

Credit, Inequality and Trade

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Abstract

Conventional wisdom suggests that in a credit constrained economy with uneven asset distribution underinvestment and income inequality is a general possibility as poor agents are barred from accessing loans from banks. This has implications for skill formation, entrepreneurship, trade and poverty. General assertion is that more even asset distribution is desirable to promote investment and efficiency. Contrary to the conventional wisdom, this paper argues that more egalitarian asset distribution is likely to reduce output of the credit intensive sector when credit limit is determined by the level of asset ownership, firms face binding credit constraints for all levels of asset holding and firms are price takers. Therefore, it is not the inequality of asset distribution but imperfect product market that adversely affects the efficiency outcome. Trade does not worsen inequality within groups of entrepreneurs and non-entrepreneurs, but inequality increases across groups. However, the country with more egalitarian distribution of assets, in contrast to usual outcome, may import credit intensive good and export capital to the rest of the world.

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Section – 1: Introduction

Credit market imperfection coupled with an uneven asset distribution can lead to inefficient outcomes. This issue has been dealt with the several sub disciplines of economics. The idea that with borrowing rate greater than lending rate one does not get first best outcome is well recognized. In development economics such anomalies lead to inadequate human capital formation and poverty traps as demonstrated in Banerjee and Newman (1993), Galor and Zeira(1993) and others. That the cost of external finance declines with the asset holding of the borrower has been well known in financial economics as discussed in Glenn Hubbard (1991). Credit market imperfection can be characterized by credit rationing, though all of the borrowers with varying amount of assets may not face a binding credit limits. During financial crisis, credit constraints play an important role and in general financial intermediation is said to have productive impact under informational and institutional distortions. That has lead to research on business cycles and endogenous growth such as Bernanke and Gertler (1989), Bencivenga and Smith (1991), Aghion and Banerjee (2005), etc. How credit market imperfection can determine pattern of comparative advantage and how financial crisis and lack of trade credit can impact volume of trade have been discussed by Deardroff (2000), Matsuyama (2005), Manova (2013), etc.

Sato (1996), Wynne (2005) and Foellmi and Oeschlin (2010) have looked at the impact of credit market imperfection, wealth inequality on entrepreneurship and trade. They discuss how inequality adversely affects production and trade and exports in the presence of credit constraints increases the degree of inequality. Smaller firms typically have less credit to work with and cannot expand production when trade expands. As they engage in labor intensive sector. Results such as these and related ones in development economies in general are important because they signify positive contribution of public policies in mitigating the inefficiencies associated with uneven asset distribution. Remarkably popular book of Thomas Pickety (2013) has brought to the fore the issue of increasing inequality and growing income of the richest.

The purpose of this paper is to suggest that while human and social welfare driven arguments against inequality should have universal acceptance, the efficiency augmenting effects of redistributive justice have to be very carefully studied in the context of credit market imperfection and international trade. We prove in a fairly general model of production and trade with standard characterization of credit market imperfection that more equal initial distribution

of asset actually hurts production and hence exports of credit intensive good. Such egalitarian schemes do not work in a model of perfect product market with atomistic firms. Hence, the obstacle to efficiency is not “inequality” as much but inequality coupled with some of product market imperfection.

Jones and Marjit (2001) have highlighted the potentially beneficial role of trade in capital scarcity problem and promoting skill formation without explicit modeling of credit market imperfection. Inequality and trade have been discussed by Mitra and Trinade (2005) with non-homothetic preferences, with the later relating pattern of trade to status seeking behavior drawing from results in experimental social psychology. But they do not discuss credit market related issues.

The equity – efficiency correlation critically depends either on the diminishing productivity story whether by transferring to those who have less, makes the system more productive or because the rich entrepreneurs do not face a binding credit limit whereas the poor ones do. Thus, if banks could transfer that surplus to the poor, production would have increased. However, such assertions will fail when firms, however rich they are, face binding credit constraint. This will happen in a competitive CRS world. Then any redistribution from richer segment will not be matched and compensated by those in the lower segment for the efficiency argument to hold. In our paper, the “middle class”, i.e. those who sit near the cut-off point of occupational choice between being a worker and an entrepreneur, is of prime significance and not those who will not use the asset as collateral to engage in production.

