

Trade between Similar Countries: Heterogeneous Entrepreneurs and Credit Market Imperfection

Sugata Marjit¹

Centre for Studies in Social Sciences, Calcutta

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Abstract

We build up a simple Ricardian trade model with imperfection in the market for credit which affects the pattern of production. Workers/entrepreneurs are endowed with different levels “capital” and need to borrow to produce the credit intensive good. We argue that in such a framework identical countries will gain from trade without the assumption of comparative advantage. Thus we show that we do not need monopolistically competitive models to generate trade between similar countries. Trade in this set up takes place in fragments and that helps alleviating credit constraints. Moreover, very poor firms and very rich ones are not likely to gain from trade in fragments, but the middle ones will.

Keywords: Trade, Credit Market, Gains from Trade

JEL Classification: F12, G20, F10

¹ Address: Centre for Studies in Social Sciences, Calcutta, R-1 Baishnabghata-Patuli Township, Kolkata – 700 094, West Bengal, India. Email: marjit@gmail.com. Financial support from RBI endowment, University of Queensland during a visit in May,2013 and CTRPFP at CSSSC is acknowledged. The paper, with a slightly different title, has been benefitted from comments of the participants at the WEAI meetings in Tokyo in March 2013. The usual disclaimer applies.

I. Introduction

This paper starts with the following question. Does credit market imperfection by itself create incentive to engage in international trade? In other words, do identical countries characterized by imperfection in credit market gain from trading with each other? The paper answers the query in affirmative. By doing so it also supports the conclusion that under such circumstances gains from trade accrue even if the countries do not enjoy comparative advantage of any kind. In a way we provide a Ricardian analogue to the Dixit-Stiglitz-Krugman variety model of trade [Dixit and Stiglitz (1977), Krugman(1990)]. Trade in those types of models leads to gain not because countries enjoy comparative advantage in producing a good or variety of goods, but because trade allows greater number of varieties to be consumed. Thus trade can take place between identical countries negating the asymmetry that is essential in more conventional models such as in Ricardian or Heckscher-Ohlin-Samuelson type models.

In this set up we discuss shortly, we provide a case where identical Ricardian nations do gain from trade because both of them suffer from credit market imperfection. Thus one can coin our model as one which deals with “South - South Trade”. But this is not the only way our result can be interpreted. If a country without having credit constraints trades with another which is affected by the shortage of credit, it is likely that the credit constrained economy will specialize in fragments. In this case there is a comparative advantage story at work, the credit constrained economy has a comparative advantage in supplying fragments. But the bottom line is that trade is perfectly feasible between countries which face such constraints and they can be exactly identical in all respects. Thus our model is capable of handling many possible trade relationships.

Two papers by Matsuyama (2005) and Deardorff (2000) bring to the fore the issue of credit and finance in the context of trade and comparative advantage. Our paper is different from both as we explicitly focus on credit market imperfection and fragmentation. Unlike Matsuyama (2005) we do not necessarily deal with comparative advantage. Deardorff (2000) argues how during financial crisis fragmentation i.e. splitting up of production process in various traded segments, may create problems. On the contrary in the paper the ability to trade in fragments actually helps to alleviate credit constraints.

The paper also shows how trade promotes entrepreneurs and how trade actually helps the poor people more in relation to wealthier ones i.e. those endowed with higher amounts of capital. It is, topic wise,

related to Jones and Marjit (2001) where fragmentation has been perceived to help the young generation relative to the old who tend to own capital. Meisenzahl (2011) in a comprehensive study on whether financing constraint actually determines firm size shows that constrained firms do have smaller size and younger firms are relatively small compared to older firms as the older ones are likely to get better credit facilities. Such young-old asymmetry corroborates Jones and Marjit (2001) conjecture, but it also lends credence to the theoretical model under consideration where we show that constrained entrepreneurs will opt for smaller size if they can. In Marjit (2008) relative capital endowments determine pattern of trade and occupational pattern simultaneously in a Heckscher-Ohlin setting, but the main focus was on wage distribution. Lineage wise this paper is related to papers dealing with more ‘classical’ interpretation of the Ricardian theory of comparative advantage a’ la Steedman (1979) and Findlay (1984) and also, though tangentially, to the literature on north-south trade [Findlay (1995)].

