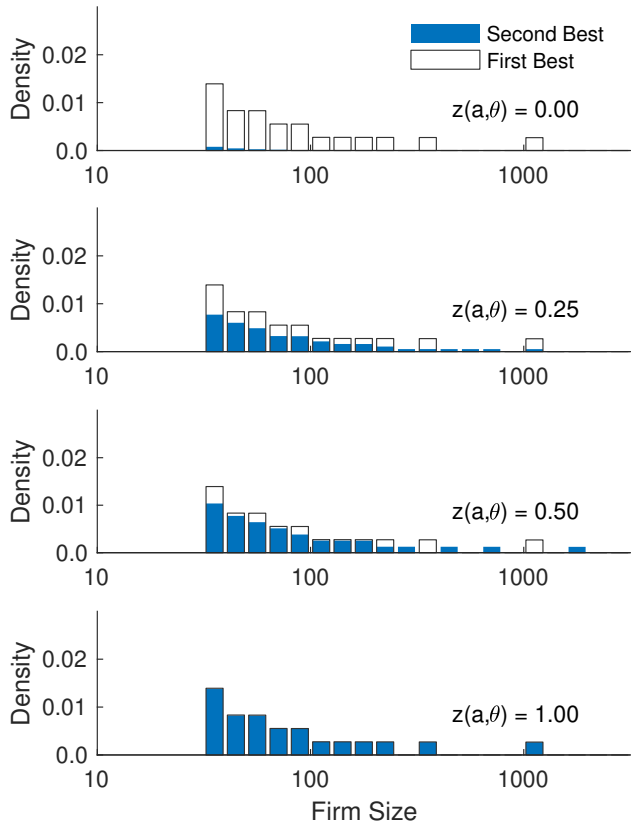
Division of Surplus: Result

- This figure looks at the division of income between labourers, lenders and entrepreneurs. The size of the columns in the figure illustrates the level of income as a fraction of US income.
- In autarky, less than half of the national income is in the form of entrepreneurial profits.
- With 50 % market access and low competition, most of the gains from credit markets are appropriated by lenders and entrepreneurial profits are squeezed relative to autarky. The main effect of increasing competition is to redistribute surplus between lenders and entrepreneurs.
- A similar pattern of surplus redistribution is found for the case of full credit market access.

Firm Size Distribution



(a) Full Distribution



(b) Upper Tail of Distribution

Figure 8: Distribution of Firm Sizes

We assume $\tau = 1$, $\phi = 1$ and $\rho = 0$.

Firm Size Distribution: Result

- This figure looks at the distribution of firm size, with variations in market access for four values varying from autarky to full access.
- Comparing autarky to the first best, we find a very clear shift in the distribution towards small firms. This lack of labour demand is what keeps the wage low.
- However, as credit market access varies, the deviation from the "first best" distribution of firm size diminishes. By the time of full credit market access, the first best is very similar to distribution generated by second-best credit markets.

Relative Income Gains from Autarky to Credit Market Access: No Competition

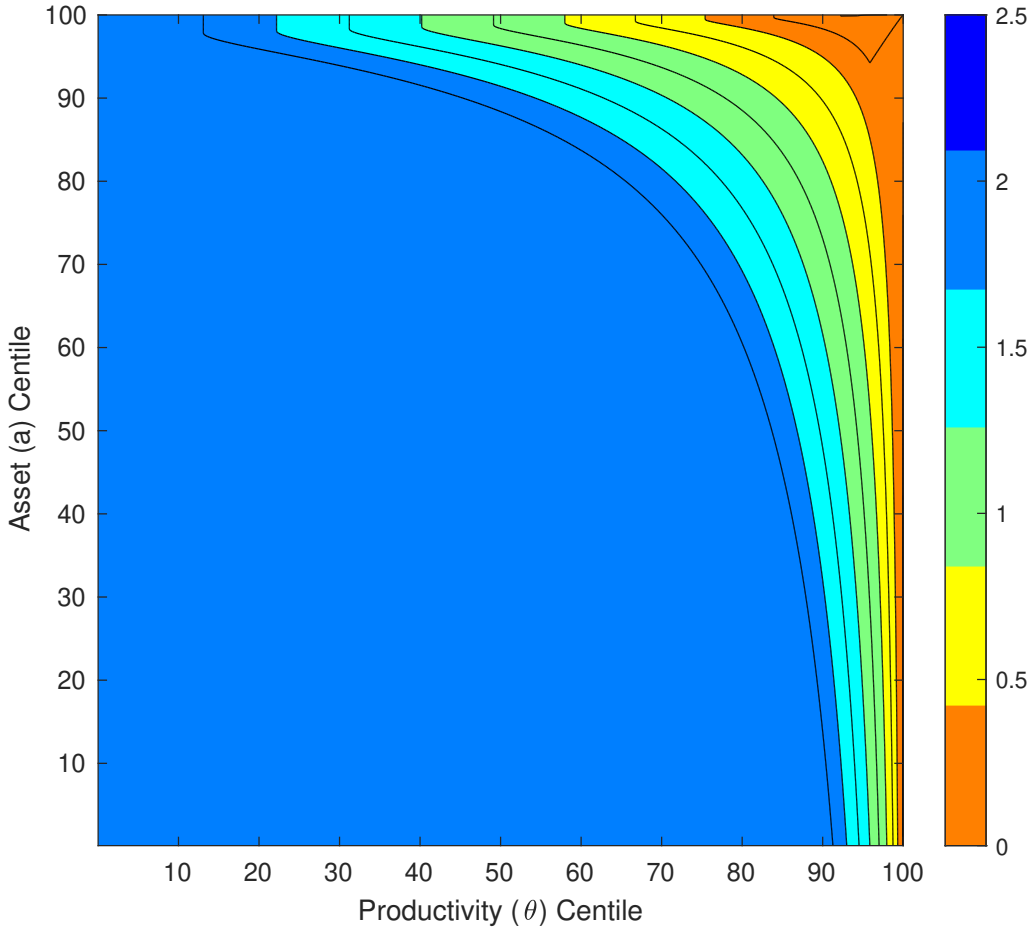


Figure 9 (A)

Assume $\tau = 1$ and $\rho = 0$.

