

## **Poor Predictive Power and the Unrealism of International Trade Models: Proposing a More Realistic (Behavioral Economics Based) Model**

**Hamid Hosseini**  
**King's College**

*Beginning with David Ricardo, if not Adam Smith, economists have developed numerous models to explain, and predicts, trade among nations. As I will demonstrate, these models have had poor predictive powers. It is possible to argue that neither gravity model, nor different versions of the comparative advantage doctrine, or even the more recent model developed by Paul Krugman, could explain international trade during the great recession that began in August 2007. For example, these models could not explain why between the first quarter of 2008 and the first quarter of 2009 global GDP fell by 4.5% while world exports declined as much as 17%. The scale and speed of that trade collapse poses a challenge to various international trade models. As I will demonstrate, this problem very much stems from lack of realism on the part of the assumptions of those models, the inadequacy and incompleteness of the causes of specialization in those models, or the neglect of trade finance in all those models. In this paper, attempt is made to develop a more realistic model that would overcome the shortcomings of the above international trade models. Prior to the development of my proposed model, I will review all of the above models and discuss the causes of specialization in them.*

### **INTRODUCTION**

During the last few centuries, economists have developed various models to explain trade among nations. These models, which have assumed that trade essentially takes place among nations and not firms or individuals of various countries, have included Adam Smith's notion of absolute advantage, the Ricardian model of comparative advantage, the Heckscher – Ohlin model, the Samuelson – Jones specific factor model, the gravity model developed by Tinbergen (in 1962), Paul Krugman's model which emphasizes economies of scale and product differential, and others. In these models, trade among nations, thus international specializations can be explained by various factors. For example, while for Smith and Ricardo trade among nations and specialization would occur on the basis of labor productivity, in the H-O model, specialization among nations takes place on the basis of each country's resource endowment, in the gravity model trade between two countries is directly related to the size of GDPs of those two nations and inversely related to distance between those two countries. No doubt, all these causes have been relevant in explaining international trade to some extent.

However, all these models have had poor predictive powers. For example, neither gravity model or any other models can explain international trade during the great recession that began in August 2007. For, as between the first quarter of 2008 and the first quarter of 2009 GDP fell by 4.5%, exports declined by 17%. The scale and speed of that trade collapse poses a challenge to various models of international trade. In my view, this very much stems from lack of realism on the part of those models – in their

simplistic assumptions, or in the inadequacy and incompetence of the cause of specialization those models assume. This paper argues that by adhering to the attributes of behavioral economies we can explain the world economy better and overcome the shortcomings that the above models face in their predictive powers. Thus, this essay, after describing some of the shortcomings of the above models, will try to construct a more realistic model of international trade. Prior to constructing the model, we will demonstrate that trade for the most part takes place among firms, and that firm may face various difficulties, including perceptual problems and the role that trade finance plays for individual exporting firms.

## **THE UNREALISM OF THE ABOVE TRADE MODELS**

Although Adam Smith emphasized the benefits of free international trade and the need for countries to specialize on the basis of labor productivity in his theory of absolute advantage, it was David Ricardo who began to model international trade among nations on the basis of comparative advantage and labor productivity.

The two country, two commodity model, one factor Ricardian model of international trade is very simplistic in its assumptions, among them that international specialization takes place on the basis of labor productivity alone. While the importance of labor productivity in international specialization cannot be ignored, however, the Ricardian model makes misleading assumptions and predictions in numerous ways. The Ricardian models, for one thing, assumes perfect specialization in each country, an assumption which cannot be observed in the real world. Because the Ricardian model is a one-factor model, it ignores that differences in resource endowment too can be a cause international trade. The Ricardian model does not also acknowledge the impact of international trade on income distribution within trading countries. As a result of this unrealistic assumption, in effect, the Ricardian model incorrectly assumes that each trading country as a whole always gains from international trade.

In the Ricardian model, while labor, as the only factor of production, is unable to move internationally (which, obviously is not totally true), it is assumed to be mobile domestically, being able to move from one industry to another. This domestic mobility will guarantee that individuals (as workers) will not be hurt by international trade. As a result, in the Ricardian model of international trade, not only that all countries which participate in international trade would benefit from global trade, but also assumes that international trade would also benefit every individual within participating countries – i.e. no effect on distribution of income. This assumption is not accurate, since international trade has substantial effects on the distribution of income within each country, and that benefits of international trade are often uneven. Why? We have to remember that resources (including labor) cannot move from one industry to another immediately and without cost, and that different sectors' demand for resources (including labor) are not exactly the same.