While we produce a clear result where exactly similar countries gain from trade, a reinterpreted version in the context of the ‘north-south’ trade also yields an interesting result. The fact that a country faces credit market imperfection while the other does not, implies that the credit constrained economy will have a comparative advantage in producing fragments. Such a trade pattern echoes the earlier concern of trade between metropolis and colonies popularized through the literature on trade between centre and periphery. Two earlier attempts in modeling such a behavior without including capital are by Sanyal (1983) and Marjit (1987).

Section 2 describes the model and the main result. Section 3 considers further consequences of the main result. Last section concludes.

II. The Model

Consider an economy producing two goods – x and y . x is produced with labour with ‘ a ’ units of labour producing one unit of x . Production of y requires one period to complete and worker have to be paid at the beginning, thus entrepreneurs require credit for the wage fund. One unit of labour produces one unit of y . This is a Ricardian economy where workers are entrepreneurs. The distribution is given in a continuum such that each worker is represented by $z \in [0,1]$. Each worker is endowed with a wage fund $k(z)$ called ‘capital’.

This is a small open economy with commodity prices and interest rates determined in the rest of the world. However, the credit market is imperfect. If the workers so wish they can buy a bond which pays them r , a return as a lender determined in the rest of the world. Thus, so far as the lending or deposit rates goes, it is fixed at r . However, if they wish to borrow to augment their capital stock they must pay $R > r$.

In the standard literature on credit market imperfection such divergence is a common occurrence. Such a summary view of the imperfect credit market has been quite popular in theories of occupational distribution and poverty trap, as surveyed in Basu (). One can easily bring in adverse selection or moral hazard type assumptions to create an endogenous wedge between R and r . But that is not necessary for the purpose in hand.

At this stage we make an assumption that $k(z)$ is small enough for all z such that it falls short of the required wage fund to produce y . Since to each worker-entrepreneur the imputed cost of producing is $\frac{1}{a}$, the alternative wage rate, our assumption suggests that $k(z) < \frac{1}{a} \forall z$. Once they decide to borrow from the international market, the banks have to incur a loan processing cost some $\alpha > 1$ on top of r , the lending rate. Thus $R = \alpha r > r$. As we shall see shortly given that $R > r$, internal source of financing such projects becomes crucial as predicted in the standard finance literature [Glenn Hubbard (1989)]. We assume competitive commodity markets where price has to be equal to average cost of production.

With this backdrop we can now specify the incentive of a representative worker to be an entrepreneur and engage in producing y rather than x .

$$P + \frac{1}{a} (1 + r) - \left[\frac{1}{a} - k(z) \right] (1 + R) \geq \left[\frac{1}{a} + k(z) \right] (1 + r) \dots \dots \dots (1), \quad P \equiv \frac{P_y}{P_x}$$

Note that RHS represents the opportunity cost of becoming an entrepreneur.

Written differently (1) boils down to

$$P + k(z)(R - r) \geq \frac{1}{a}(1 + R) \dots \dots \dots (2)$$

Note that with perfect credit market ($r = R$)

Hence, (2) boils down to

$$P \geq \frac{1}{a}(1 + r) \dots \dots \dots (3)$$

$k(z)$ vanishes from the scene because with $r = R$, internal financing becomes irrelevant.

(3) also suggests that whether the economy will specialize in x or y depend on whether the return from entrepreneurship $\left[P - \frac{1}{a}(1 + r) \right]$ is positive.

Complete specialization will be the likely outcome if $> \frac{1}{a}(1 + r)$, indicating the fundamental Ricardian proposition.