The paper is divided into five sections. The second one describes the basic model. The third describes the basic results i.e. the effect of inequality of asset distribution and trade. The next one deals with endogenous interest rate. The last section concludes.

Section – 2: Model

x needs credit and labour, y needs only labour $\rightarrow$ Production of each and every require one unit of labour per unit of output. One can be a worker or an entrepreneur in x .

Workers / Potential Entrepreneurs are distributed in a continuum with assets $k(z)$, $k' > 0$, $\in [0,1]$. y is the numeraire good.

Opportunity cost of not being in y is given to be,

$$c(z) = r + k(z).r \quad \dots (1)$$

(1) states that workers can invest their wage income and the asset to obtain rate of return r . r is determined globally and is exogenous to the model. We treat $r = 1 + r$

Profit in x for z^{th} entrepreneur is given by

$$\pi(z) = P(B(z) + k(z))R - B(z)R \quad \dots (2)$$

$B(z)$ denotes borrowing, R , the borrowing rate $> r$, the deposit rate.

Competitive banking with intermediation cost implies $R = \mu r$, where, μ = intermediation cost > 1 .

Competitive product markets imply that the individual firm takes P as given.

Be in x as an entrepreneur iff,

$$(P - R)B(z) + (P - r)k(z) \geq r \quad \dots (3)$$

Note that $P > R > r$, otherwise $B(z) = 0$

Also individual demand for $B(z)$ at a given P is unbounded. Since firms are competitive, they would like to sell as much as they can.

Banks worry about default [Aghion and Benerjee (2005)]. No default incentive constraint.

$$P[B(z) + k(z)] - B(z)R - k(z)r \geq P[B(z) + k(z)] - k(z)r - q\theta(k(z) + B(z)) \quad \dots (4)$$

$$\text{Or, } B(z) \leq \frac{q\theta}{R - q\theta} k(z) \quad \dots (5)$$

where q is the probability that the defaulter can be punished and if punished θ fraction of the total assets can be approximated by the bank.

$$\text{From (3), } k(\tilde{z}) = \frac{r}{(P-R)\frac{q\theta}{R-q\theta} + (P-r)} \quad \dots (6)$$

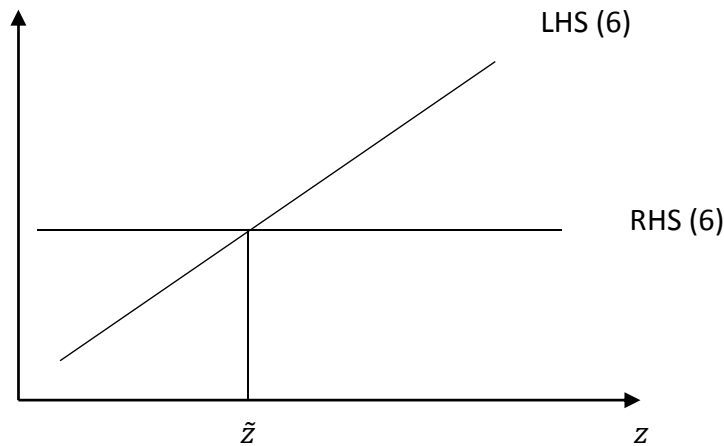


Figure-1

If there is an interior equilibrium then $\forall Z \geq \tilde{Z}$, workers become entrepreneurs and $\forall Z < \tilde{Z}$, they choose to remain as workers.

