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Trade Between Similar Countries: The Role of Credit Market Imperfection

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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.

Keywords: Trade, Credit Market, Gains from Trade

JEL Classification: F 10

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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”.

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 deal with comparative advantage at all. 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. 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. 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)).

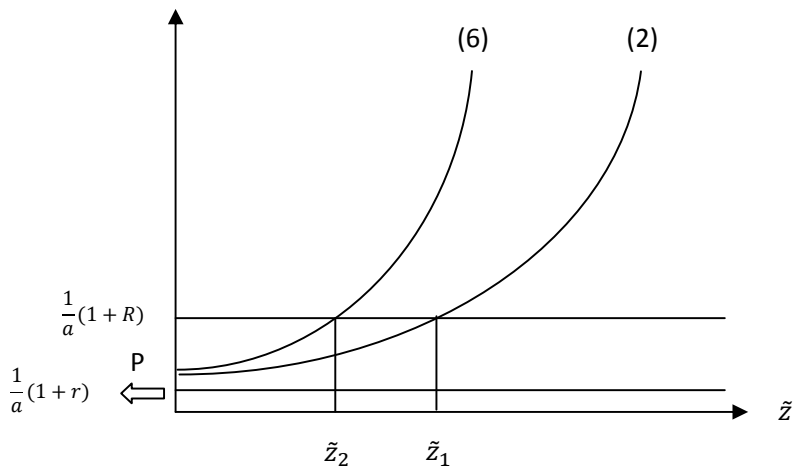


Fig - 1

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))

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

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

Therefore (7) will imply

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

If \tilde{z} initially (with $\lambda = 1$) is such that $\tilde{z} > \frac{1}{1+\frac{1}{\varepsilon}}$ and we allow trade in fragments \tilde{z} drops and 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 $1 + \frac{1}{\varepsilon}$, 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 \tilde{z} may actually reduce production of y. Since $(1 - \tilde{z})$ 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.

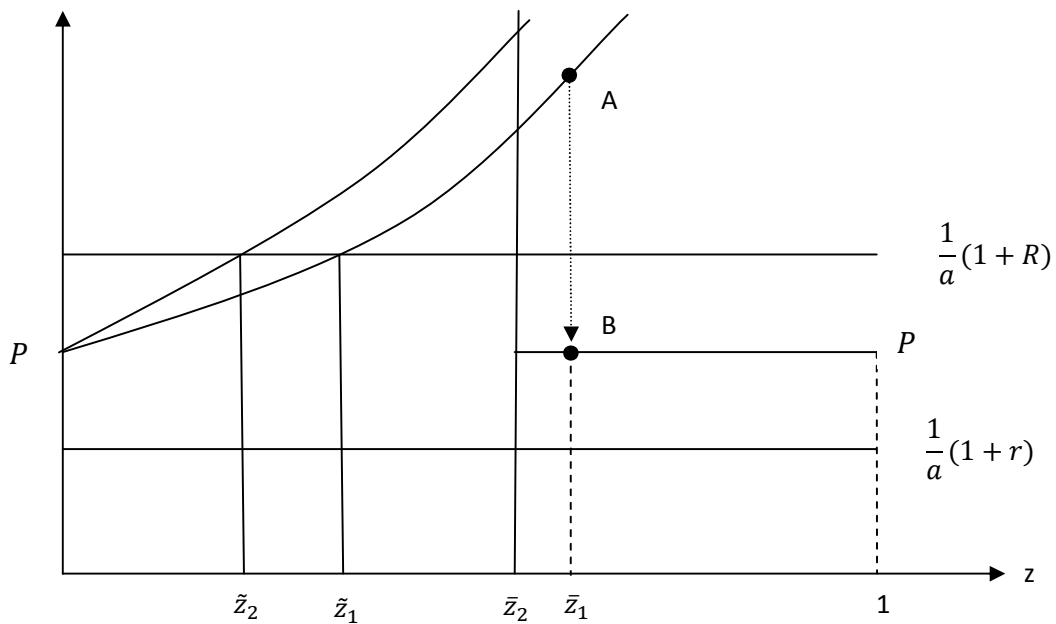


Fig - 2

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. 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”. The next task is to endogenize both price and interest rates in the context of two large open economies.

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