The Influence of Curiosity on Foreign Firms' Export Decision:

From Game Theoretic Approach[1]

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Abstract

This paper studies how domestic consumers and government's curiosity affects foreign firm's entry decision. Game theoretic approach is adopted, and several factors that influence exporters' entry decision are discussed. It is assumed that a firm' entry decision depends on its competitors' decision, which calls for game theoretic analysis. It is also assumed that consumers' curiosity affect their consuming behavior. Equilibrium situations are discussed, and a similar result as is shown by the gravity equation is derived. It is also analyzed in the paper how domestic government's preferential duties affect foreign firms' entry decision, which in turn influences domestic country's trade policy making. The result derived on this issue is similar to that derived by using the Median Voter Model in international trade.

I. Introduction

Analyzing international trade theory from a perspective of game theory becomes popular in today's literature. Including game theory in analysis has made significant contribution to trade theory. Just as some scholars point out, it is especially appropriate that contribution of game theory is made to the field of international trade, "since both theory and practice in this area (international trade) have been revolutionized as a consequence of issues game theory addresses" (Abbott and Kallio 1996)

In recent year, many scholars have realized the importance of the role game theory plays in international trade. In early literature, some have pointed out that a dynamic game allows the inclusion of both importers and exporters in a multiperiod framework (Karp and McCalla 1983). Those scholars apply a Nash noncooperative difference game to the international corn market to explore the plausibility of numerical results. They suggest in their paper that a difference game based on a better econometric model could be useful for policy analysis. In 1987, Avinash Dixit discusses, from a game theoretic point of view, whether being a small country can be an advantage in international trade. He considers three issues, oligopolies, bargaining and alliances, and argues the economic advantage or disadvantage of size are made under each issue (Dixit 1987). Dixit's paper is highly commented by following scholars, since it points out a new direction for research on international trade and strategic behavior (Kierzkowski 1987).

Most literature that combines game theory and international trade yields insight into the policymaking problem. Game theoretic analysis is important in making the optimal national

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trade policy, since it depends on what other nations' policies are. By solving for the static Nash equilibria in the quota and tariff games, Bagwell and Staiger (1990) reaches the result that as the volume of trade expands, the level of protection must rise in a cooperative equilibrium to mitigate the rising trade volume and hold the incentive to defect in check (Bagwell and Staiger 1990). Mayer (1991) demonstrates in his paper that if countries are divided internally between divergent interests, this will alter the outcome of strategic games between countries in policymaking, such as setting tariffs. In 1993, Johnson, Mahe and Roe use a world trade model couples with game theory to search for mutually acceptable agreements between the United States and the European Community (Johnson, Mahe and Roe 1993). They demonstrate that game theoretic analysis of GATT plays a role in the process and outcome of trade negotiation, and their results suggest that it is in the best interest of the United States (resp. EC) for the EC (resp. US) to liberalize while the other follows the status quo. Qiu (1994) points out that when cost is private information, the home government is confronted by a decision of the tradeoff between two trade policy options: a menu of policies and a uniform policy. The main result from his study is that policy menu is preferred to uniform policy under Cournot competition while the opposite occurs under Bertrand competition (Qiu 1994). Abbott and Kallio (1996) extend the analysis in search of the rationality behind the agreement on agriculture in GATT in which export subsidies are subjected to financial and quantitative constraints (IATRC). Maggi (1999) examines equilibrium trade policies when firms have better information than governments about the profitability of the industry. This analysis suggests that information asymmetries may increase trade policy distortions in equilibrium and worsen the "prisoner's dilemma" between governments(Maggi 1999).

While game theoretic analysis has been widely adopted in the field of international trade, in the fields of international business and marketing, how firms enter foreign markets has also been a topic of strong interest to researchers (Tse, Pan and Au 1997). In the early literature of this topic, Anderson and Gatignon (1986, 1988) and Erramilli and Rao (1993)[12] offer a transaction cost framework for investigating the entry mode decision. Agarwal and Ramaswami (1992) classify the factors determining the choice of a specific foreign market entry mode into three categories: ownership advantages of a firm, location advantages of a market, and internalization advantages of integrating transactions. Tse, Pan and Au (1997) propose a model that describes how host country-, home country- and industry-specific factors affect foreign firms' decisions on how they enter the market and whether they will enter with a partner firm or not. They also describe how operation-related factors, i.e., the location and the level of local government, affect these decisions. Besides these factors, empirical results, based on the entry information of U.S. Fortune 500 firms in China between 1979 and 1996, show that larger firms with greater level of internalization and scope economies are likely to enter this foreign market earlier (Gaba, Pan and Ungson, 2002).