Relative Income Gains from Autarky to Credit Market Access: Full Competition (Winzorised)

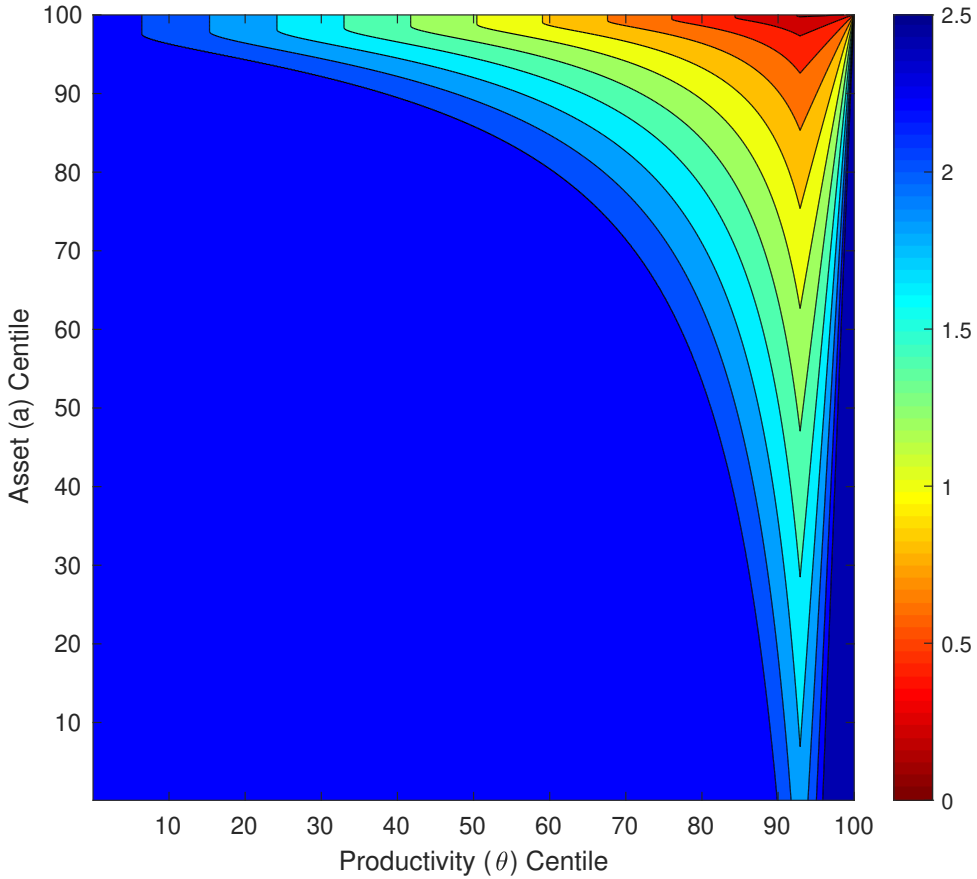


Figure 9 (B)

Assume $\tau = 1$ and $\rho = 0$.

Relative Income Gains from Autarky to Credit Market Access: Result

- This figure looks at how the gains from participation in credit markets is distributed across the population.
- The gains and losses of credit markets, relative to autarky, are highly heterogeneous: distributional outcomes are largely driven by general equilibrium effects on wages.
- Those who are workers in autarky are all better off with the possibility of trading in credit markets.

Relative Income Gains from Autarky to Credit Market Access: Result

- Among those who were entrepreneurs in autarky, a large fraction also lose from the introduction of credit markets due to rising wages. These losses are concentrated amongst entrepreneurs with higher level of wealth, holding θ constant.
- In the absence of competition, all of the most productive entrepreneurs lose relative to autarchy, since the increase in wages is not compensated by better credit access.

Relative Income Gains from Autarchy to "Good" Finance

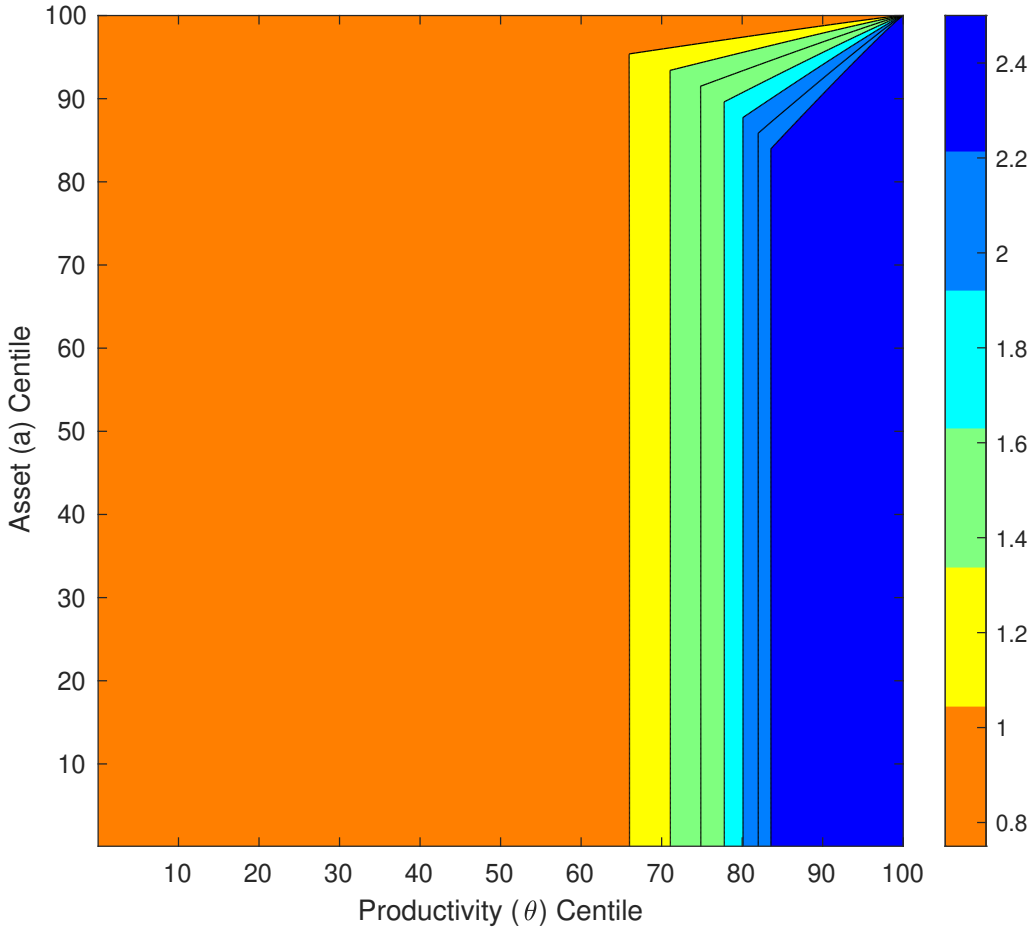


Figure 9 (C)