Let us now rank $k(z)$ such that $k'(z) > 0$ for $z \in [0,1]$ with $P + k(1)(R - r) > \frac{1}{a}(1 + R)$ and

$P + k(0)(R - r) < \frac{1}{a}(1 + R)$ and define \tilde{z} such that

$$P + k(\tilde{z})(R - r) = \frac{1}{a}(1 + R) \dots \dots \dots (4)$$

It is obvious from (3) and (4) that since $r < R$, incentive to produce y seems to be greater with a distorted credit market. However the net incentive, if any, to engage in production of y will be greater in an undistorted credit market, since the following holds,

$$\left[P - \frac{1}{a}(1 + r) \right] - \left[P + k(z)(R - r) - \frac{1}{a}(1 + R) \right] = \left[\frac{1}{a} - k(z) \right] (R - r) > 0 \text{ as } k(z) \leq \frac{1}{a} \text{ for } z \leq \tilde{z}.$$

Since $k'(z) > 0$, $\forall z \geq \tilde{z}$ workers will become entrepreneurs in y and for the rest, x seems to be more profitable. Thus even if (3) holds with strict inequality, (4) may discourage all $z < \tilde{z}$ to become entrepreneurs in y , thus causing deviation from the first best allocation.

Therefore $(1 - \tilde{z})$ will be the amount of y that will be produced and $\frac{\tilde{z}}{a}$ will be the amount of x .

We now turn to the main result of the paper.

We consider two exactly identical economies embedded in the world facing the same P, r, R , etc. with exactly similar distribution of $k(z)$. Now suppose that production of y can be done in fragments i.e. by splitting up the production process. [Jones and Kierzkowski (2001)] so that if one country produces λ fraction of the value, the other will produce $(1 - \lambda)$ fraction, trade and mix them to produce one unit of y . Let us try to rewrite the incentive constraint (1) when the economy we have started with produces λ fraction of y and imports $(1 - \lambda)$ fraction from the other, from its exactly identical counterpart.

The new constraints looks like

$$\lambda P - \left[\frac{\lambda}{a} - k(z) \right] (1 + R) + \frac{1}{a}(1 + r) \geq \frac{1}{a}(1 + r) + k(z)(1 + r) \dots \dots \dots (5)$$

Note that the country gets λ fraction of the net value employing λ fraction of worker who can work $(1 - \lambda)$ fraction in x and get $\frac{1}{a}(1 + r)$ in total.

(5) is rewritten as (6)

$$P + \frac{k(z)}{\lambda}(R - r) \geq \frac{1}{a}(1 + R) \dots \dots \dots (6)$$

Note the change in (6) from (2)

In fact LHS in (6) is greater than the LHS in (2) implying greater incentive to produce y . Fig-1 depicts \tilde{z} in two different cases with \tilde{z}_2 (in (6)) being less than \tilde{z}_1 (in (2)).

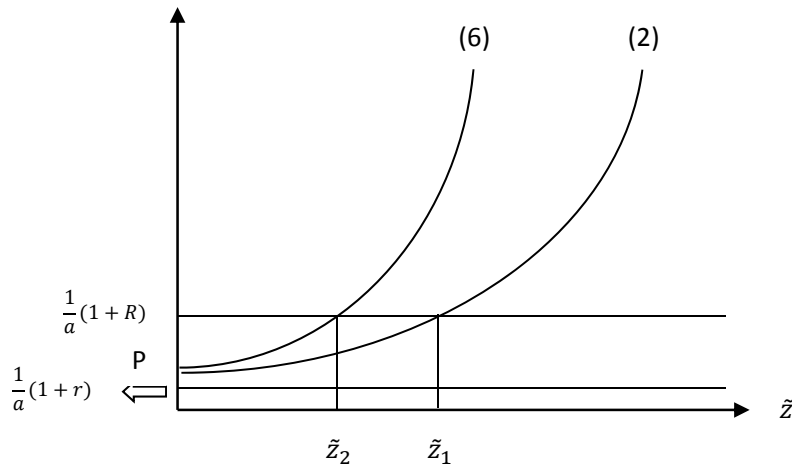


Fig - 1

As $\lambda < 1$, LHS in (6) is greater than RHS in (6) for $\tilde{z} = \tilde{z}_1$, implying a drop in \tilde{z} to \tilde{z}_2 .