Total Output is as follows,

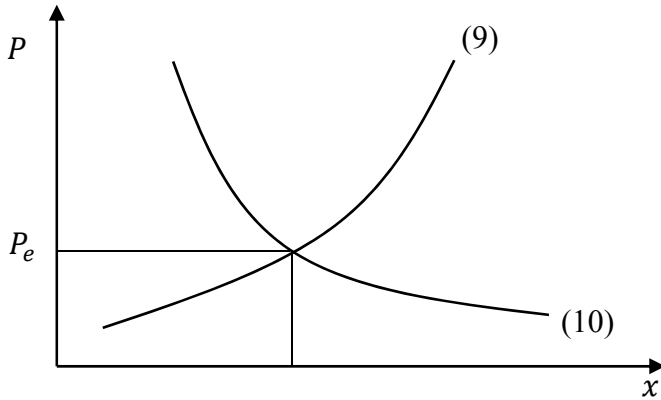
$$X(\tilde{Z}) = \int_{\tilde{Z}}^1 x(z) dz = \left(1 + \frac{q\theta}{R-q\theta}\right) \int_{\tilde{Z}(P)}^1 k(z) dz \quad \dots (7)$$

$$\frac{\delta X}{\delta P} > 0 \text{ as } \tilde{Z}' < 0 \quad \dots (8)$$

$$X(\tilde{Z}) + Y = \tilde{Z} \quad \text{or} \quad \frac{X(\tilde{Z})}{Y} = \frac{X(\tilde{Z})}{\tilde{Z} - X(\tilde{Z})} \quad \dots (9)$$

Labor needs to be fully employed.

$$\text{Homothetic demand } \frac{X^D}{Y^D} = f(P) \quad f' < 0 \quad \dots (10)$$



$P_e \rightarrow \text{Autarkic Equilibrium}$

Fig-2

$$(\tilde{Z}_e) = \frac{r}{(P_e - R) \frac{q\theta}{R-q\theta} + (P_e - r)} \quad \dots (11)$$

Therefore, in equilibrium we have $\tilde{Z}_e$ workers and $(1 - \tilde{Z}_e)$ entrepreneurs. P_e denotes the Autarkic equilibrium.

Section – 3: (a) Asset Distribution and Production and Trade

Given this setup, we now evaluate whether uneven initial distribution of asset is the root cause of lower production in the credit intensive sector, a generally accepted conclusion in the literature.

The next proposition summarizes the result.

$$\int_0^1 k_1(z) dz = \int_0^1 k_2(z) dz = \bar{k}$$

$$\int_0^{\hat{z}_1} k_1(z)dz < \int_0^{\hat{z}_1} k_2(z)dz, \quad \int_{\hat{z}_2}^1 k_1(z)dz > \int_{\hat{z}_2}^1 k_2(z)dz$$

$$\text{and } \int_0^{\hat{z}_1} k_2(z)dz - \int_0^{\hat{z}_1} k_1(z)dz = \int_{\hat{z}_2}^1 k_1(z)dz - \int_{\hat{z}_2}^1 k_2(z)dz$$

Distribution 1 is less egalitarian and z_e is the same for both distribution at a given P . Note figure 3. Then for distribution 2, X will be less for any given P . This will shift the relative supply curve to the left increasing P_e .

Proposition 1

An egalitarian distribution that does not alter $\tilde{z}$ will reduce total production of X at a given P .

Proof: As discussed above. QED.

Redistribution in favor of those who do not emerge as entrepreneurs will adversely affect total output because everyone who is producing X is facing a binding credit constraint. Asset reallocation away from them reduces production, but does not increase production by the beneficiary group. In fig – 2, (9) shifts to the left increasing P_e . The critical factor is $\tilde{Z}$. If asset redistributed from the rich to those around $\tilde{Z}$ such that $\tilde{Z}$ declines, then one would compare the change in extensive margin i.e. output increase due to entry of new entrepreneurs with the offsetting effects of the intensive margin i.e. existing rich entrepreneurs reducing output. Once total output at any given price is affected, autarkic relative price of X will also be different. What we can conclude at this stage is that between two otherwise exactly identical countries, the one with more uneven asset distribution can emerge as larger producer and exporter of the credit intensive good. In an imperfectly competitive product market, the rich may not use up the entire credit limit since they may choose not to produce beyond a strategic amount. In that case redistribution will be more efficient. What we show is that it is not inequality per se but imperfection in the product market which breaks down the conventional result. Note that with given r , the egalitarian distribution raises P and eventually reduces $\tilde{z}$. That in turn will increase the production of X , but cannot overturn the initial impact due to the stability argument and ultimately P rises.