Relative Income Gains from Autarchy to "Good" Finance

- This figure shows for each individual in the (theta, a) space how their income when getting access to "good" finance ($\tau = 1$, $\phi = 1$) relates to their income not having access, starting from a baseline where only 10% have access to finance.
- This is the partial equilibrium exercise, where we abstract from general equilibrium wage effects. The yellow area are people who are equally well off, either because they continue to be wage labourers [basically everybody left of some theta-threshold], or because they already were well-financed at baseline (a couple of guys with high assets and (relatively) low theta.

Relative Income Gains from Autarchy to "Good" Finance

- At least two things can be seen: (i) few people will actually take up the credit contract; the large majority continues to be wage labourers; (ii) amongst those who take up finance we have strongly heterogeneous effects [notice: we cap the relative income gain at 2.5, there are a few for whom it's much higher].
- The expected income from the project takes into account any opportunity cost of capital put into the business by the entrepreneur [but not any income from remaining assets, if any]; and it's the wage for labour [not taking into account any income from a]. So it's the income deviation relative to what anybody would have if their only income was $\gamma * a$

Summary of Key Findings - I

- Increased capital market competition has two effects on firm capital: it increases capital access, and in general equilibrium it also increases wages.
- Since labour and capital are complementary in our setting the latter effect depresses capital usage.
- For some entrepreneurs this latter effect more than offsets the positive effect of increases capital access.
- For entrepreneurs with high wealth levels the increased capital market competition does not lead to substantially improved credit access, and the positive effect of credit market competition on wages depresses capital usage.

Summary of Key Findings - II

- With optimal second best credit contracts, wealth does not have a strong quantitative effect on the allocation of resources over a wide range of wealth levels. This is because, in a general equilibrium setting, the outside option of wage labour and/or the possibility of receiving an efficiency utility level, does most of the work.
- As wages rise, there is stronger selection of entrepreneurs from the pool of those who have higher ability which, in turn, leads the size distribution of firms to shift towards larger employers as capital-deepening takes place in the economy, resulting in higher wages.

Summary of Key Findings - III

- As the financial market access expands further, we get only a small fraction of the population running their own firms with the vast majority relying on supplying labour, but this is good for the workers as wages are higher.
- While this general equilibrium aspect of the analysis and the labour market channel is in line with the broad thrust of the recent macrodevelopment literature (see Buera et al 2015 for a review), our paper is distinguished by its effort to disentangle the effects of financial access, credit market frictions, and the degree of competition in the credit market.

Concluding Comments - I

- Paper has developed quantitative implications of a micro-founded credit market model:
  - allows us to look at specific frictions: (i) limited use of collateral, (ii) limited competition, (iii) limited access.
- We show that financial inclusion is quantitatively more important than reducing contracting frictions: moving from autarky to full-inclusion increases the wage from 40% to 90% of the US wage.
- Insights could be important for how evaluating credit market policy.
  - Perhaps important not to evaluate reforms one dimension at a time.

Concluding Comments - II

- Given that most of the poor in developing countries are dependent on wage labour, the biggest effects on poverty reduction from changes in the financial sector come through the transformational effect on occupational choice and rising wages.
- The paper also reinforces the message in Moll (2014) who has highlighted the importance of diminishing the extent of small-scale self-employment as development progresses with such individuals mainly switching to wage labour.
- This is consistent with explorations of the limited impact of micro-credit in field experimental studies.