Figure 1 has been drawn to indicate $P > \frac{1}{a}(1+r)$ which implies that if there is no distortion in the credit market, the economy would have specialized in y . If we allow trade in fragments \tilde{z} drops and we have $\lambda((1 - \tilde{z}(\lambda)))$ working hours being spent on y .

Another important point is to convince ourselves that the trading nations both suffering from credit market imperfection will trade without any reference to comparative advantage. It is possible that the closed economy can engage in internal trade when agents produce fragments of y . But whenever another country appears in the horizon, there will be inter-country trade provided technological considerations do not prohibit further fragmentation. The point we are trying to make is that, since $R > r$, there are latent diseconomies of scale and fragmentation allows higher income.

We take up both issues in little more detail in the next section.

III. Trade, Fragmentation and First Best Allocation

How does $\lambda(1 - \tilde{z}(\lambda))$ behave once we lower λ which leads to a decline in \tilde{z} . We shall demonstrate that in terms of the following proposition.

Proposition-1:

Trade in Fragments allows a movement towards first best allocation from autarky i.e. ($\lambda = 1$)

iff $\tilde{z} > \frac{1}{1+\frac{1}{\epsilon}}$ where $\epsilon \equiv \frac{k'(\tilde{z})}{k(\tilde{z})} \tilde{z}$

Proof:

If $P > \frac{1}{a}(1 + r)$, only y will be produced and we define it as the first best allocation where $\tilde{z} = 0$, All working hours are devoted to production of y.

Given that $k(\tilde{z}) = \frac{\lambda[\frac{1}{a}(1+R)-P]}{(R-r)}$ (from (6))

$$\frac{d[\lambda(1-\tilde{z}(\lambda))]}{d\lambda} = 1 - \tilde{z} \left(1 + \frac{1}{\epsilon}\right) \dots \dots \dots (7)$$

Where $\epsilon = \frac{k'(\tilde{z})}{k(\tilde{z})} \tilde{z} > 0$ denotes the elasticity of distribution of capital or wage fund stock with respect to \tilde{z} .

Therefore (7) will imply

$$\frac{d[\lambda(1-\tilde{z}(\lambda))]}{d\lambda} < 0 \text{ iff } \tilde{z} > \frac{1}{1+\frac{1}{\epsilon}} \dots \dots \dots (8)$$

If \tilde{z} initially (with $\lambda = 1$) is such that $\tilde{z} > \frac{1}{1+\frac{1}{\epsilon}}$ and we allow trade in fragments \tilde{z} drops and given given (8) L_y i.e. total allocation of labour in y increases and we move towards the first best QED.

Proposition 1 clearly state that for \tilde{z} lower than $1 + \frac{1}{\epsilon}$, trade in fragments will induce more people to be entrepreneurs but total allocation of labour for production of y will actually fall. As more people come into sector y, the existing ones allocate less working hours towards production of y. It is a tradeoff between extensive and intensive margin. Countries with smaller amounts of $k(z) \forall z$ are likely to generate a higher \tilde{z} at the initial equilibrium ($\lambda = 1$) implying the reluctance of the people to move into y as $R > r$. Surely, in such cases trade in fragments will lead to greater production of y and lower production of x. However, if initial \tilde{z} is fairly low,

further decline in \bar{z} may actually reduce production of y . Since $(1 - \bar{z})$ is relatively high, a drop in λ (from $\lambda = 1$), impacts more heavily on y which can not be compensated by allowing more workers in production of y .