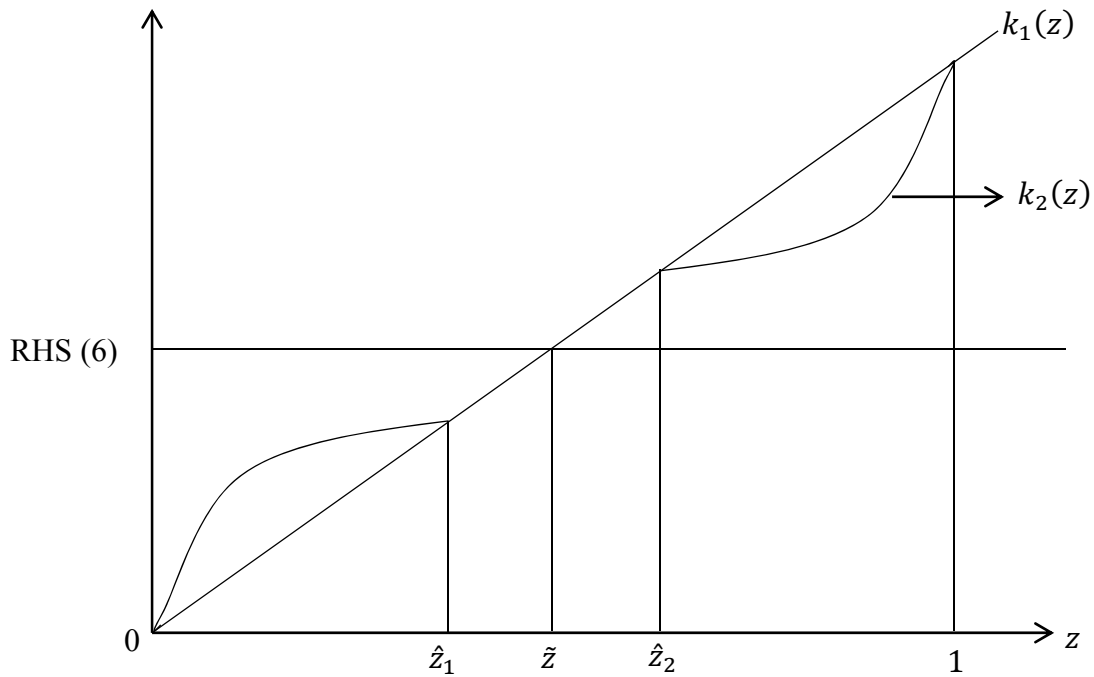


Figure – 3

(b) Trade and Inequality

Let us consider an increase in the relative price of x as the country opens up for trade and exports x . This will affect $\tilde{z}_e$ and $\tilde{z}$ will fall up to $\tilde{z}_T$. We consider the income distribution between existing entrepreneurs and those who will not be entrepreneurs even after a decline in $\tilde{Z}$. Since r does not change and a higher P increases income of the existing entrepreneurs, income distribution between $Z \in [0, \tilde{Z}_T]$ and $Z \in [\tilde{Z}_e, 1]$ with $\tilde{z}_T < \hat{z}_e$ will go in favor of the richer segment. Hence trade will increase degree of inequality between entrepreneurs and non-entrepreneurs.