As the works of Paul Krugman and others have demonstrated, economies of scale too can be viewed as a cause of global specialization. By ignoring this point, the Ricardian model cannot explain the large trade flows between apparently similar countries.

While the H-O model of international trade, by allowing for more than one factor of production, can be viewed as an improvement over the Ricardian model, it is also simplistic in its assumptions, thus, has had problems making accurate empirical prediction of the pattern of international trade. This explains the (1953) Leontief paradox, demonstrating the inability of the H-O model in explaining trade of the United States visa vs. other economies, and the 1987 (global) test by Bowen, Leams, and Sveikavan which was done for twenty seven countries. This model, with simplistic assumptions of constant returns to scale, perfect competition, international immobility of the factors of production, and the same technology for the same good in both (all) countries, assumes that the county that is abundant in a given factor exports the good whose production is intensive in that factor (i.e. H-O theorem), and international trade leads to factor – price equalization. The assumptions of the gravity and other trade models too are not very realistic. For example, while GDP and distance, assumed by gravity model as determinants international trade, are important, there are other factors that are ignored by the model.

## **TRADE TAKES PLACE AMONG FIRMS**

Certainly, labor productivity, resource endowment, economies of scale, and GDP size and distance among nations affect international trade. However, we should realize that international trade, with some exceptions, usually takes place among firms (usually multinational enterprises). Those exceptions being when a nation's resources are owned by the government, or when governments regulate or control all or aspect of international trade. The first of these includes various oil exporting countries, like Saudi Arabia, where oil resources, the bulk of their international trade, are owned by the government. The second example includes a country such as the United States or the European union members, when regulating aspects of their international trade. For example, because of U.S. sanctions, American firms cannot trade with Cuba, North Korea, or Iran (or, starting with July 1, 2012, firms within the EU cannot purchase oil from Iran). Outside of these two exceptions, trade usually takes place among firms, and trade theory among firms is very much influenced by other factors. The so-called new trade deals with firms as the basis of international trade. However, in my view, for firms to be successful exporters, two factors, not mentioned by this new body of thought, become significant. One factor, somehow related to perceptual abilities is what some writers have called psychic distance. The second factor, a financially-based factor, is based in what is called trade finance. Both of these factors have been ignored by various models of international trade, including the latest ones.

If firms are viewed as agents of international trade, it is important to realize that not all firms within a country have the same opportunity to engage in international trade. It is also important to realize that firms doing trade with other nations face a much more complex environment than if they were trading with firms within the same country; this complexity often leads to a great deal of uncertainty. Traditional models of trade have ignored these types of complexity and uncertainty. Traditional models of international trade have more or less assumed some type of comparative advantage, i.e. differences in opportunity costs of production, for trading nations. While for the Ricardian version these differences emerge from differences in labor productivity in different countries, in the Heckscher-Ohlin version comparative advantage among nations stems from differences in the endowments of the factors of production among nations. In newer models, comparative advantage may emerge from economies of scale, etc. if especially the first two factors were the only causes of international specialization and international trade, then most if not all firms in a country with comparative advantage would engage in international trade. Yet, as emphasized by Andrew Bernard, Bradford Jenson, Stephen Redding, and Peter Schott, that is not the cast at all. As those authors argued in their 2007 *Journal of Economic Perspective* essay, "Of the 5.5 million firms operating in the United States in 2000, just 4 percent were exporters. Among these exporting firms, the top 10 percent accounted for 96 percent of total U.S. exports". Obviously, the firms engaged in more exporting must have various advantages that those with less exports or nor exports lack. The firms that export more must have advantages that would allow them to overcome some of the difficulties and complexities associated with international trade.

## **PSYCHIC DISTANCE AND INTERNATIONAL TRADE**

As stated earlier, firms, as agents of international trade, face a complex environment dealing with both exporting and importing as compared to their engagement in the home market. In fact, this fact was acknowledged by writers as early as 1956, when economist W. Backerman, in his *The Review of Economics and Statistics* paper, discussed what became known as psychic distance as a barrier to international trade. To him, in addition to geographical barriers (such as distance, which emphasized in the Gravity Model) psychic distance too can be a factor in international trade. (1956, p.36). Some ten years later, in his 1966 book an *Econometric Study of International Trade Flows*, H. Linnemann too viewed it as a barrier to international trade, which Joliet and Hubner defined as: "The perceived distance between the home country and a foreign country, resulting from the differences in terms of cultural, business, and political differences, i.e. in language, political and legal systems, trade practice, etc." (2003, p.5).