Let us now consider a case where at least some workers are endowed with enough capital so that they do not have to borrow. Since $k'(z) > 0$

Let us stipulate some \bar{z} such that $k(\bar{z}) = \frac{1}{a}, \bar{z} < 1$

Therefore for $z \in [\bar{z}, 1]$, workers-entrepreneurs do not need to borrow. This incentive constraint boils down to

$$P + \frac{1}{a}(1+r) + \left(k(z) - \frac{1}{a}\right)(1+r) \geq \frac{1}{a}(1+r) + k(z)(1+r)$$

$$\text{or, } P \geq \frac{1}{a}(1+r)$$

In Fig-1 we have P exceeding $\frac{1}{a}(1+r)$. Therefore, all such worker-entrepreneurs beyond \bar{z} will definitely produce y . Fig-2 summarizes the new equilibrium.

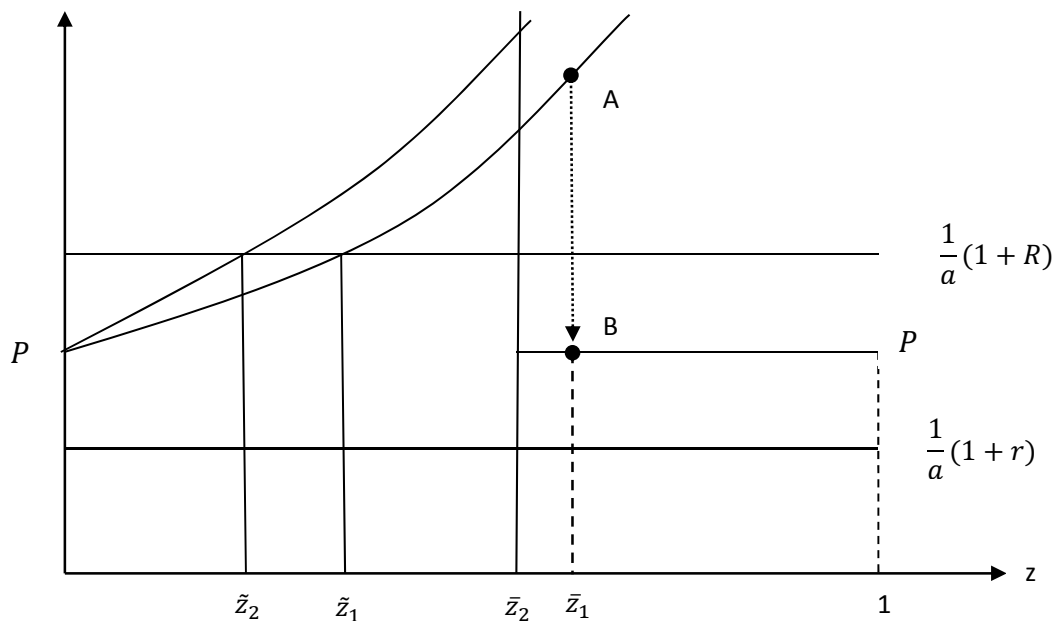


Fig - 2

Initially up to \tilde{z}_1 were engaged in x and \tilde{z}_1 to 1 were engaged in y. But from \bar{z}_1 to 1, the incentive constraint jumps down from A to B and coincides with the price line. With fragmentation \tilde{z}_1 declines up to \tilde{z}_2 and z_1 declines up to \bar{z}_2 .

In fact relatively rich workers i.e. indexed \bar{z} and beyond do not need to engage in trade in fragments since λ does not affect their incentive constraint. However, now more people do not face the constraint any more and $\bar{z}_2 < \tilde{z}_1$. Thus the prediction of the model is that with credit constraints binding, relatively poor will engage in trade. Net benefit from trade, net of the opportunity cost is greater for those who face the credit constraint because for them having greater amount of internal finance provides an added benefit. For those who does not face the borrowing constraint own finances do not matter. While relatively rich will be reluctant to trade in fragments, relatively poor will be eager to engage in such a trade. Of course those who continue to produce x will not derive the benefit from trade in fragments. Thus the workers are divided into three categories. First, the poorest who wish to move into y sector but will find credit too costly to borrow and will produce x. Second, those who will borrow and trade in fragments to produce y. Third, the richest ones who will produce y but will be indifferent towards trade in fragments.