Theoretical discussions abound, but there is an overwhelming lack of combination of game theory, international trade theory and consumption theories together, in analyzing the decision firms make when they decide whether or not to enter a foreign market. Furthermore, literature that analyzes international trade theory from the point of game theory mainly

focuses on the policymaking issue of the importing countries, but generally neglects the decision of exporters. On the other hand, most previous research on foreign entry issue in marketing area only focuses on a single country (Tse, Pan and Au 1997). There is a lack of a more general model that discusses foreign firms' entry decision.

This paper will examine how domestic consumers and government's curiosity affects foreign firm's entry decision. Ideas from international trade, game theory, marketing, and macroeconomics will all be used in this paper. Since both game theory (there is Nobel Prize recognizing contributions of game theory to economic analysis, see Abbott and Kallio 1996) and foreign entry decision (it is regarded as a "frontier issue" in international market by Wind and Perlmutter, 1977) have inspired researchers' great interest these years, the issue discussed in this paper is a very interesting research topic. I hope to make four contributions: First, this paper does not only focus on a particular country, as is done by most previous literature in foreign entry decision, but looks at a more general case. The model discussed in the following sections does not specify a particular country, and can be referred to by countries in general. Second, I have derived in Section II the same result as is shown in gravity equation, and in Section IV a similar result as that is shown by the Median Voter Model, but here my approach is very different from the previous researchers on these issues. That is, my result, which is creative in some sense, provides a game theoretic, marketing and even psychological foundation of the result shown by gravity equation and the Median Voter Model. Third, combining ideas from international trade, game theory, marketing and macroeconomics is a very meaningful attempt, which is seldom seen in previous literature. I hope this paper will, at least to some extent, inspire the readers' interest and deep thinking of this topic. Finally, although the analysis in this paper is mainly theoretical rather than empirical, I hope that this analysis will be helpful to the exporters in making decisions of entering a foreign market. Meanwhile, policymakers in importing country could set up trade policies based on their knowledge of the factors influencing exporters' decision.

The rest of the paper is organized as follows. Section II discusses a "curiosity model", which analyzes how people's curiosity of foreign products can possibly influence exporters' entry decision. Section III discusses how government's preferential duties affect foreign firm's entry decision, which in turn influences domestic country's policy making. Section IV combines these two discussions together, and show in graphs when the firm gets zero profit. Section V concludes.

II. How People's Curiosity Affects Foreign Firm's Entry Decision

The idea of this model comes from a "bank run" model and an exam question from fall 2009 EC 741 class at Boston University (Instructor: Christophe Chamley). Although the original model is not related with international trade or people's curiosity at all, my modeling approach is inspired by this work. But of course, here I have made some obvious changes and extension to the original model (The original model is in *Rational Herds*, Chapter 11, p298-301).

It is not uncommon to see that, when the exporters are among the first ones sell products in a foreign country, people in the importing country will have an obvious "curiosity" in this new imported products. For example, in 1992, first McDonalds' open in Beijing, China caused people's big interest and there was always a long queue outside the restaurant at that time.

For simplicity, I assume that the marginal cost each firm face is zero. Here I normalize the mass of foreign firms that produce a same kind of products and that are able to export to a certain foreign country to one. Note here this kind of goods cannot be produced by firms in the importing country, so their import will cause people's curiosity. It is also assumed that although the goods produced by the firms are of the same kind, domestic people still have a curiosity in each of them, since they are of different brands. Suppose that the foreign firms make their decision of whether to sell in the importing country or not simultaneously. Let X denotes the fraction of foreign firms (which produce the homogeneous products and are able to export) that finally decide to enter the domestic market. This X cannot be observed by any single firm, and hence a game in which one's decision depends on others' decision can be constructed.