Appendix

Credit Contracts and Firm Outcomes

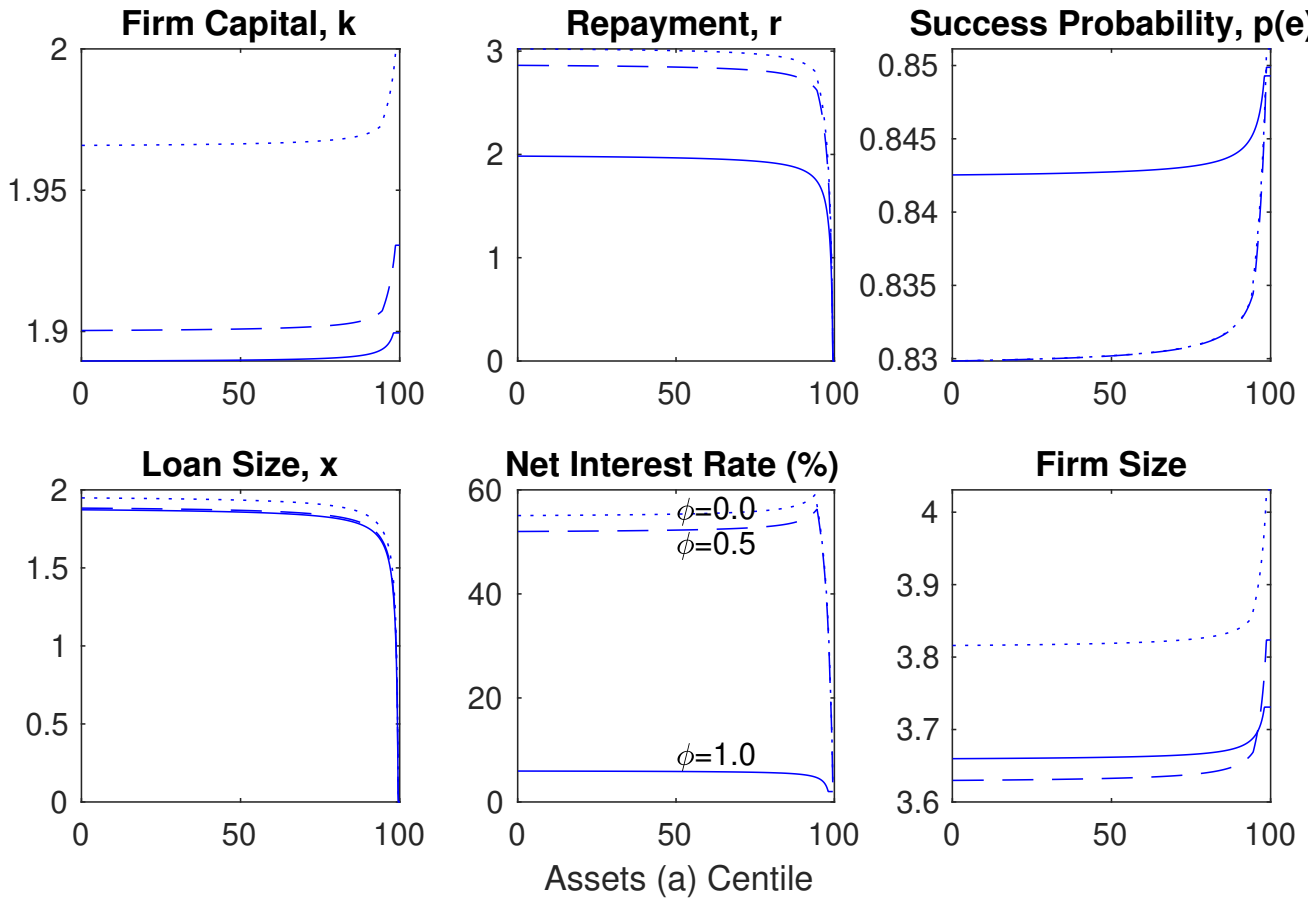


Figure 1 (B)

We assume $\tau = 1$ and $\rho = 0$, and we consider the 96th percentile of the productivity (θ) distribution. return

Credit Contracts and Firm Outcomes: Results

- This figure looks at a more marginal group of entrepreneurs by focusing on the 96th percentile in the productivity distribution.
- The relationship between competition and default probabilities is much less for these marginal entrepreneurs.
- Capital allocation is now much lower (due to productivity being lower) but, in common with the baseline, it is very flat during low levels of the wealth distribution.
- Although repayment and loan size are lower, the same broad relationship with wealth and competition is observed as in the higher productivity case.
- Interest rates are lower for these less productive borrowers.

Credit Contracts and Firm Outcomes

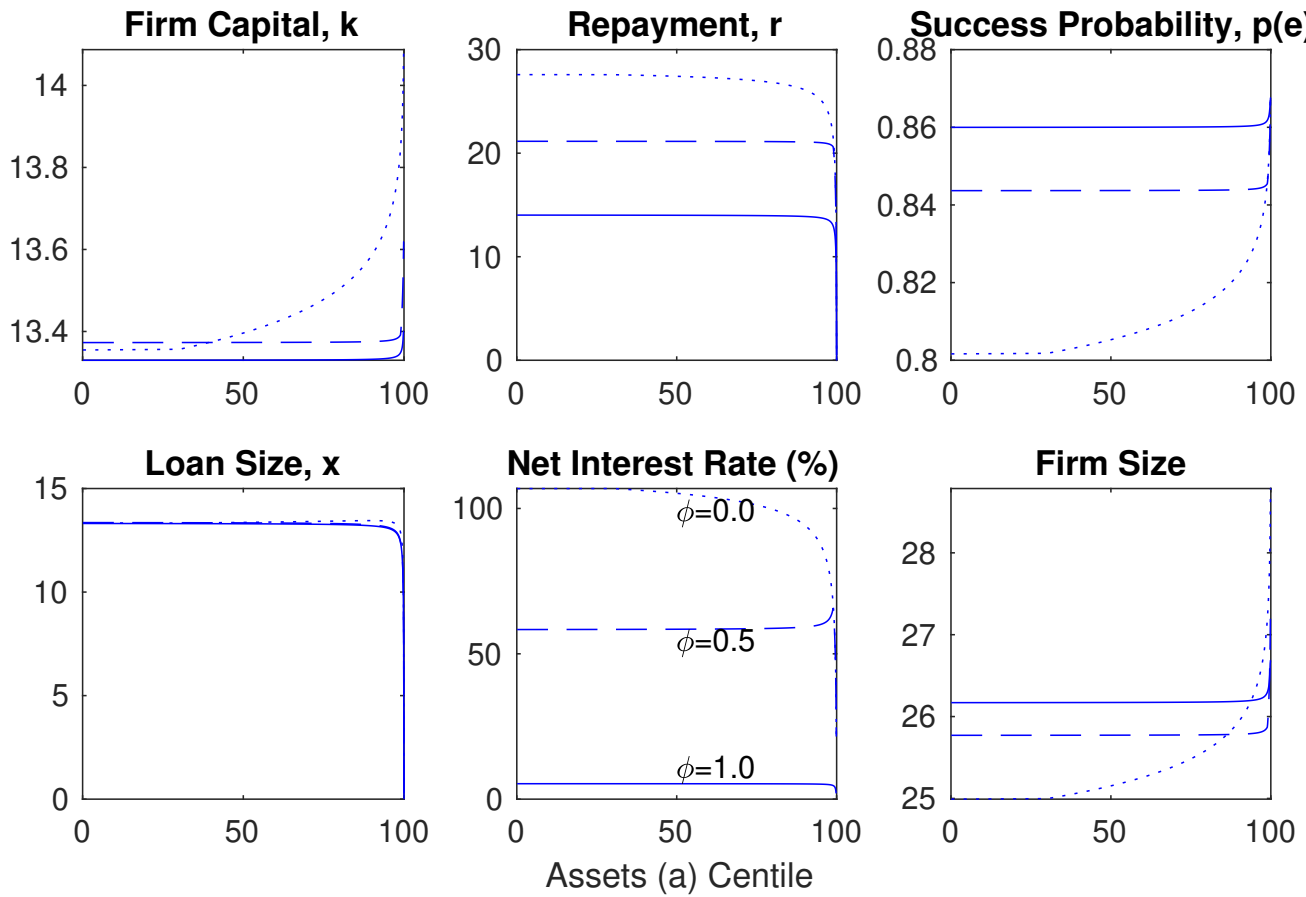


Figure 1 (C)

We assume $\tau = 1$ and $\rho = 0.3$, and we consider the 99.5th percentile of the productivity (θ) distribution. return

Credit Contracts and Firm Outcomes: Results

- Here we allow for a stronger correlation between wealth and productivity, which increases the density of high wealth/high productivity individuals. The optimal contracts for each (a, θ) are essentially preserved compared to the baseline.