Although psychic distance as a topic had been discussed by Beckerman in 1956 and by Linnemann in 1966, it gained prominence in the mid-1970s with the introduction of what has become known as internationalization theory in international business. This was done by the members of the Uppsala School in Sweden, in the works by Johanson and Vahlne (1977) and others. Johanson and Vahlne viewed language, culture, political systems, level of education, etc. as factors influencing the internationalization process. To those writers, firms are likely to begin their internationalization expansion, such as trade, into countries that are psychically close, before gradually expanding into countries that are psychically distant. To Johanson and Vahlne, because of the complexity issue, (insufficient knowledge, etc.) the first step in the internationalization process is “exporting to a country via an agent, later established a sales subsidiary...”. (1977, p.24). Obviously, this entry sequence for the firm engaging in international trade will begin in psychically close markets, to be followed into more psychically distant markets. In a manner similar to the proponents of behavioral economics, members of the Uppsala School, viewed psychically distance consists of factors that prevent or disturb firm’s learning about and understanding of foreign environment. (Nordstrom and Vahlne, 1994, p.43). The 1998 description of D.J. Lee too is similar to a description by someone adhering to behavioral economics, since, to him, psychic distance stems from perceptions about both cultural and business difference of home and foreign markets. (1998). To demonstrate these differences, Nordstrom and Vahlne even developed a psychic distance index, measuring those differences, between Sweden and various other countries. Using the same methodology, Romen and Shenkar found that Canada and the United States were almost the same. (See O’Grady and Lane, 1996, p.312).

As some writers have argued, perceptions associated with psychic distance may even lead to the opposite results. Using psychic distance index, one would expect that Canadian firms having more success trading with firms in the United States. However, in their 1996 study, O’Grady and Lane found that Canadian firms which entered the United States market experienced a great deal of failure. This is what O’Grady and Lane called psychic distance paradox. (1996, p.31). The explanation those two authors gave for that paradox was as follows: “Instead of psychically close countries being easy to enter and to do business in, we argue that perceived similarities can cause decision makers to fail because they do not prepare for the differences”. (p.10). In other words, “These mental maps or preconceived ideas of the United States, and what it would be like to do business there, created barriers to learning about this new market”. (p.325).

## **INTERNATIONAL TRADE AND TRADE FINANCE**

As stated before, the decline in world exports during the great recession that began in 2007 was much more than the decline in world GDP – while the value of world GDP fell by 4.6%, world exports fell by 17%. As suggested by Mary Amiti (2009, p.1), this decline in exports could not be explained by the gravity or other internal trade models. This demonstrates the fact that firms engaged in international trade are also affected by trade finance, a factor ignored by various international trade models. More specifically, this suggests that the health of banks and other financial institutions providing trade finance to firms which engage in international trade has a much larger effect on exporting than it has on domestic sales. This should be obvious since exports are much more sensitive to financial shocks like the one occurring during the great recession, since exports have much more default risk and higher working capital requirements than domestic sales in any country. Since firms engaging in exporting typically lack the ability or willingness to evaluate and measure default risk themselves, it explains why those firms often turn to banks to provide payment insurance and guarantees, and work with banks or other financial institutions to acquire credit or exporting guarantees. In fact, Mark Aubrin (2007), using data from the Joint-IMF-OECD-World Bank Statistics on External Debt, estimated that 90 percent of international trade transactions involve some form of credit, insurance, or guarantee issued by a bank or financial institutions. This is what is typically called trade finance, in other words “the use of financial intermediaries to manage an exporter payment risked terms”. (Ibid, p.2) In fact, the role of trade finance in international trade was very much seen in the case of Japanese economic crisis during the 1990s.

Trade finance matters much more for international trade than domestic trade, because international trade is much more sensitive to financial shocks. International transactions are often viewed as much more risky than domestic transactions for at least two reasons. First, firms engaged in international trade have difficulty understanding and using foreign legal systems in the event of default or delay in payment. Second, “exporters often have much less information about counterparty risk and therefore are less willing to extend trade credit themselves”. (Amiti, p.6). As a result of these two factors export insurance is an enormous business. Of course, exporters also use trade finance since international trade takes a great deal more time to execute. These factors demonstrate the importance of trade finance, explaining why 90% of international trade transactions involve some type of credit, insurance, etc.

Why did international trade collapse after 2007? One may attribute that the rise of trade barriers. While there was an increase in the rhetoric of protection, in 2008 and 2009, however, as suggested by Mark Wynne, “there is very little evidence to date that this rhetoric translated into more restrictive trade policy”. (2009, p.6). It seems that policy makers among more industrialized countries have absorbed the lesson of the Great Depression, when protectionist trade policy exacerbated the downturn”. (Ibid).

