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Coordination of Competition Policies: Empirical Evidence from the European Union and the United States

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Abstract

As trade policies became more liberalized, more academic and political interest started to focus on domestic policies. The main reason is the increasing ease with which externalities caused by domestic policies can be transmitted to trading partners. This paper focuses on the competition policies and our aim is to address the gap in the theoretical and especially the empirical literature on the externalities imposed by mergers of foreign firms. In the theoretical section of the paper, we identify the economic variables that determine if a foreign merger will have welfare implications. In the empirical section, we use a comprehensive dataset of largest mergers involving American firms some of which are investigated by the European authorities. We employ a discrete choice model to see which variables are important in determining the probability of review and identify the main mechanisms through which international externalities operate. We find the following to have significant affects: (1) the nationality of the acquired firm, (2) the market presence of both merging firm in Europe and (3) the market presence of other American firms in Europe in that industry. Furthermore, we find that these variables are complementary and strongly reinforce each other's influence on the review decision. These findings will have important implications for any policy discussion and analysis.

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1 Introduction

One of the most distinctive features of Post-war economic environment has been the continuous decrease in trade barriers. This has been achieved mainly through the negotiation rounds organized at the auspices of the GATT (and now the World Trade Organization - WTO) and the formation of regional preferential trading blocks such as the European Union and the NAFTA¹. A significant consequence of liberal trade policies and integrated markets is the growing importance of other domestic policies of governments. The main cause for this emphasis is the increased ease with which the impact of any domestic policy (such as tax policy or environmental regulation) that affects domestic prices will be exported to other markets. In other words, lower trade barriers lead to increased responsiveness of international prices to domestic policies and easier transmission of externalities across national borders.

This paper will focus on competition policies which are among the domestic policies attracting the most attention. There are many studies conducted by and/or aimed at the policymakers mostly based on specific cases or legal standards. The standard argument states that governments relax their competition policies in open economies since most of the positive externalities of a strict competition policy accrue to foreign consumers while the costs are borne by domestic firms. This, in return, gives rise to arguments in favor of a multilateral framework² to coordinate such policies. However, despite their increasing significance, the issues and debates arising from negative international externalities of globally inefficient domestic competition policies have not been extensively addressed at the theoretical level. Furthermore there are even fewer empirical studies.

Our aim is to address the gap in the theoretical and especially the empirical literature on the externalities imposed by mergers of foreign firms on national economies. In the theoretical section, we will present a model identifying the main economic variables that determine if a merger involving foreign firms has significant welfare consequences for a country. These are (1) the nationality of the firms (2) the market shares of the merging firms, (3) the market share of all domestic firms in both domestic and foreign markets and (4) the relative proportion of the domestic consumers in

¹According to some calculations, the average tariff rate imposed by developed countries on industrial products has decreased to 4% in 1994 from an average of 40% in 1947 (Staiger, 1994). Furthermore, many non-tariff barriers such as quotas and other subsidies have been eliminated, increasing the transparency of the system considerably.

²The standard suggestion is the WTO due to close link between the competition and trade policies.

the global market. In the empirical section of the paper, we will use a comprehensive dataset of the largest mergers and acquisitions over the last five years that involve at least one American firm. We will employ a discrete choice model to see how important the variables from the theoretical section are in determining the probability of investigation of a given merger by the European Union (EU) authorities. If there exists significant international externalities, then these variables would have statistical significance in determining the probability of review by the EU. Furthermore, we can determine which variables are relatively more significant by using this technique.

Our unique dataset includes 209 cases out of which 52 were investigated by the Directorate General IV (Competition) of the European Commission due to their significant potential impact on the EU economies. These investigations are conducted under the authority granted by Council Regulation number 4064 of 1989 and coordinated with the American authorities under two separate treaties. Furthermore, the EU authorities made substantial divestiture demands in 13 of these cases in order to approve the operations of the new firm within the EU markets³ with the acknowledgment of the US authorities.