Consider the distribution among the existing entrepreneurs. Let their income be denoted as $\Omega(z)$.

$$\text{From (1) } \hat{\Omega}(z) = \hat{P} \quad \dots (12)$$

Hence for any two existing entrepreneurs, rich or poor, income distribution does not change with trade.

Now consider the new entrepreneurs and the existing ones and we need to compare.

$$A_1 \equiv \frac{[(P_e - R)B(z_1) + (P_e - r)]k(z_1)}{r + rk(z_2)} \quad \text{and}$$

$$A_2 \equiv \frac{(P_T - R)B(z_1) + (P_T - r)k(z_1)}{(P_T - R)B(z_2) + (P_T - r)k(z_2)}$$

Note that for the new entrepreneurs it is a finite jump [Beladi, Chakrabarty and Marjit (2015), Marjit and Mandal (2015), Marjit, Kar and Beladi (2007)]. In particular let us look at $z_2 = \tilde{z}_T$, the new cutoff point.

Using (5) A_2 can be reduced to

$$A_2 = \frac{k(z_1)}{k(z_2)} \text{ where } B(z) = \alpha \cdot k(z) \quad \dots (13)$$

$$\text{and } A_1 = \frac{[(P_e - R)\alpha + (P_e - r)]k(z_1)}{r + rk(z_2)}$$

$$A_2 \leq A_1 \text{ iff } \frac{k(z_1)}{k(z_2)} \leq \frac{[(P_e - R)\alpha + (P_e - r)]k(z)}{r + rk(z_2)}$$

$$\text{Or, } r + rk(z_2) \leq [(P_e - R)\alpha + (P_e - r)]k(z_2)$$

$$\text{Or, } \frac{r}{k(z_2)} + r \leq (P_e - R)\alpha + (P_e - r) \quad \dots (14)$$

Note that for $z_2 = \tilde{z}_T$ strict equality holds. Consider $\tilde{z}_e > z > \tilde{z}_T$ i.e. the set of fresh. But we know that none of the fresh entrepreneurs chose to be entrepreneurs at P_e hence (14) must hold in reverse. Hence trade must increase degree of inequality between old entrepreneurs and new entrepreneurs i.e. old gains more.

But note that among the existing entrepreneurs the relative income remains unchanged from (13).

Proposition – 2

Export of the credit intensive good will lead to the following pattern of income distribution.

- a) Within the group of existing entrepreneurs, income distribution will not change between the rich and the poor.
- b) Fresh entrepreneurs will be richer compared to the non-entrepreneurs but will be the poorer compared to the existing entrepreneurs.

Proof – See the discussion above.

Usually trade is supposed to affect inequality by allowing those who can expand production by accessing more credit and not allowing those who cannot. Typically the rich benefit relative to the poor. But we show that this argument is invalid with competitive product market because everyone is utilizing credit up to their credit limit. A rise in relative price of x does not increase production via the existing entrepreneurs but through fresh entry. However, all entrepreneurs gain because of an increase in the relative price relative to their opportunity cost of not being an entrepreneur. Whether trade necessarily leads to greater inequality depends on which group we are referring to. Among the existing entrepreneurs it remains unchanged. However, while fresh entrepreneurs gain relative to the non-entrepreneurs but they lose relative to the existing entrepreneurs.

Section – 4: Endogenous r

With the assumption of competitive banking has to be the same for all borrowers each bank charges an identification cost $\mu > 1$ over and above r .

Total supply of credit is given by $K^s = \int_0^{\tilde{z}} k(z) dz$ when $\tilde{z}$ is the cutoff point.