As argued by Mark Wynne, the financial crisis that began in August 2007 had a more direct impact on trade flows, over and above the effect it had through the decline in economic activity. Why? “One possibility is that stress in the financial system caused financial institutions to out back or trade finance to exporting firms. (p.8). Existing models of international trade do not assign an important role to access to trade finance as an important determinant of trade. According to Wynne, the evidence available suggests that access to trade finance is an important determinant of firm’s ability to export and that the declines in exports to the United States were greatest among firms in countries where access to finance was already limited and for firms that were most dependent on external finance, had the lowest collateralizable assets and had the least access to trade credit. (Ibid, p.13).

## **UTILIZATION OF BEHAVIORAL ECONOMICS TO MODEL INTERNATIONAL TRADE**

As explained before, notwithstanding some exceptions, international trade occurs among firms and not national governments. Specifically, international trade occurs among internationally engaged firms, whether multinational or international companies. Whether MNCs or not, these entities have decision makers who, as real human beings, are boundedly (and not omnisciently) rational individuals who face very complex global environments. Being real, these decision makers do not possess identical capabilities to obtain information relevant to the benefits and difficulties of their decisions to engage in international trade. In various international trade models, no such differences exist. In fact, information processing skills of these decision makers-whether about what has been called psychic distance, the possibility/difficulty of trade finance, or about the possibility of gainful international trade – are non-homogenous, and the uncertainties they face are agent specific. Undoubtedly, in this uncertain environment, the decision-makers within those globally engaged organizations must make decisions whose difficulties – in terms of both psychic distance and trade finance – exceed their own competence. As a result, decision making for those individuals moves from one of risk to that of uncertainty. In other words, while the international environment faced by those decision makers is very complex, decision makers have limited capacity for facing this complexity. (See Hosseini 2003 and Hosseini 2006). But how should we model decision making for companies that engage in international trade in this complex environment?

Let us limit ourselves to the decision-making process of companies that engage in international trade (never mind that many exporters do also import and engage in foreign investment). Then, assume that  $U$  represents the uncertainty associated with making a decision to export for companies whose decision-makers are influenced by psychic distance as well as the ease and difficulty of attaining trade finance. We can argue that  $U$  is a decreasing function of  $P$ , i.e. the perceptual abilities of knowing the ease-difficulty of obtaining trade finance and understanding the degree of psychic distance. We can also argue that  $U$  is an increasing function of the complexity of the global trade environment reflecting the ease-difficulty of trade finance and the degree of trade finance. Since the complexity of international trade environment

increases with an increase in psychic distance and the difficulty of obtaining trade finance, we can argue that this complexity is a measure of psychic distance and the difficulty of obtaining trade finance, which we would designate as E. No doubt, E itself is a decreasing function of newly attained information about psychic distance (i.e. cultural, political economic) and the difficulty of trade finance, or N. Thus, we can write:

$$u = (P, E, N) \Rightarrow \text{equation 1}$$

where:

$$\dot{u}(P) < 0$$

$$\dot{u}(E) > 0$$

$$\dot{u}(N) < 0$$

New information (N) may either increase or decrease the risk-adjusted value of an exporting decision. Obviously, an increase in N decreases the complexity of the international trade decision, being able to help decision makers within firms to revise previously held expectations about the country which they want to export to, and the possibility of receiving trade finance. Further, the impact of this new information may be positive or negative. Positive new information can increase the size/volume of intended exports, while negative new information can lead to a reduction in its volume. Of course, we have to realize that international information gathering, or even information about the ease –difficulty of trade finance, should be viewed as subjective, since different firm decision maker would react to new information differently.

In our model, the decision to export, and the amount to be exported, is a function of the level of uncertainty about exporting faced by the firms involved. The conditional probability that the firm engages in exporting when it should depends on this uncertainty we would term R (U). We would also let

W(U) denote the conditional probability of making an export decision when it should not. Obviously, both R and W are functions of U, which we defined as the uncertainty associated with making a right export decision. We can also argue that:

$$\dot{R}(U) < 0$$

$$\dot{W}(U) > 0$$

Thus, as uncertainty (U) increases, R will decrease and W will increase, thus the ration of R/W will decrease.

To proceed further, let us assume that:

Q (E) is the probability that the firm's export decision is correct, and 1 – Q (E) the probability that the firm's export decision is incorrect (again, E being a measure of complexity in terms of psychic distance and trade finance).