The main contribution of this paper is to show that the EU is more likely to review a merger if (1) the acquired firm is European, (2) both merging firms have high market share in Europe, (3) all American firms have a high market share in Europe and (4) the merger price is higher. The second variable is a signal of the importance of the consumer welfare while the last one shows the importance of producer welfare. Since a merger decreases competition (and increases prices), other firms benefit from it. If more of the benefit accrues to American firms, then EU authorities oppose this merger more. On the other hand, we find no significant effect from American market shares of merging firms and other European firms on the probability of the review.

Another interesting result is the strong pairwise complementarity between all of the significant variables which is likely to be significant especially for policy analysis and coordination. If we are looking at an average merger between two American firms where the acquiring firm has medium presence in the European market, then increasing the market presence of all American firms in Europe from weak to medium increases the probability from 0.032 to 0.373. On the other hand,

³In several cases, EU blocked a merger but our data set unfortunately does not include failed mergers since it is hard to identify the exact cause in most cases. For example, MCI Worldcom-Sprint was cancelled at the objection of both the Justice Department in the US and EU Commission.

if the acquiring firms has strong presence, the probability would go from 0.141 to 0.746 which is a much larger impact showing the reinforcing effects of these two variables.

The remainder of the paper is organized as follows. In the next section, we review some of the important work in the literature on the international dimensions of domestic competition and anti-trust policies. Then we present a brief theoretical model to identify significant economic variables through which international externalities operate. This is followed by a discussion of the legal framework in the European union to investigate foreign mergers with significant impact on European economies. After a section on the data and the empirical methodology, we present our main empirical analysis and results. Conclusions will follow the comparative statics exercises with the significant variables.

2 Literature Review and Theoretical Background

The international trade and investment literature has borrowed extensively from the industrial organization literature in the past, especially on strategic trade policies and issues related to international trade resulting from imperfect competition. It is again natural to turn to the industrial organization literature to analyze the international externalities caused by the domestic competition policies. Most of the papers on the analysis of mergers ignore the international implications and focus on a closed economy while few of the existing theoretical papers establish strong results.

On the policy side, there are many studies looking at the linkages between trade and competition policies. Although there is widespread agreement on the international externalities caused by domestic competition policies, the suggestions on how to alleviate the problems disagree on many points. Lloyd and Sampson [1995], Hoekman and Mavroidis [1994] and Jacquemin [1995] are some of the initial policy papers looking at the linkages and how these can be addressed in a multilateral platform, especially in the WTO. Scherer [1994] and Graham and Richardson [1997] are more extensive studies with specific suggestions in favor of multilateral administration of competition policies. The European Commission report [1995] goes one step further to publish a report with a series of suggestions from a government body. Hoekman [1997] evaluates alternative proposals for mechanisms to handle competition policies according to their economic and political implications.

The theoretical work on the international implications and coordination of competition policies

is more scant. In an early paper, Dixit [1984] investigates the impact of industry concentration on domestic welfare in the context of strategic trade policy. Horn and Levinsohn [2000] is one of the few attempts to analyze the international externalities caused by domestic merger policies in the context of the linkages between trade liberalization and the optimal industrial concentration policy (the number of firms in an industry) chosen by a government. Their model assumes linear demand and supply with segmented markets and symmetric firms. Their aim is to find how the optimal number of (symmetric) firms changes as the trade policy is liberalized. In other words, they want to analyze the intuition that competition policy becomes more relaxed as trade is liberalized since liberalization acts as a substitute for government intervention to maintain competition in the market. However their results are ambiguous and they argue that "one should not expect to find any particular relationship between trade and merger policy." The ambiguity results from a very simple feature of the model. A decrease in industry concentration in country A hurts the consumers in A and B while benefiting the producers of both countries in both markets. Although we can determine the signs of the changes, we can not easily determine the relative magnitudes. They conclude that the international welfare implications of domestic merger policies could be either positive or negative in a slightly more general context and the burden of proof should fall on those who argue in favor of an international agreement on competition policy. Richardson [1999] is another paper in the spirit of Horn and Levinsohn [2000] looking at the link between trade and competition policies.