Suppose that when the firms are trying to enter the foreign market for the first time, this X can also be viewed as the quantity purchased by the domestic consumers, if I normalize the mass of consumers in the importing country to be one, and assume that this consumer only purchases one unit from a single firm, and each firm only sells one unit to this single consumer. This assumption will be realistic in the following senses: When a firm tries to enter the foreign market, it usually "tests" the market first, that is, it will only chooses to export a limited number of products (if the firm directly exports the final goods); or open only one plant in the foreign country at first (if the firm does the FDI), rather than choosing the quantity that maximizes its profit. That is, the firms do not compete in quantity. An example that is close to our reality is the food industry: McDonalds opened its first restaurant in China in 1990, while its second restaurant in China is opened two years later. It seems credible that McDonalds is using these two years to "test" the Chinese market. Similarly, KFC opened its first restaurant in China in 1987, while its second restaurant comes one year later (Yunsheng Huang, 2005). When these firms enter the market, although they are selling homogeneous products, people will still grow a **curiosity** (here curiosity plays a role in this model) and will try the product from the new foreign firm (for example, even if the fried chicken sold by McDonalds and KFC are the same, since they are sold by two different brands, domestic consumers will still try them both when they enter the domestic market). The number of consumers and the quantity sold by the foreign firm can thus all be normalized to one, i.e. the firms do not compete in quantity.

Under this assumption, all the firms that enter the domestic market sell their product at the same price $p=v-cX$, where v is a positive number, c is a fixed coefficient. $p\geq 0$. Assume that there are plenty of firms that try to export to the foreign country, so when a firm makes its entry decision, whether itself enters or not, i.e. increasing or reducing another firm does not change X. It can be easily shown that when $X<\frac{v}{c}$, firms make positive profit, and when

$X > \frac{v}{c}$, firms make negative profit.

If the game is with common knowledge of $\frac{v}{c}$, then if $\frac{v}{c}>1$, it is sure that $X < \frac{v}{c}$, so the only equilibrium is that all of them export.

If $\frac{v}{c}$ is not a common knowledge, for simplicity, denote it as θ, and it is uniformly distributed on $[\underline{\theta}, \bar{\theta}]$. Suppose that each producer receives a signal of θ (for example, by their own market research or the data of exporting other kinds of products to that country, a firm may receive a signal of the level of θ), denote this signal as s= θ+∈, and ∈ has a uniform distribution on [-ε,ε].

Denote s* as the critical value, which is the same to all the firms. When s> s*, the firm will export (This is because when s is big, that means $\frac{v}{c}$ is big, and hence it is more likely that $X < \frac{v}{c}$). Otherwise it won't. This condition is equivalent to ∈>s*-θ.

So only the firms that satisfy ∈>s*-θ will export. Since I have normalized the mass of firms which are "able to" export as 1, then the fraction of those who really decide to export, X, can be derived by Prob (∈>s*-θ). Then by calculating the probability, I get $X=\text{Prob}(\in>s^*-\theta)=\frac{\theta+\varepsilon-s^*}{2\varepsilon}$.

Therefore, if $\theta>\frac{\theta+\varepsilon-s^*}{2\varepsilon}$, i.e. $\theta > \frac{\varepsilon-s^*}{2\varepsilon-1}$, a firm will decides to export. Otherwise it will not.

Now let I discuss what this θ stands for. Here θ is denoted as $\frac{v}{c}$, which is determined by how the curve p=v-cX looks like. Since it is assumed that each consumer only purchases one unit from a single firm, and each firm only sells one unit to one consumer (I have normalized the mass of customers to be one). Under this assumption, p=v-cX can be viewed as the demand curve of the importing country:

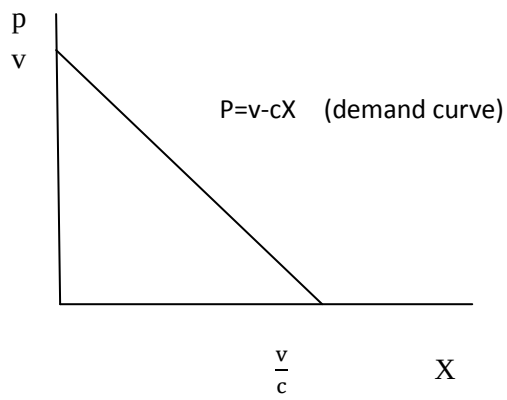

FIGURE 1 –The demand curve of the importing country

Here v denotes the highest expected value of the product, and c is the slope of the demand curve. Hence the bigger c is, the steeper this line is, and for any given X, the more inelastic the importing demand is at the point of (X, v-cX). And we know that smaller countries' importing demand curves are more inelastic (Dixit, 1987)[3]. Hence given v as equal for all countries, small countries are more likely to get a smaller value of $\frac{v}{c}$, i.e. θ. And from the previous discussion, the bigger θ is, the more likely that we have $\theta > \frac{\varepsilon - s*}{2\varepsilon - 1}$, and thus the more likely foreign firms will enter the domestic market. Hence from the above result, I can conclude that bigger countries are more likely to attract foreign firms that sell new products than do smaller countries.

This derives the same result as the Gravity Equation (McCallum, 1995), i.e. volumes of trade are positively related to countries' GDP level, and thus positively related to countries' sizes (Feenstra 2003). Helpman (1987) also showed how the volume of trade will be related to the relative size of countries, i.e. $\frac{\text{Volume of trade in A}}{\text{GDP}^{A}} = s^{A}(1-\sum_{i\epsilon A}(s^{iA})^{2})$ from which we can see that volume of trade in a certain country is positively related to its size. Similar approaches including Debaere (2002), who provides the most complete treatment, and Anderson and van Wincoop (2003) etc. (referred to Robert C. Feenstra: Advanced International Trade: Theory and Evidence, Princeton Press, p146-160). All the above theorems claim the positive relationship between trade volume and countries' sizes (GDP). Although my analysis and the model used here is quite different from all of the above models, we finally get the same result. My result provides a game theoretic, marketing and even psychological foundation of the above theorems, which is creative in some sense.

The intuition behind my result is somewhat obvious: in larger countries, or the countries with high GDP level, the ability to accommodate foreign firms is also high, since consumers are generally richer. For a given v, the graph of the large and small countries' demand curves will look as follows. That is, from the graph we can easily see, that when X increases ΔX, then the price of the product in small country falls more than that of the large country.

Intuitively, it is due to that people in small country are generally poorer than those in the larger country, so people's curiosity in small country fades more quickly, so they will be less willing to test the product from a new firm. "Curiosity" to products from a new foreign firm is a "luxury" in some sense. Common citizens from those very poor countries, who are still struggling to survive, will find it hard to grow "curiosity" to new foreign products.

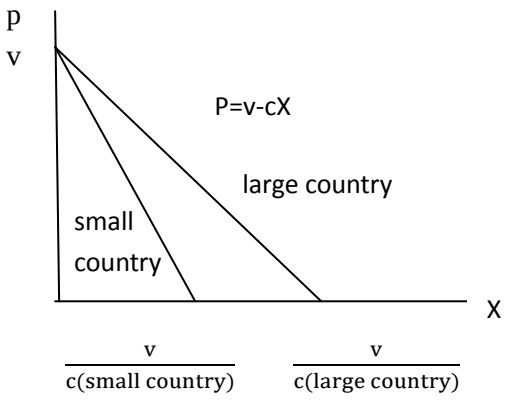

FIGURE 2 –Large country and small country's demand curves

III. How Government's Preferential Duties Affects Foreign Firm's Entry Decision

As I mentioned in the introduction, game theoretic analysis is important in making the optimal national trade policy, since it depends on what other nations' policies are. Here I will show in this section, that regardless of other nations' policies, game theoretic approach can also be adopted when making trade policy. Instead of considering other nations' trade policy, consider other firms' entry decision to the same importing country will influence a foreign firm's entry decision, and will thus influence the importing country's policy making problem.

If I change the model a little bit, it will tell a different story, but will be analyzed using the same method (Again, here I have also referred to the "bank run" model in *RH Chapter 11* that I mentioned in the above section, but here I have also made obvious changes to the original model.). Now suppose that because of the curiosity and interest inspired by the diversity foreign products bring, when the first foreign producers of a certain product enter domestic market, government of the importing country will offer some encouraging policies, such as a reduction in tariff, to attract more foreign firms enter the domestic market.