Similarly demand for credit is given by $K^d = \int_{\tilde{z}}^1 \left[\frac{q\theta}{\mu r - q\theta} \right] k(z) dz$

Also $\tilde{z}$ determined by (6)

The credit market clearing condition

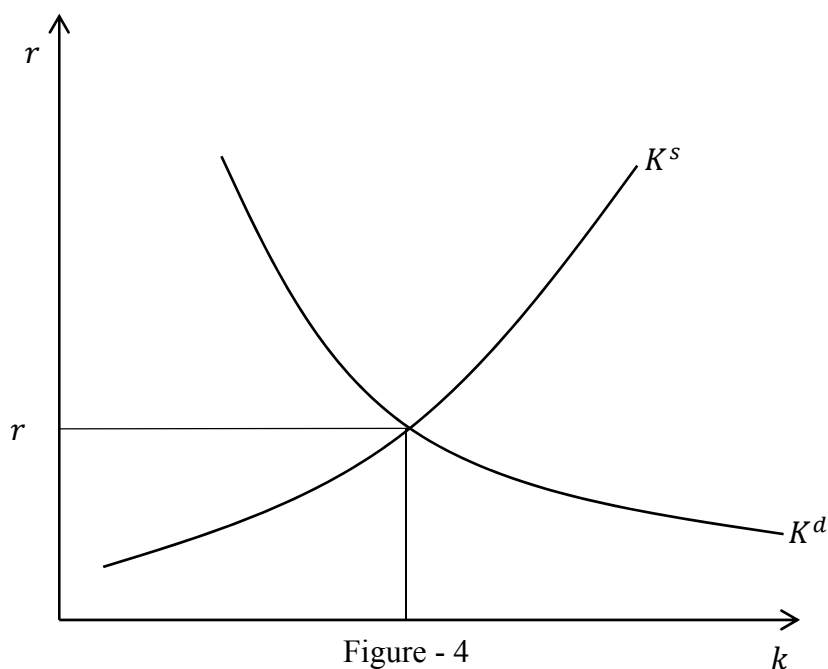
$$\left(\frac{q\theta}{\mu r - q\theta} \right) \int_{\tilde{z}(r)}^1 k(z) dz = \int_0^{\tilde{z}(r)} k(z) dz \quad \dots (15)$$

From (6)

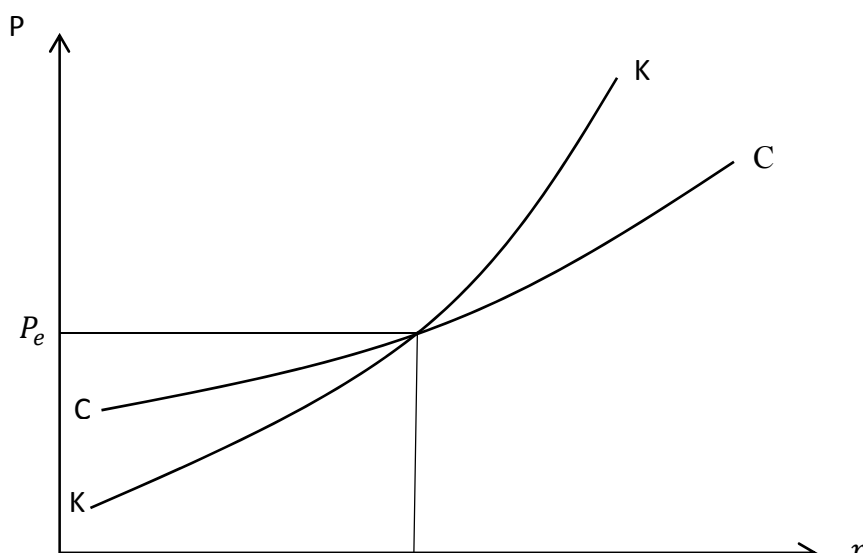
$$k(\tilde{z}) = \frac{1}{\left(\frac{p}{r} - \mu \right) \left(\frac{q\theta}{\mu r - q\theta} \right) + \frac{p}{r} - 1} \quad \dots (16)$$

Hence, as $k' > 0$, $\tilde{z}' > 0$

(15) and (16) imply that LHS is downward sloping and RHS is upward rising; as shown in the following diagram.