A strand of the industrial organization literature, following Farrell and Shapiro [1990], employs a different technique to analyze the welfare impact of a horizontal merger in a Cournot market. The first group of papers mentioned in the previous paragraph assume that the firms are identical in every respect when their number decreases from n to $n - 1$. On the other hand, Farrell and Shapiro [1990] assume that firms i and j merge while everything else stays the same. This scenario is extremely flexible and does not require symmetry (in size, cost etc.) among firms as opposed to the previous group of models. Furthermore, it is more useful for a policymaker who has to approve a proposed merger rather than deciding on an optimal number of firms. They start with the assumption that a proposed merger has to be profitable for the merging firms otherwise it would not be proposed. Then a sufficient (but not necessary) condition for a merger to be socially efficient is for the external effect (on consumers and other firms) to be positive. Barros and Cabral [1994]

extend this model to the open economy case and this structure forms the basis of our theoretical model.

The model in this paper is along the lines of Farrell and Shapiro [1990] and Barros and Cabral [1994]. We assume a standard Cournot model with homogenous goods. Demand is given by $p(Q)$ where p is the price and Q is the total quantity. There are n firms competing in the market and the total cost function of firm i for output level q_i is given by $c_i(q_i)$. Each firm maximizes its profit given by $\pi_i(q_i, q_{-i}) = p(q_i + q_{-i})q_i - c_i(q_i)$ where $q_{-i} = Q - q_i$ is the total output of other firms. The first order condition that maximizes profits for each firm is

$$p(Q) + q_i p'(Q) - c'_i(q_i) = 0 \quad (1)$$

We assume that (1) marginal cost is non-decreasing and (2) the industry demand curve satisfies $p'(Q) + Qp''(Q) < 0$. These are sufficient to guarantee the stability of the Cournot equilibrium.

The total welfare in a market is defined as follows:

$$W = \left[\int_0^Q p(x) dx - p(Q)Q \right] + \left[p(Q)Q_M - \sum_{i \in M} c_i(q_i) \right] + \left[p(Q)Q_O - \sum_{i \in O} c_i(q_i) \right]$$

where the first expression is the consumer surplus, the second is the total profit level of the firms involved in the merger and the last one is the total profit of the non-merging firms. M denotes the set of firms involved in the merger and O is set of firms outside the merger. When we totally differentiate the above expression, we get the following:

$$dW = \left[-Q \frac{\partial p}{\partial Q} dQ \right] + \left[p dQ_M + Q_M \frac{\partial p}{\partial Q} dQ - dC_M \right] + \left[p dQ_O + Q_O \frac{\partial p}{\partial Q} dQ - \sum_{i \in O} \frac{\partial c_i}{\partial q_i} dq_i \right]$$

The first expression is the change in the consumer surplus, the second is the change in the profit levels of the merging firms and the third is the impact on the profit levels of the outside firms. For consumer welfare to increase, we need the market price to go down which is only possible if the merger generates considerable synergies between the firms. In most cases, the prices go up and the consumers suffer while other firms benefit. We can rewrite the above expression as

$$dW = d\Pi_M + \frac{\partial p}{\partial Q} dQ [Q_O - Q] + \sum_{i \in O} \left[p - \frac{\partial c_i}{\partial q_i} \right] dq_i$$

where the first term is the change in the profit level of the merging firms which we assume to be positive. We know that $p - \frac{\partial c_i}{\partial q_i} = -q_i \frac{\partial p}{\partial Q}$ from the first order condition in equation (1). Also, we

define $\lambda_i = -\frac{dq_i}{dQ}$ as the response of a firm's output to changes in total output. It is easy to show that $0 < \lambda_i \leq 1$ under the stability assumptions we made earlier. Furthermore, if demand and cost are linear, then $\lambda_i = 1$. When we substitute, these two definitions into the above equation, we get

$$dW = d\Pi_M + \sum_{i \in O} [q_i \lambda_i - Q_M] \frac{\partial p}{\partial Q} dQ$$

If the second expression on the right is positive, then the net welfare impact of a merger is positive. Since $\frac{\partial p}{\partial Q} dQ > 0$ after a merger, it is sufficient to have $\sum_{i \in O} [q_i \lambda_i - Q_M] > 0$. If we were to divide this expression by Q , we get the sufficient condition $\sum_{i \in O} s_i \lambda_i > s_M$ where s_i is the market share of firm i and s_M is the total market share of the firms involved in the merger. The following proposition summarizes the insightful result of Farrell and Shapiro [1990]:

Proposition 1 (Farrell and Shapiro [1990]): *Suppose a merger between firms $i \in M$. If the merger is profitable for the firms (i.e. $d\Pi_M > 0$), the price rises after a merger and $\sum_{i \in O} s_i \lambda_i > s_M$, then the merger definitely increases social welfare.*

Since $\lambda_i \leq 1$, another sufficient (more relaxed but more easily calculated) condition for welfare improvement is $s_o > s_M$. In other words, if the merging firms have less than half of the market, then the merger definitely improves welfare! Barros and Cabral [1994] aim to extend this model to an open economy. For example, they show that for a small importing country, a merger is welfare improving if $\sum_{i \in O} s_i \lambda_i > s_M + s_F$ where s_F is the market share of foreign firms. Thus, it is more difficult for a small importing economy to approve a merger than a closed economy since some of the competition reducing benefits of the merger go to foreign firms.

In the next section, we will generalize the Farrell and Shapiro result to a country that trades (both exports and imports) with another country. It turns out that same variables are important for welfare changes if the two markets are integrated or separated⁴. It is reasonable to assume that the markets are integrated (especially between the US and the EU) in most manufacturing industries since consumers can take advantage of price differentials. On the other hand, service industries are more likely to be segmented since the products are not easily tradable. We present both cases for completeness.

⁴The models similar to Horn and Levinsohn [2000] assume that the markets are separated while Barros and Cabral [1994] assume they are integrated for analytical simplicity.

2.1 Merger in an integrated market

We assume that there are two countries A and B in which the firms and their shareholders are located, but all firms compete in the world market. In the absence of trade barriers and other restrictions, the consumers can purchase from any company regardless of location. However, when deciding on merger policy, the governments only take into account the welfare of their consumers and the firms located in their jurisdiction. We perform the following welfare analysis from the perspective of country A . We assume that α denotes the portion of total consumers in A and $\delta = \sum_{i \in A} s_i$ is the market share of the firms located there. Then the welfare level of country A is given by

$$W^A = \alpha \left[\int_0^Q p(x) dx - p(Q) Q \right] + \left[p(Q) Q_M - \sum_{i \in M} c_i(q_i) \right] + \left[p(Q) Q_O - \sum_{i \in O} c_i(q_i) \right]$$

where M is an empty set if the merging firms are located in country B and O denotes the non-merging firms located in A . Following the steps of the previous section, we obtain the following:

$$dW = d\Pi_M + \alpha \left[-Q \frac{\partial p}{\partial Q} dQ \right] + \left[Q_O \frac{\partial p}{\partial Q} dQ + \sum_{i \in O} \left[p - \frac{\partial c_i}{\partial q_i} \right] dq_i \right]$$

This expression is significant for showing the mechanisms through which the impact of a merger would operate. The first expression on the right is the change in the profit level of the merging firms and is positive if they are located in A and zero otherwise. The second is the change in the welfare of the domestic consumers (proportional to their share in the global market α) and is always negative due to decreased competition and higher prices. The last expression is the impact on the domestic non-merging firms which is always positive and proportional to their market share. Further substitutions similar to the ones in the previous section yield

$$\begin{aligned} dW &= d\Pi_M + \sum_{i \in O} [q_i \lambda_i + Q_O - \alpha Q] \frac{\partial p}{\partial Q} dQ \\ &= d\Pi_M + Q \sum_{i \in O} [s_i \lambda_i + s_i - \alpha] \frac{\partial p}{\partial Q} dQ \end{aligned}$$