Credit Contracts and Firm Outcomes

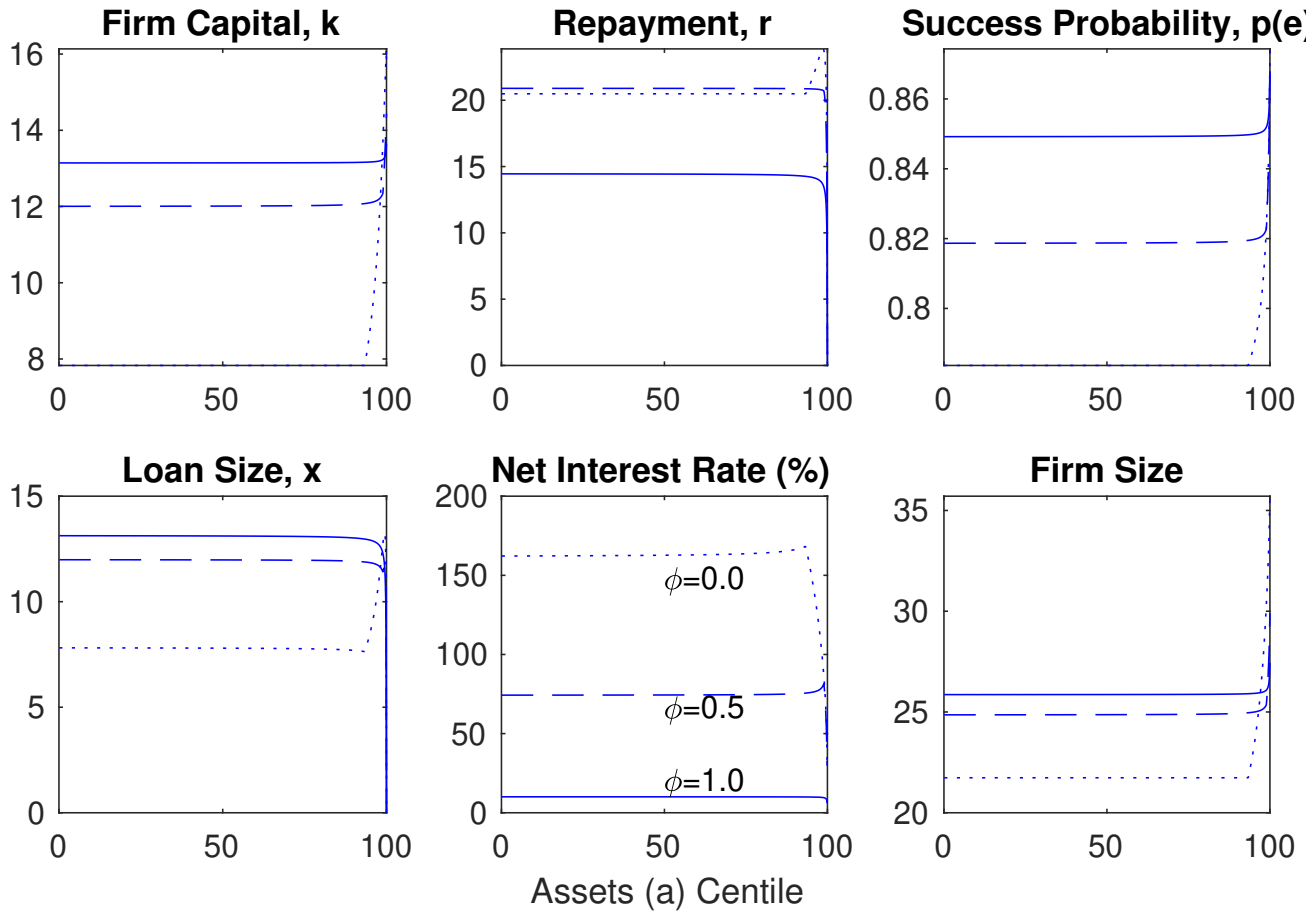


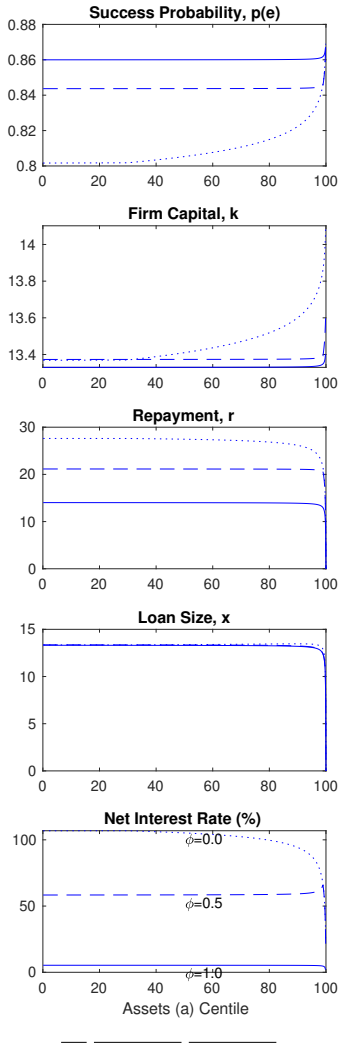
Figure 1 (D)

We assume $\tau = 0.5$ and $\rho = 0$, and we consider the 99.5th percentile of the productivity (θ) distribution. return