But as more and more foreign producers enter the domestic market and become competitors with home industry, this "curiosity" fades, and the preferential duties disappear. When that happens, the government will take some actions, such as increase tariff or set up trade barriers to protect domestic industry. As is written in my introduction, this has been demonstrated by Bagwell and Staiger (1990), that the level of protection must rise in a cooperative equilibrium to mitigate the rising trade volume[5]. That is, when the fraction of importers reaches a certain levelθ, the government will take some actions to prevent others' entry.

Assume the mass of all firms that are able to export the homogeneous product to the home market is 1. Let X be the fraction of firms that decide to export. Suppose that if the fraction of firms entering the domestic market is smaller than an exogenous number θ, the government will offer a deduction of tariff to the firms who enter the home market. Then those firms will pay T-d to the government, where T is the original tariff, and d is the tariff deduction. If the fraction of firms entering the domestic market is bigger thanθ, then the firms cannot benefit from the tariff deduction, and will still pay T to the government.

Thus what the firm should pay to the government is:

$$P=\begin{cases} T-d & \text{if } X<\theta \\ T & \text{if } X>\theta \end{cases}$$

If thisθand X are common knowledge, then the firm knows beforehand whether it will get the tariff deduction or not, and if so this problem will be uninteresting. In contrast with Maggi (1999)'s paper that examined equilibrium trade policies when firms have better information than governments, here I assume that the government has more information than firms. Now consider the following imperfect information case:

(i) θ is a common knowledge, while X is not. That is, a firm knows before its exporting, that the importing country's government will give a deduction to a certain fraction of firms who export to this country, but it doesn't know how many foreign firms that sell the same homogeneous products will also enter the domestic market, since they make their entry decision simultaneously. Whether getting the deduction or not will definitely influence the firm's exporting decision. The firm can only receive a signal of X: s= X+∈, and ∈ has a uniform distribution on [-ε,ε]. Denote s* as the critical value. When s<s*, the firm will believe that X is small, so that it will get the deduction. Otherwise it won't. This condition is equivalent to ∈<s*-X. If we assume that the firm will only export if it can get the tariff deduction (otherwise the tariff will be too high for it to afford, and it would rather choose another country that offers it the deduction), then X=Prob(∈<s*-X). From this we can derive X= $\frac{\varepsilon+s*}{2\varepsilon+1}$, which is the equilibrium value. So if the government knows firm's critical value s*, it can derive the fraction of firms that will export. And the government can make its trade policy based on that.

(ii) Bothθ and X are not common knowledge. Then the situation will be almost the same as I solved in Section (II). Assume that θ is uniformly distributed on [$\underline{\theta}$, $\bar{\theta}$]. Here instead of receiving a signal of X, the firm can receive a signal of θ, s= θ+∈and ∈ has a uniform distribution on [-ε,ε]. When s>s*, it meansθ is big, so it is more likely X<θ, i.e. the firm will believes that it will get the deduction. Otherwise it won't. This condition is equivalent to ∈>s*-θ. Again, if we assume that the firm will only export if it can get the tariff deduction, then from the calculation of Section II, when $\theta > \frac{\varepsilon-s*}{2\varepsilon-1}$, firms will export. Otherwise it won't.

So when $0<\theta<1$, what the government can get from the firms who enter the domestic market is: $P=\int_{\frac{\varepsilon-s*}{2\varepsilon-1}}^{\bar{\theta}}(T-d)f(\theta)d\theta + \int_{\underline{\theta}}^{\frac{\varepsilon-s*}{2\varepsilon-1}} T f(\theta)d\theta$. Here since θ is uniformly distributed on $[\underline{\theta}, \bar{\theta}]$, then $f(\theta)=\frac{1}{\bar{\theta}-\underline{\theta}}$. Hence we can derive the result: $P=T-d(\frac{\bar{\theta}-\frac{\varepsilon-s*}{2\varepsilon-1}}{\bar{\theta}-\underline{\theta}})=T-\frac{\bar{\theta}(2\varepsilon-1)-(\varepsilon-s*)}{(\bar{\theta}-\underline{\theta})(2\varepsilon-1)}$. So when the government knows the firms' conjecture of $\bar{\theta}$ and $\underline{\theta}$, and the firm's critical value s*, it can derive its expected payoff, and make its trade policy based on that.