This expression states that a sufficient condition for a merger to be welfare improving is $\sum_{i \in O} [s_i \lambda_i + s_i - \alpha] > 0$ or $\sum_{i \in O} s_i \lambda_i > \alpha - \delta + s_M$ as established by Barros and Cabral [1994]. In the case of linear demand and supply ($\lambda_i = 1$) with symmetric countries ($\alpha = 1/2$), this expression simplifies to $\sum_{i \in O} s_i > \frac{1}{4}$

located in different countries. We again perform the welfare analysis from the perspective of country A . We let Q^A denote the total quantity consumed in A . Similarly, Q_M^A and Q_O^A denote the quantities produced by merging and non-merging domestic firms in market A . Similar quantities are defined for market B as well. M (O) denote the set of the merging (non-merging) firms of country A and it is an empty set if the merger takes place among firms located in B . Then the welfare function for country A is given by

$$W^A = \left[\int_0^{Q^A} p(x)dx - p(Q^A)Q^A \right] + \left[p(Q^A)Q_M^A - \sum_{i \in M} c_i^A(q_i) \right] + \left[p(Q^A)Q_O^A - \sum_{i \in O} c_i^A(q_i) \right] \\ + \left[p(Q^B)Q_M^B - \sum_{i \in M} c_i^A(q_i) \right] + \left[p(Q^B)Q_O^B - \sum_{i \in O} c_i^A(q_i) \right]$$

where the last two expression denote the profit levels earned by A 's (merging and non-merging) firms in B ⁵. When we differentiate the above expression, we get the following:

$$dW = \left[-Q^A \frac{\partial p^A}{\partial Q^A} dQ^A \right] + \left[p^A dQ_M^A + Q_M^A \frac{\partial p^A}{\partial Q^A} dQ^A - dC_M^A \right] + \left[p^A dQ_O^A + Q_O^A \frac{\partial p}{\partial Q^A} dQ^A - \sum_{i \in O} \frac{\partial c_i^A}{\partial q_i} dq_i^A \right] \\ + \left[p^B dQ_M^B + Q_M^B \frac{\partial p^B}{\partial Q^B} dQ^B - dC_M^B \right] + \left[p^B dQ_O^B + Q_O^B \frac{\partial p}{\partial Q^B} dQ^B - \sum_{i \in O} \frac{\partial c_i^B}{\partial q_i} dq_i^B \right]$$

Further simplifications and substitutions lead to

$$dW = d\Pi_M^A + d\Pi_M^B + Q^A \sum_{i \in O} [s_i^A \lambda_i^A + s^A - s_M^A - 1] \frac{\partial p^A}{\partial Q^A} dQ^A \quad (3) \\ + Q^B \sum_{i \in O} [s_i^B \lambda_i^B + s^B - s_M^B] \frac{\partial p^B}{\partial Q^B} dQ^B$$

The first two expressions are the changes in the profit levels of the merging firms in market A and B respectively and it is zero if the merging firms are from B . The second expression⁶ is the combined welfare implication for the consumers and non-merging firms in market A . This can be positive or negative as discussed previously. The last expression is the profit change from the operations of the non-merging firms in B . Since the government of A does not attach any weight to the welfare of consumers in A , this expression is definitely positive.

⁵We will assume that firm i serves markets A and B from separate facilities so that the cost functions are independent for simplicity.

⁶In this expression, s_M^A (s^A) denotes the market share of merging (all domestic) firms in market A . In the second expression, s_M^B (s^B) denotes the market share of merging (all domestic) firms in market B .

which states that merger is definitely welfare improving if the market share of firms in A is greater than $1/4$. We make one more substitution using the equation $\sum_{i \in O} s_i = \delta - s_M$ which is the market share of non-merging domestic firms. Then we obtain

$$dW = d\Pi_M + Q \sum_{i \in O} [s_i \lambda_i + \delta - s_M - \alpha] \frac{\partial p}{\partial Q} dQ \quad (2)$$

We use this expression to identify the economic variables with significant impact on the welfare of consumers and producers in this country. The nationalities of the merging firms are the first important variables as identified by $d\Pi_M$. If these firms are domestic, then the authorities are more likely to approve the merger since this expression is positive. The second variable is the global market share of A 's firms given by δ . The higher this variable is, the greater the proportion of the increased producer surplus accruing to country A due to decreased competition after a merger. Thus government A is more likely to approve a merger if δ is high. The third variable is the market share of merging firms denoted by s_M . The higher this variable is the less likely the government A is in approving the merger due to its negative impact on the consumer surplus and the producer surplus of non-merging firms. The final variable is the share of domestic consumers α . The government of A is less likely to oppose a merger if this variable is higher since a higher share of the decrease of the consumer surplus is borne by domestic consumers. We can summarize these conclusions as the following:

Conjecture 2 *The government of A is more likely to oppose a merger due to the presence of international externalities if (1) the merging firms (or the acquiring firms in an acquisition) are located outside A , (2) if the global market share of merging firms is higher, (3) if the global market share of domestic firms (δ) is lower and (4) if the percentage of consumers located there (α) is higher.*

We should note that $\delta - \alpha$ is simply the trade balance of A in that industry. This implies that the country is less likely to be in favor of the merger if it is running a trade deficit.

2.2 Merger in segmented markets

In this section, we analyze the impact of a merger in segmented markets where the consumers can not take advantage of price differentials and the firms are able to charge different prices to consumers

We can again use this expression again to test the significance of externalities caused by mergers for the consumers and the producers of A . For completeness, we summarize the conclusion of this section in the next conjecture:

Conjecture 3 *The government of A is more likely to oppose a merger if (1) the merging firms (or the acquiring firms in an acquisition) are located outside A , (2) if the domestic and foreign market shares of merging firms (s_M^A and s_M^B) are higher and (3) if the domestic and foreign market shares of domestic firms (s^A and s^B) are lower.*

The aim of this section was to establish the main determinants of merger policies of a government that aims to maximize the social welfare of its citizens and domestic firms. We have extended the relatively flexible model used by Farrell and Shapiro for a closed economy to the case of open economies with segmented and integrated markets. Several important variables are shown to significant in determining whether a government approves a merger or not.

Both models predict that the nationality of merging firms is quite important. In recent years we have also observed quite a few cross-border mergers and acquisitions. If we assume that the shareholders of the acquiring firm obtain most of the gains from a merger, then a government is more likely to approve a merger if the acquiring firm is located there and is more opposed if one of its firms is taken over⁷. Second, the overall market share of domestic firms (whether if it is an integrated or a segmented market) is important. The main competition decreasing benefit of a merger accrue to other firms while consumers pay the costs. Thus if the share of domestic firms in the market (both domestic and foreign) is higher, a bigger portion of the benefits flows to country A . Third, the overall market shares of merging firms is as important as it is in a closed economy. Higher market share implies higher losses for consumers and lower gains for non-merging firms and therefore more opposition by the government. Finally, if a higher portion of the consumers are located in A , then the government is more likely to oppose a merger since this is where most of the welfare loss arises.

⁷Of course, there tends to be a nationalistic sentiment (especially in Europe) to oppose foreign companies' acquisitions of domestic firms.

3 Competition Policies of the European Union

In this section, we review the main competition policies of the European Union before we proceed to the empirical section that aims to determine the significance of international externalities. The legal basis for the competition policies implemented and enforced by the European Union Commission for the member states is found in the Articles 85, 86, 89 and 90 of the original Treaty of Rome that established the European Economic Community⁸. However, most of the current policies and practices are based on Council Regulation No. 4064 titled "*The Control of Concentrations Between Undertakings*" which was adopted by the European Union Council on December 21, 1989. The main aim of this regulation was to enforce and implement competition policies within Europe since the members were aware of the limited capacity of domestic competition laws to enforce socially efficient outcomes. In particular, it was anticipated that the union-wide externalities from domestic laws would increase with further market integration. For example, if two German pharmaceutical firms with dominant market positions that earn 90% of their revenues from other European countries wanted to merge, German authorities are reluctant to oppose this, although it might lead to lower European welfare. The main aim of the establishment of a specific Competition Directorate General (DG) within the European Commission was exactly to avoid such negative externalities arising from domestic policies. This does not mean domestic competition authorities are abolished or are redundant. They are responsible for analyzing the local impact of mergers in other parts of the union as well as overseeing issues that involve firms that mainly operate in their local markets. Most of the resources of the Competition Directorate are targeted towards this primary role of internalizing intra-European externalities as can be seen from the composition of their case load.