From (16) we know as P increases $\tilde{z}$ must go down shifting the demand up and supply down and leading to a rise in r . This defines the locus of (P, r) as KK in Figure-5. The commodity market equilibrium is also affected by changes in r . In Figure – 2, higher r will reduce supply of x by raising $\tilde{z}$ and will increase P . This is defined as the locus CC in Figure – 5.



P adjusts along CC and r adjusts along KK. (P_e, r_e) represent the general equilibrium solution of the system. They in turn determine $\tilde{z}, X$ and Y .

Let us repeat the impact of an egalitarian asset distribution, as suggested in the earlier section which does not alter $\tilde{z}$ to start with. As demonstrated earlier, at given r , P will increase. Hence, CC will shift upward in Figure – 5.

Also, given P , demand for credit shrinks and supply increases, hence r must drop. So KK will shift to the left.

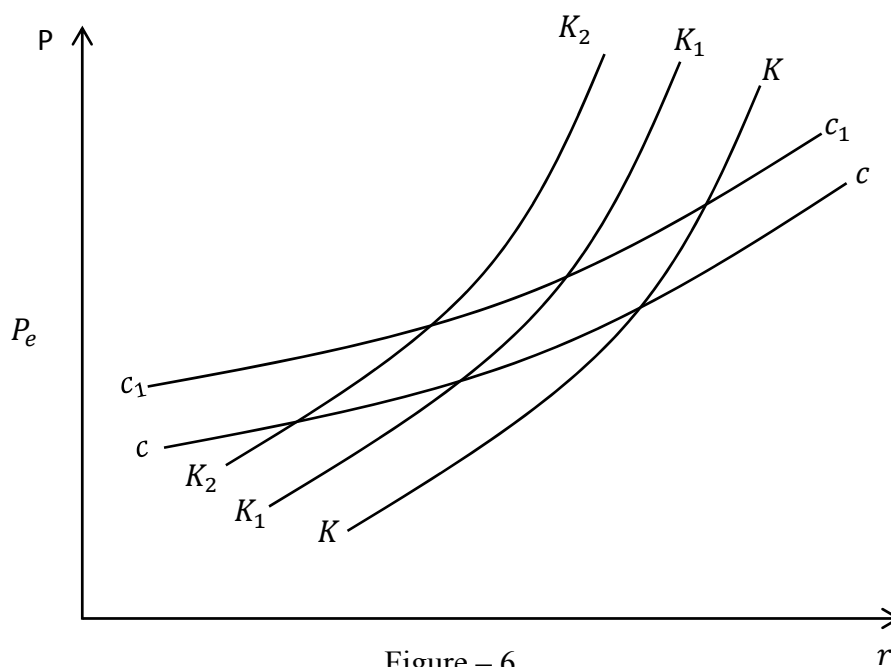


Figure – 6

Note that in the new equilibrium P will be higher but r can move up or down as depicted in Figure-6. With KK shifting as K_1K_1 or K_2K_2 . Given r as P increases, it raises r as well, with KK given and CC shifting up. But with increasing P , $\tilde{z}$ starts falling and more entrepreneurs come to raising demand for credit and reducing supply. Also as KK shifts up, r can drastically fall,

reducing $\tilde{z}$ further. Drop in $\tilde{z}$ does a balancing effect and r may go up or down. (Please see the appendix (for a linear case)).

If both P and r go up, it is consistent with the standard outcome in a traditional Heckscher-Ohlin-Samuelson type trade model. Credit intensive good is scarce and so is overall availability of credit signaled by a rise in r and hence $R = \mu r$. But if r falls and credit is in excess supply due to lack of entrepreneurs, we have an interesting possibility. This can happen in the following way.

To start with, the redistribution creates excess supply of credit as P increases. An increase in P reduces $\tilde{z}$ and can recover a part of it or can overcompensate. Hence r may go down or go up to maintain the ultimate credit market equilibrium. If r drops, we would import credit intensive good but we may export credit in the sense that since r in the rest of the world or in the less egalitarian nation is higher. Given an opportunity, credit will flow out, quite contrary to the usual perception, a result derived in a different environment and context by Lucas (AER) and Antras (JPE). A more egalitarian poor country will be prone to capital flight because lower credit demand will reduce r and at the same time credit intensive good will be in short supply.