IV. General Equilibrium with endogenous P

In the last section we have determined \tilde{z} as satisfying

$$P + k(\tilde{z})(R - r) = \frac{1}{a}(1 + R) \dots \dots \dots (8)$$

Given $k' > 0$ (8) implies that with an increase in P, $k(\tilde{z})$ will fall and \tilde{z} will fall. Total production of Y denoted by $(1 - \tilde{z})$ will rise and as \tilde{z} goes down, production of X will decline. Thus we get a relationship such as

$$Y/X = f(P) \dots \dots \dots (9) \quad \text{With } f' > 0$$

Remember we are in an autarky and we close the model by a homothetic demand function

$$\frac{D_Y}{D_X} = \phi(P) \dots \dots \dots (10) \quad \text{With } \phi' < 0$$

From (2) and (3) we determine the autarkic equilibrium relative price P_0 and the rest of the variables given R and r. Note that we shall get identical relative price in both countries as they are exact replica of each other.

As we open up trade in fragments we get different \tilde{z} in both countries. Without loss of generality let us assume that the production process of Y can be divided into only two fragments of equal size. Such a division is technologically given which splits up the process in half.

The way we have defined \tilde{z} now is

$$P + \frac{k(\tilde{z})}{1/2}(R - r) = 1/a(1 + R) \dots \dots \dots (11)$$

We have shown earlier that at any given P, \tilde{z} will fall. Given P, we have same \tilde{z} in both countries and they are lower. Total production of Y at a given P in each country is determined by

$$Y = \frac{1}{2}(1 - \tilde{z}_T) \dots \dots \dots (12)$$

Recall that now $1/2$ of working hour is spent on X by each worker-entrepreneur in Y although \tilde{z}_T is lower than \tilde{z}_O , the autarkic \tilde{z} . We have already analyzed that for the general case $\lambda \neq 1/2$ the total production can go either way. However, in the market example, total production of Y in two countries will be given by

$$2 \times \frac{1}{2}(1 - z_T) = (1 - z_T)$$

Since $z_T < z_O$, total production of Y must increase. Typically in new equilibrium relative supply of Y will increase and P will fall. This is exactly what is expected because the process of trade is also a process of technological progress as it releases the credit constraint for both countries. Trade allows for greater production of Y as entrepreneurs move into Y. In general the effect of trade on aggregate production will be ambiguous since in the general case z_T will depend on λ or $(1-\lambda)$ as the case may be.

V. Concluding Remarks

Central message of this paper is that economies constrained by the availability of credit as reflected in a difference between the borrowing and the lending rate will have a natural tendency to trade with each other by fragmenting the production process. Thus exactly identical countries will gain from trade by sharing production of the credit intensive good releasing the pressure on their internal finance. In the typical Dixit Stiglitz Krugman type models identical economies gain from trade by consuming greater number of varieties. Ours is a standard Ricardian model of inter industry trade. Comparative advantage does not play any role here. Countries will trade even if they have exactly identical technologies. Smaller sized activities to some extent alleviate the problem of credit market imperfection. International trade in fragments allows firms to choose smaller size of output which suffers the credit constraint.

The model suggests that those with more than adequate amount of capital are not likely to engage in such trade simply because internal financing does not assume a special role in this context. Relatively poor workers – entrepreneurs will engage in trade in intermediate or fragments. Fragmentation contributes in terms of encouraging entrepreneurs among the relatively poor echoing the observations in Jones and Marjit (2001).

We have deliberately suppressed all differences between the countries, especially those that lead to comparative advantage. It does not matter how the production activity is divided between the countries. As long as such activities can be divided there will be natural gains from trade. In an otherwise scale neutral world availability of credit assumes a critical role. “Small” as a size seems to be more convenient than the “Large”. We have not explicitly worked out the case when a country with unconstrained entrepreneurs faces another where credit is available only at a premium. It is clear as long as $P > 1/a(1+r)$, the richer nation will specialize in Y. But in that case the constrained economy will do better in supplying fragments to the richer nation.

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