IV. A Combined Result

If I combine Section (II) and Section (III) (ii) together, i.e. suppose that there is a firm trying to enter a foreign market. The firm has zero marginal cost, and its price is determined by p=v-cX, where X denotes fraction of firms enter the importing country's market (but X cannot be viewed by this firm). From the consumers' perspective of view, they still have the curiosity to the product from a newly entered firm, even though it is homogeneous with the ones sold by other firms, so they will try the "new" product. While testing the market, the firm can only sell one unit of product, i.e. $\pi=p=v-cX$. Here the importing country's government has a policy that if there are only a few firms enter, i.e. if $X<\theta$, then the firms will get a tariff deduction, i.e. each of them will only pay T-d to the government. But if $X>\theta$, each of them should pay T to the government.

So here we should compare this θ with $\frac{v}{c}$. If $\theta<\frac{v}{c}$, the firm's expected payoff is:

$$\Pi=\begin{cases} v-cX+d-T & \text{when } X<\theta \\ v-cX-T & \text{when } \theta<X<\frac{v}{c}. \\ -T & \text{when } X>\frac{v}{c} \end{cases}$$

Case (i) If $\theta<\frac{v-T}{c}$, it can be shown in the following graph:

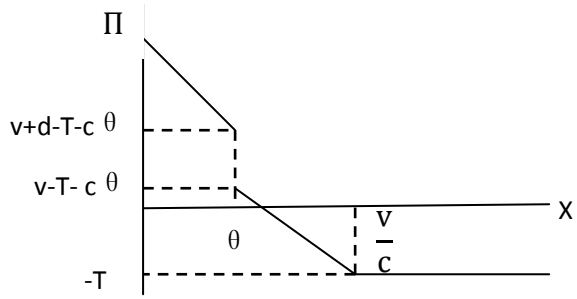

FIGURE 3 –Firm′s payoff curve when $\theta<\frac{v-T}{c}$

It can be shown that when $X=\frac{v-T}{c}$, the expected payoff equals to zero. So this X here equals the equilibrium fraction of firms that export. So for a given $\frac{v}{c}$, when tariff T increases,

X must decrease. It is correct according to our intuition, because high tariff discourages imports.

This can also be shown that for any given X, when $\frac{v}{c}$ increases, T should also increase. As is discussed in Section II, $\frac{v}{c}$ is bigger for large countries, i.e. the countries with high GDP level. This demonstrates some other scholars' conclusion (who use the Median Voter Model, which is totally different from the model and analysis used here), i.e. import tariffs should be used in capital-abundant industrialized countries. They come to the conclusion from the equation $t^m=(1-\rho^m)\frac{dr}{dp}\frac{K}{m'(p)}$, where ρ^m is the capital/labor ratio for the median individual relative to the overall capital/labor endowment for the economy. This ratio is less than one (Alesina and Rodrik, 1994). Then m'(p)<0. And hence t^m is positive when the import good is labor intensive, but negative when the import good is capital intensive. This leads to the conclusion that import tariffs should be used in capital-abundant industrialized countries, but import subsidies in labor-abundant developing countries (Feenstra 2003). Although my discussion here has nothing to do with the factor endowment, I can also reach a same result as theirs, that when a country becomes developed (i.e. large countries with high GDP level), that is, when $\frac{v}{c}$ increases, to maintain the same import volumes as before, import tariff should also increase.