Section – 5: Conclusion

In this paper we show that in contrast to the common belief, more egalitarian asset distribution tends to reduce the output of the credit intensive sector. As compared to the inequality of asset distribution, product market imperfection leads to (has more impact on) the inefficiency. It is shown that, inequality increases only across the groups and not within the groups of entrepreneurs. Further we show that a country characterized by an egalitarian distribution of assets would import credit intensive good from the rest of the world and export credit to the rest of the world. Finally, we consider the operation of an informal credit sector, where there is a potential for the firms without any assets to borrow. However, there is a punishment for the lenders in this sector. We show that in order to check this activity, the magnitude of the fine must be very large. The ultimate impact of operation of the informal credit sector depends upon its net effect upon the number of entrepreneurs.

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Appendix:

The following are the basic equations for the product and credit markets respectively:

$$\begin{aligned} P &= \alpha + \beta r + \gamma z_{eg} \\ r &= a + bP - cz_{eg} \end{aligned}$$

where, z_{eg} refers to the asset distribution being egalitarian; the parameters $\alpha, \beta, \gamma, a, b$ and c are real numbers.

$$\Rightarrow \begin{aligned} P - \beta r &= \alpha + \gamma z_{eg} \\ -bP + r &= a - cz_{eg} \end{aligned}$$

$$\Rightarrow \begin{bmatrix} 1 & -\beta \\ -b & 1 \end{bmatrix} \begin{bmatrix} P \\ r \end{bmatrix} = \begin{bmatrix} \alpha + \gamma z_{eg} \\ a - cz_{eg} \end{bmatrix}$$

$$P = \frac{\begin{vmatrix} \alpha + \gamma z_{eg} & -\beta \\ a - cz_{eg} & 1 \end{vmatrix}}{\begin{vmatrix} 1 & -\beta \\ -b & 1 \end{vmatrix}} = \frac{\alpha + \gamma z_{eg} + a\beta - \beta cz_{eg}}{(1 - b\beta)} = \frac{\alpha + a\beta + (\gamma - \beta c)z_{eg}}{(1 - b\beta)}$$

and

$$r = \frac{\begin{vmatrix} 1 & \alpha + \gamma z_{eg} \\ -b & a - cz_{eg} \end{vmatrix}}{\begin{vmatrix} 1 & -\beta \\ -b & 1 \end{vmatrix}} = \frac{a - cz_{eg} + b\alpha + b\gamma z_{eg}}{(1 - b\beta)} = \frac{a + b\alpha + (b\gamma - c)z_{eg}}{(1 - b\beta)}$$

Comparative Statics (the effect of an egalitarian distribution on P & r):

$$\frac{\partial P}{\partial z_{eg}} = \frac{(\gamma - \beta c)}{(1 - b\beta)}$$

And

$$\frac{\partial r}{\partial z_{eg}} = \frac{(b\gamma - c)}{(1 - b\beta)}$$

We have $1 > b\beta$ (because $\frac{dP}{dr}$ along KK is greater than $\frac{dP}{dr}$ along CC (please see fig. 5)).

There does exist a chance that c may fall in between β and $\frac{1}{b}$, i.e., $\beta < \frac{\gamma}{c} < \frac{1}{b}$ or $b\gamma < c < \frac{\gamma}{\beta}$. As long as this chance exists, there also exists a chance that,

$$\frac{\partial P}{\partial z_{eg}} = \frac{(\gamma - \beta c)}{(1 - b\beta)} > 0$$

And

$$\frac{\partial r}{\partial z_{eg}} = \frac{(b\gamma - c)}{(1 - b\beta)} < 0.$$