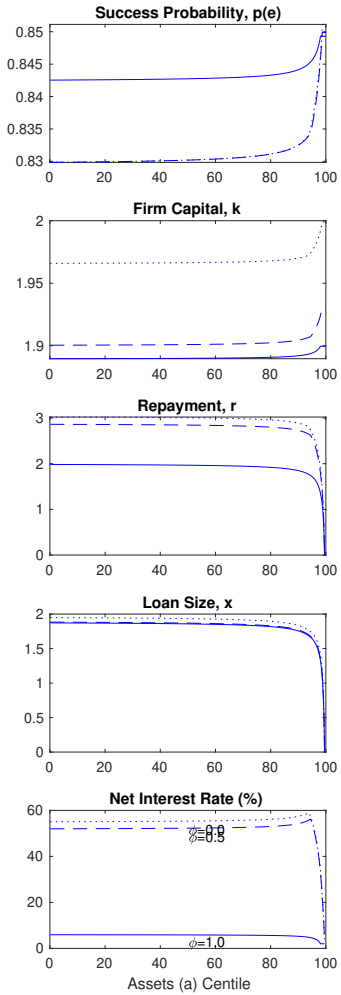
Credit Contracts and Firm Outcomes: Results

- This figure considers $\tau = 0.5$ so that only 50% of the inside capital can be used as collateral.
- In our model such a decrease in the collateralizability of inside capital implies that defaulting becomes more attractive for the borrower and more costly to the lender. As a consequence the lender decreases the loan size and hence firm capital k.
- We observe the quantitative implications of this mechanism, where the effects on the default, loan size, firm capital, and interest rate are particularly pronounced in uncompetitive lending environments.

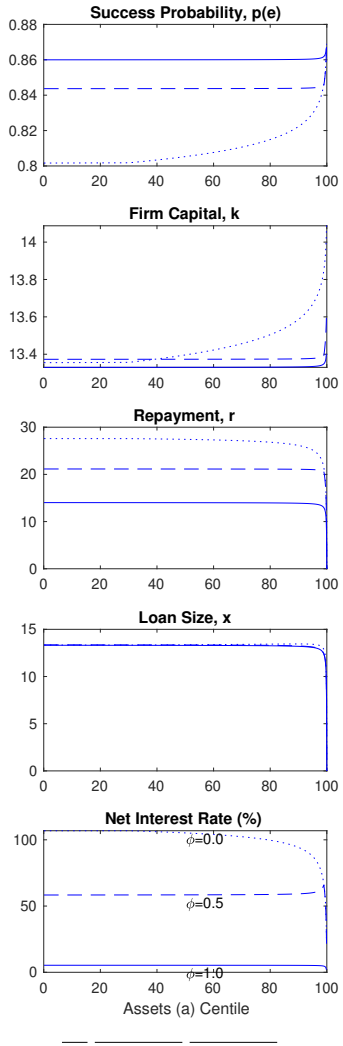
Credit Contracts and Firm Outcomes (Full Figure 1)