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Case (ii) If $\frac{v-T}{c} < \theta < \frac{v+d-T}{c} < \frac{v}{c}$ (i.e. d<T), then the graph will be like this:

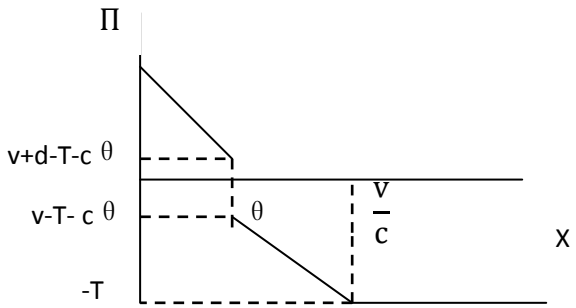

FIGURE 4 –Firm′s payoff curve when $\frac{v-T}{c} < \theta < \frac{v+d-T}{c} < \frac{v}{c}$

Then it can be seen that when X=θ, the firm will make zero profit. That is, firms' export decision only depend onθ. That is, when a country becomes smaller (i.e. $\frac{v}{c}$ becomes smaller than the previous case. For any given θ, here $\frac{v-T}{c} < \theta$, while in the previous case$\theta < \frac{v-T}{c}$), the deduction of tariff decision (the exogenous value ofθ, which can be viewed as the deduction tariff policy set by the government) plays a more important role in foreign firms'

entry decision (In the previous case, neitherθnor d influences the equilibrium X). So this also reaches the same result as "import subsidies (here it is the tariff deduction) should be used in labor-abundant developing countries" (Feenstra 2003. i.e. countries with a low GDP level), since it will influence foreign firms' entry decision.

Case (iii) If $\frac{v+d-T}{c}<\theta<\frac{v}{c}$,

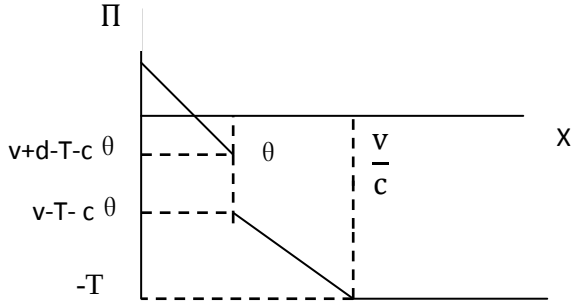

FIGURE5 –Firm′s payoff curve when $\frac{v+d-T}{c}<\theta<\frac{v}{c}$

Then when $X=\frac{v+d-T}{c}$, the expected payoff equals to zero. Since here $\frac{v}{c}$ is also positively related with T, it reaches the same result as Case (i)

If$\theta>\frac{v}{c}$, the firm's expected payoff is:

$$\Pi=\begin{cases} v-cX+d-T & \text{when } X<\frac{v}{c} \\ d-T & \text{when } \frac{v}{c}<X<\theta \\ -T & \text{when } X>\theta \end{cases}$$

Case (iv) When d is the deduction, i.e. d<T, firms will not enter when $X>\frac{v}{c}$.

It can be shown in the following graph:

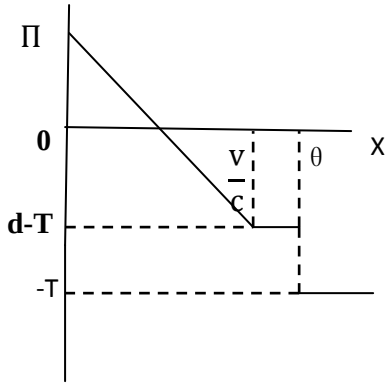

FIGURE 6 –Firm's payoff curve when$\theta>\frac{v}{c}$ and d<T

When $X=\frac{v+d-T}{c}$, the expected payoff equals to zero. Since here $\frac{v}{c}$ is also positively related with T, it reaches the same result as Case (i).

Case (v) But if d denotes the import subsidy, which are rarely observed, despite the prediction from the median voter model (Feenstra 2003), then d>T, and the graph looks like this:

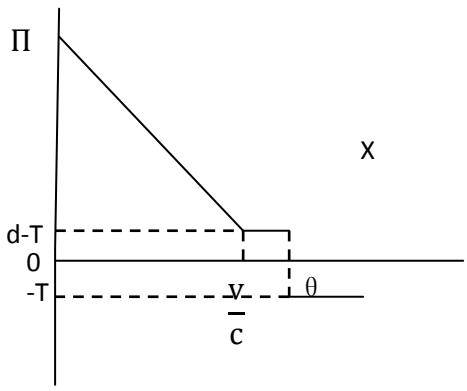

FIGURE 7 –Firm's payoff curve when$\theta>\frac{v}{c}$ and d>T

Then we can see in this graph that firms will export when X=θ, i.e. firms' decision only depends on government's import subsidy decision. Note here the import subsidy will make a difference only if $\frac{v}{c}<\theta$ (if $\frac{v}{c}>\theta$, as is shown in Case (i), the level ofθor d does not influence the equilibrium fraction of firms who export; while in other cases, it is assumed that d<T). When $\frac{v}{c}<\theta$, that means $\frac{v}{c}$ is small, and since we know that $\frac{v}{c}$ is small for small countries, I can reach the conclusion that the import subsidy will only influence firms' decision when entering a small country (i.e. a country with lower GDP level), which is similar to the conclusion "import subsidies should be used in labor-abundant developing countries" derived by using the Median Voter Model (Feenstra 2003).

V. Conclusion

I have attempted in this paper to develop a model that analyzes firms' entry decision in a foreign market. Ideas from international trade, game theory, marketing and macroeconomics are addressed in this paper.

In the model, it is assumed that the foreign firms make their entry decision simultaneously, and their price will be p=v-cX, where X denotes the fraction of firms that decide to export. If the information is imperfect, it is assumed that consumers receive a signal s, which relates to the real value of $\frac{v}{c}$ and a disturbance $\in$. It is assumed that there is a

critical value of the signal s, denoted as s*. Then if $\frac{v}{c} > \frac{\varepsilon - s*}{2\varepsilon - 1}$, the firm will export, otherwise it will not. The mass of consumers are normalized to one. It is assumed that each consumer only purchases one unit from a single firm, and each firm only sells one unit to one consumer. It is because when firms make their entry decision, they usually sell a limited number or open a limited number of plants in the domestic country, to "test" the market. And because of the curiosity, consumers will try the product from all firms that export. Then under this assumption p=v-cX can be viewed as the demand curve. Hence the bigger c is, the steeper this line is, and for any given X, the more inelastic the importing demand is at the point of (X, v-cX). Since smaller countries' importing demand curves are more inelastic, I come to the conclusion that bigger countries are more likely to attract foreign firms that sell new products than do smaller countries. This is the same result as is derived by gravity equation.

It is also discussed in this paper that because of the curiosity and interest inspired by the diversity foreign products bring, when the number of foreign producers of a certain product enter domestic market is small, government of the importing country will offer a deduction in tariff, to attract more foreign firms enter the domestic market. But as more and more foreign producers enter the domestic market and become competitors with home industry, this "curiosity" fades, and the preferential duties disappear. It is assumed that if the fraction of firms entering the domestic market (X) is smaller than an exogenous number θ, firms can have the tariff deduction. Then I discussed two situations: X is unknown whileθ is known, and both X andθ are unknown. Assume in the first case that the firm can only receive a signal of X: s= X+∈, and ∈ has a uniform distribution on [-ε,ε]. Denote s* as the critical value. Then I can calculate the equilibrium value of $X=\frac{\varepsilon + s*}{2\varepsilon + 1}$. In the latter case, assume that θ is uniformly distributed on [$\underline{\theta}$, $\bar{\theta}$]. The firm can receive a signal of θ, s= θ+∈and ∈ has a uniform distribution on [-ε,ε]. Then the government can expect to receive P $=T-d(\frac{\bar{\theta}-\frac{\varepsilon - s*}{2\varepsilon - 1}}{\bar{\theta}-\underline{\theta}})=T-\frac{\bar{\theta}(2\varepsilon - 1)-(\varepsilon - s*)}{(\bar{\theta}-\underline{\theta})(2\varepsilon - 1)}$ from the importing countries.

I have also combined the above firm and government behaviors together, and analyze in graphs when firm reaches the zero profit point. I come to a very similar conclusion with the Median Voter Model, i.e. large countries should use import tariff, while import subsidy can only influence the equilibrium situation in small countries.

Of course, there are certainly some limitations in this paper, calling for modification in further research. For example, this paper only focuses on importing country's size and policymaking problem. It will make the issue more interesting if exporting country's size or policymaking problem can be involved in the future discussion. Also, this model only focuses on the initial period when firms sell product to a foreign country, i.e. when firms are "testing" the market, a more interesting topic will involve when exporting firms choose the price and quantity according to their profit maximization problem.

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