Let us also assume that, for the firm, if it exports when it should its success is shown by a positive profit (gain) rate of G (E), and if it exports when it should not it fails, as measured by a loss of L (E). If that is the case, then firms should know exporting should take place if the expected gain (i.e. success rate) exceeds expected loss (i.e. failure rate). Because we argue that:

$$\text{Expected gain} = G(E) = R(U) \cdot Q(E) \text{ and}$$

$$\text{Expected loss} = L(E) = L(E) \cdot [1 - Q(E)],$$

Then we can write (equation #2) as:

$$G(E) \cdot R(U) \cdot Q(E) > L(E) \cdot W(U) [1 - Q(E)] \Rightarrow \#2$$

$$\text{Dividing both sides of equation (\#2) by } = G(E) Q(E) \cdot W(E)$$

We will have:

$$\underline{G(E) \cdot R(U) \cdot Q(E)} \quad \text{is greater than} \quad \underline{L(E) \cdot W(U) \cdot [1 - Q(E)]}$$

$$G(E) \cdot Q(E) \cdot W(U)$$

$$G(E) \cdot Q(E) \cdot W(U)$$

Since this is equal to  $U(P, E)$ , and we can call the above equation  $R$  the reliability condition, or  $B(P, E)$ .

We can re-arrange equation #2 to get our #3 equation, thereby introducing the tolerance limit,  $T(E)$ .

$$B(P, E) \frac{R[UCP, (E)]}{W[UCP, (E)]} \text{ is greater than } \frac{L(E) \cdot [1 - Q(E)]}{G(E) \cdot Q(E)} = T(E), \text{ or equation \#3}$$

The left hand side of the inequality in equation #3 is the reliability ratio, which is the ratio of our conditional probabilities, in other words the probability of correctly exporting when the entry leads to profit, relative to the probability of exporting when that exporting decision leads to a loss. This ratio shows that an agent's competence-complexity gap affects the relative probability of making an export decision compared to the probability of making a correct export decision.

$T(E)$  in that equation is the tolerance limit. In the context of exporting to foreign countries,  $T(E)$  should be different depending upon the risk-adjusted expected values. Obviously, as the risk-adjusted expected value of an export decision becomes negative (due to a large psychic distance, or difficulty of obtaining trade finance), the exporting project becomes less desirable for the firm.  $T(E)$  of greater one represents inability to export due to a large psychic distance and difficulty to obtain trade finance, and  $T(E)$  of less one but positive is the opposite. At any time, the risk-adjusted expected value of an export project may be positive or negative depending upon the positive/negative values of  $G(E)$ ,  $L(E)$ , and  $Q(E)$ . In this model, the value of  $T(E)$  may deviate from the value of one which would explain represent a behavior change for the firm's decision makers. The degree and speed of this change depends on the reliability ratio, which in turn depends on the conceptual competence to interpret new information, and the degree of  $T(E)$  divergence from one.

It is possible that information about the country the firm wishes to export to, or about the possibility of trade finance, becomes difficult to obtain or understand, or mistakes are made by firm decision makers. If such things occur, actions by exporting firms become unreliable since their competency – gap would be lower. At least partly, this explains the fact that firms in advanced countries would be more willing to export to other industrialized countries. Perhaps this would also explain why such firms would be less willing and eager to export to countries in periods of political upheaval or economic crisis.

This model, relying on the realism of behavioral economics, assumes that decision makers of firms engaging in international trade are non-homogeneous in terms of their perceptual abilities, or their abilities to obtain trade finance. In other words, for those managers.

$$P1 > P2 > P3 \dots > Pn$$

Since all have the same degree of access to information, and all can apply for sources of trade finance, we can argue that uncertainties would be the opposite, or:

$$U1 < U2 < U3 \dots < Un$$

Recalling that  $R(U)$  is the probability that an international export is taking place when it should,  $W(U)$  would be the probability of it when that export should not/would not be made, and that  $R(U)$  is a decreasing function of  $U$  and  $W(U)$  an increasing function of that. As a result we can write:

$$R1(U) > R2 > R3(U) \dots Rn(U) \text{ and}$$

$$W1(U) < W2(U) < W3(U) \dots < Wn(U)$$

As a result of the above, we can write:

$$B1(P1, E) > B2(P2, E) > B3(P3, E) \dots Bn(Pn, E)$$

On the basis of these, a firm's exporting project becomes feasible if each  $B(P,E)$  exceeds its  $T(E)$ . Thus, in the case that information is vague and confusing, it would cause a great deal of uncertainty since  $B(P,E)$  would be less than  $T(E)$ . In other words, the exporting project should not be taken unless more positive information would emerge.

As stated before, international trade takes place among firms and not countries, and that managers of different firms possess different abilities and access to information. Thus, realistically speaking, the reliability rate would exceed the tolerance limit for some firms, and not for others - even for the same trading countries and in terms of trade finance. Thus, for the firms that are able to export successfully,  $B(P, E)$  would exceed their  $T(E)$ .

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