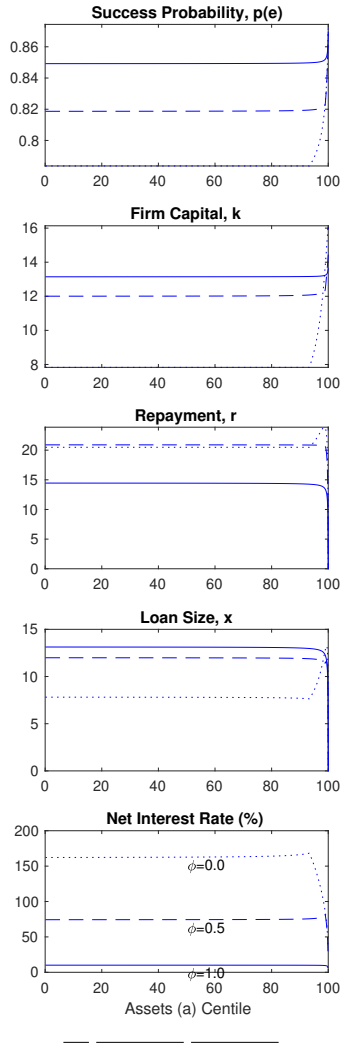
(a) Baseline



(b) 96th percentile θ



(c) $\rho = 0.3$



(d) $\tau = 0.50$

return

Equilibrium Entrepreneurs

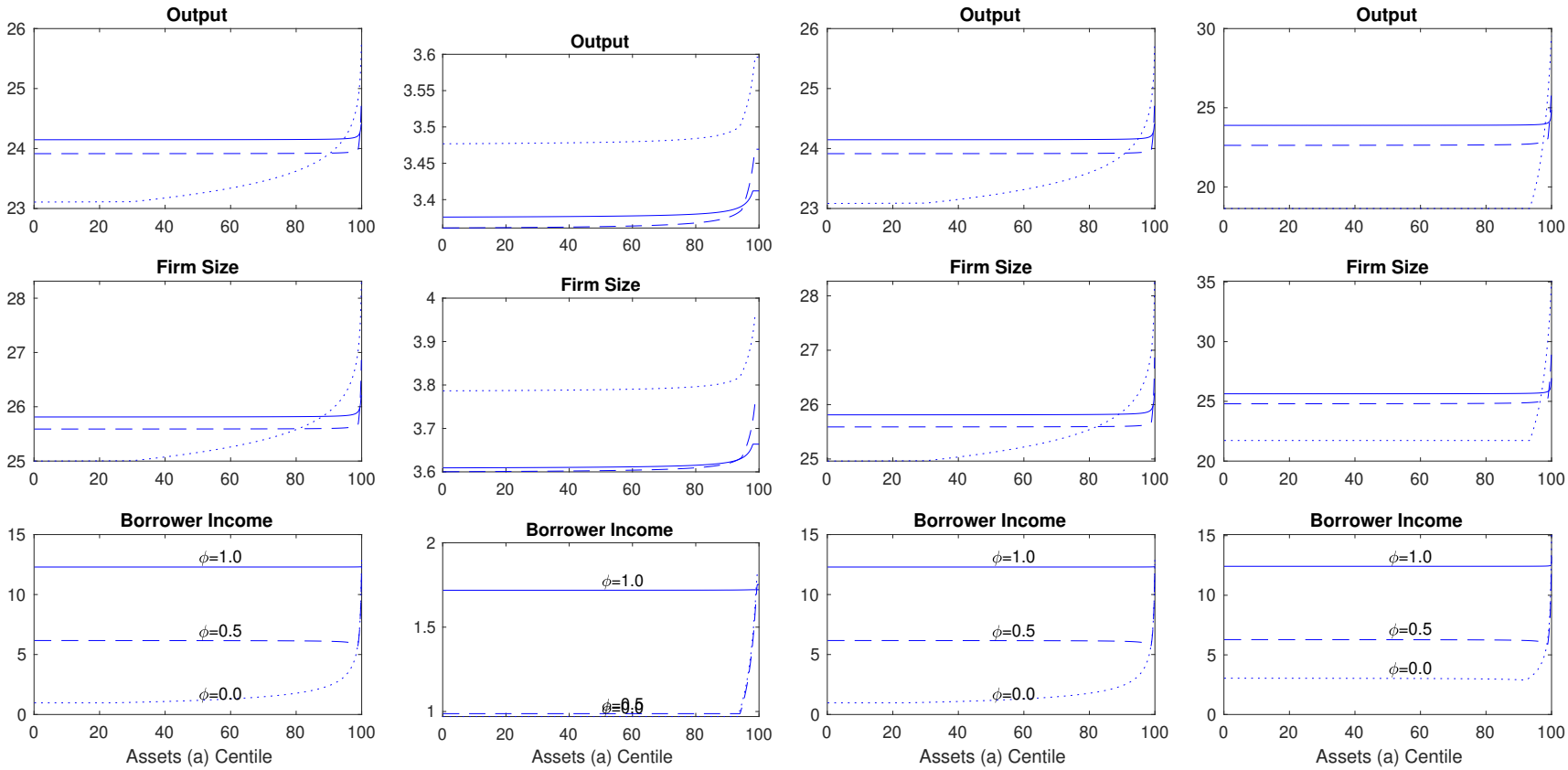


Figure 4 Equilibrium Entrepreneurs

From the left to the right figures, we impose respectively, $\tau = 1$ (benchmark), the 96th centile of the productivity distribution, $\rho = 0.3$, and $\tau = 0.5$.

Equilibrium Entrepreneurs

- This figure looks at outcomes among entrepreneurs, i.e. output, labour demand, and the income of entrepreneurs, for the same core parameter values (from left to the right, we have benchmark, 96th percentile of productivity, $\rho = 0.3$, and $\tau = 0.5$).
- In benchmark, output (for successful entrepreneurs) is largely unaffected by wealth up to the 95th percentile of the wealth distribution regardless of the level of competition. For high asset levels, output is highest when competition is lowest. Firms of entrepreneurs with high asset levels are largest when competition is lowest since the wage rate is lowest then. The income of entrepreneurs depends strongly on the level of competition as the share of the surplus is affected by this.

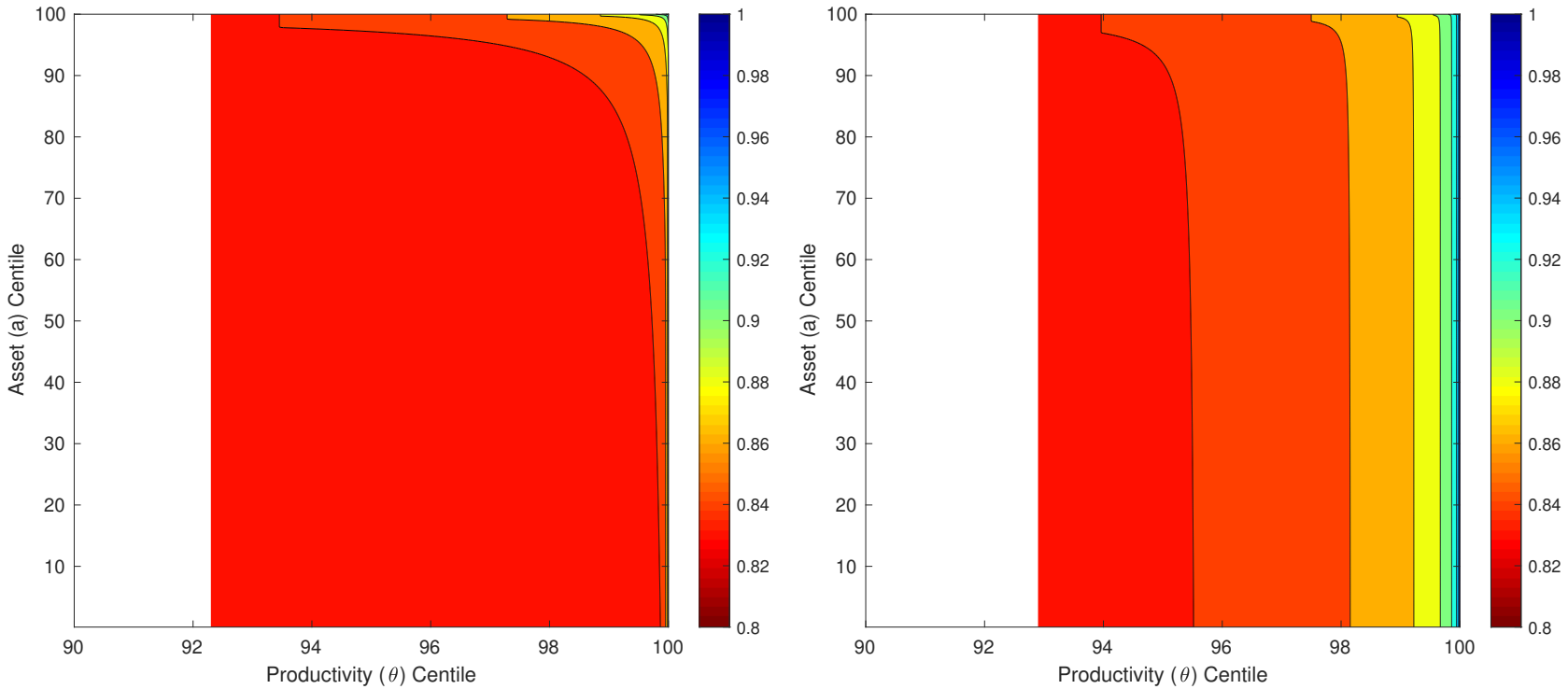
Equilibrium Entrepreneurs

- The second subfigure shows that having smaller entrepreneurs scales down the size of incomes and labour demand. Competition has a non-monotonic effect on labour demand and income. Increasing the correlation between wealth and productivity again has little effect.
- In the last subfigure, the de Soto effect is strongest for low levels of competition, where a decrease in τ leads to markedly lower levels of output and smaller firms. This effect is substantially muted for intermediate or high levels of credit market competition.

Competition and Aggregate Capital

- Lenders extract surplus in response to a decrease of competition by adjusting k and r.
- It turns out that in our calibration, the (partial equilibrium) effect on k is moderate, while the effect on r is large, leading to a pronounced decrease in the success probability, see next slide.
- The lower success probability causes a large fall in (expected) aggregate labour demand and hence wages.
- This causes some increase in labour hiring at the start-up stage (but not enough to swamp the lower aggregate demand effect) which in turn leads to increases in firm capital as labour and capital are complements.
- On average this wage effect more than compensates the initial decrease in capital.

Competition and Success Probability



(a) $\phi = 0$ (b) $\phi = 1$

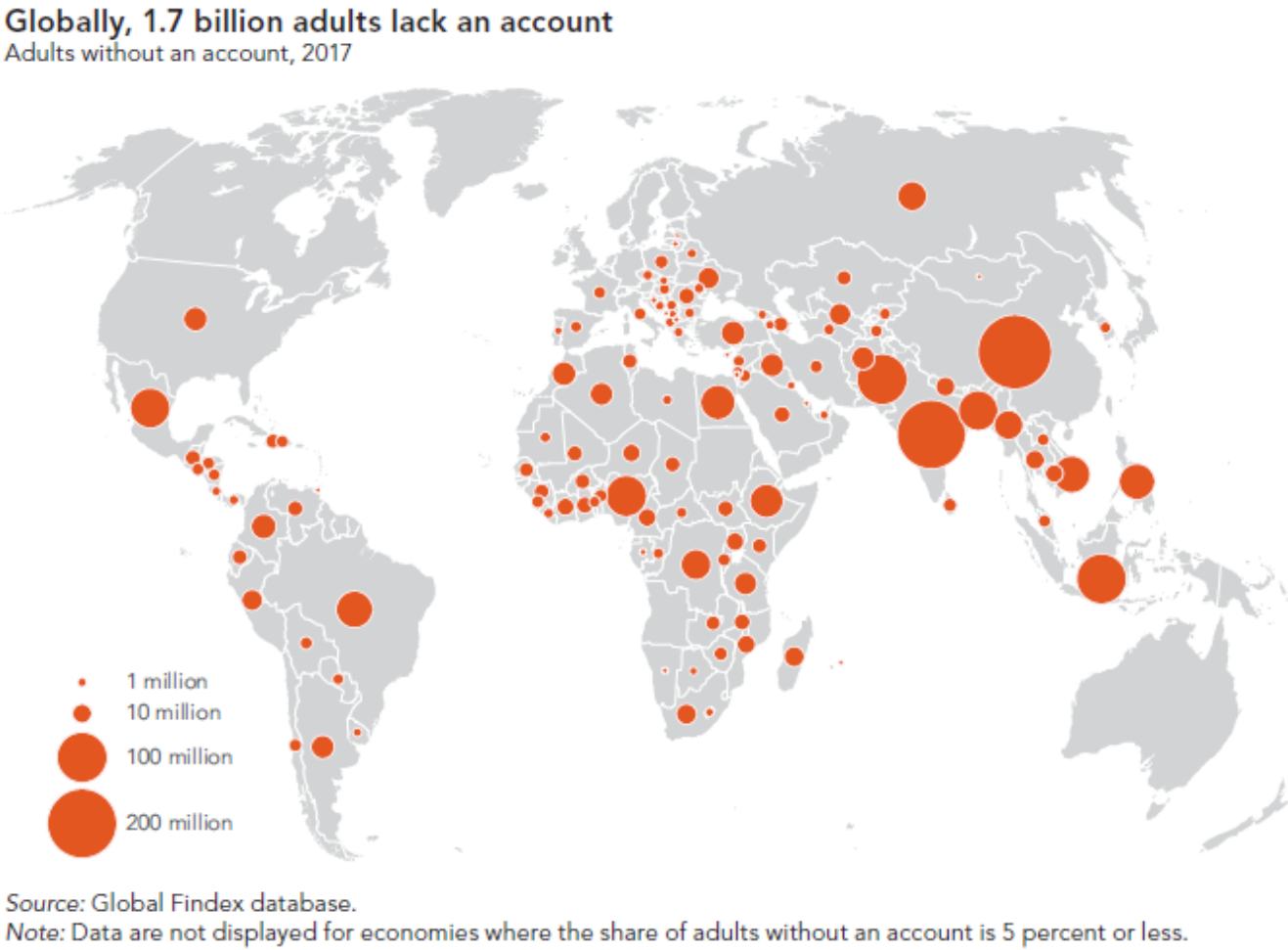
Figure 10 Competition and Success Probability

Here we show the success probability for each (a, θ). We assume $\tau = 1$ and full market integration.

return

Motivation

- Well known: access to banking services is limited around the world.



return

Model Set Up

- There are some aspects of our set-up that could be modified:
  - First, the two-stage structure, with all the uncertainty in the first stage and none in the second stage.
  - Second, all the physical capital sunk at the first stage without knowing whether the project will succeed - build a factory or a shop as a start-up but then shutting it down if the product does not sell and so never hiring any regular workers.
  - Third, we create an extra category of managerial labour that is different from ordinary labour but receive the same expected wage - only reason to do that is for large firms e will be very high and that is hard to justify as being supplied by the entrepreneur only

Model Set Up

- Possible variations we are considering:
  - Only the entrepreneur chooses e (no managerial labour needed) and only physical capital is needed at this stage.
  - Capital is invested in two stages - start-up and scaling-up
  - Suppose all inputs are put in place in the first stage including ordinary labour
    - Then uncertainty is resolved and if the project fails no one gets anything.
    - Then ordinary workers too get a wage that is outcome-contingent like managerial labour in the existing model.

return