While market integration was progressing in Europe in 1990's, similar market integration and lowering of trade barriers was taking place also at the global level. This integration implies that the domestic policies of other governments and the economic events in other countries have more significant consequences across the world and competition policies occupies the top of the list. The Competition Directorate of the Commission became the natural venue to handle the EU-wide implications of mergers in other jurisdictions since it has both the legal authority and economic incentive to promote interests of all of the EU members.

⁸These became Articles 81, 82, 85 and 86 in the new Treaty of Amsterdam which went into force on May1st, 1999.

As we stated earlier, the formal legal and practical basis of anti-trust activities of the EU are based on Council Regulation 4064/89. There are several criteria that need to be met for a merger to be considered to have a "Community dimension" and the EU commission has to be notified of the mergers that satisfy these criteria to obtain approval. The first set of criteria state that

- 1- The combined worldwide turnover of the firms is more than 5 billion Euro
- 2- Community-wide turnover of each of the firms is at least 250 million Euro
- 3- More than 2/3rds of each firm's European turnover should not come from the same member state.

The first criterion is aimed to determine how big a merger has to be to receive attention from the EU. We should note that this states joint revenue, so that the acquisition of a small firm by a large firm could still be reviewed by EU. Second criterion is the most important one for this paper since it aims to determine the extent of the potential impact on the EU, especially the consumers. However, this is a very a small portion of the total revenue of the merging firms. The aim here is to consider the impact on other European firms in the world markets since this is a very important welfare dimension of anti-trust policy as we argued in the previous section. The final criterion states that if both firms receive a majority of their EU revenues in the same country, then the jurisdiction falls onto the authorities of that country since there are likely to be fewer intra-EU externalities. If these criteria are not met, then a second set might apply:

- 1- The combined worldwide turnover of the firms is more than 2.5 billion Euros
- 2- In at least three countries, the combined turnover of the firms is at least 100 million Euros
- 3- In these three countries, each firm has at least revenues of 25 million Euros
- 4- More than 2/3rds of each firm's European turnover should not come from the same member state.

These criteria are the same in spirit but are more restrictive. In short, the Council Regulation gives the Commission the authority to investigate any merger whether it involves a European firm or not. Of course, the Competition DG does not analyze every merger that satisfies these criteria given its limited resources. Naturally, the majority of the cases involve European firms but mergers between non-European firms are receiving increasing scrutiny as the recent MCI Worldcom and

Sprint merger proposal shows. A large part of the failure of this merger is attributed to the strong opposition of the EU. This brings us to the enforcement issues. In most cases, it is assumed that the EU would have limited or no jurisdiction over a merger involving two foreign firms. Although this is technically correct in the sense that the EU can not stop such a merger, it has the legal authority and the power to impose limitations on their activities within the EU. For example, it can impose extra taxes, penalties and can even bar them from doing business in Europe which provides significant enforcement power over firms with substantial operations in Europe.

Finally, there is, at least on paper, extensive communication and cooperation between EU Commission's Competition Directorate and the American authorities, the anti-trust division of the Department of Justice and the Federal Trade Commission. The basis of the cooperation is the agreement signed on September 23, 1991 and the enforcement agreement signed on June 4, 1998. The initial agreement recognizes the increased integration of world economies and notes that effective enforcement of domestic competition laws require cooperation and coordination, especially in terms of information sharing. For example, firms who need to receive the approval from both authorities need to sign a waiver that allows the authorities to share their information freely. More importantly, the agreement specifically states that potential conflicts of national interests are likely to arise⁹. Specific attention is paid to activities occurring in one jurisdiction and affecting the other one. In this case, the affected party might request punishment of this activity since this might be a more effective way of solving the problem. Regardless of the legal text, the main aim of the cooperation agreements is to avoid negative externalities and reach a Pareto superior outcome compared to unilateral policies. A very good example of this occurred in the Worldcom and MCI merger. The EU was against the merger because of the firms' joint dominance over the global internet traffic. Other competitors were also American firms (AT&T and GTE) so the only impact of the merger on Europe would be through lower consumer welfare. The US government was in favor of the merger and the two sides reached a solution in which part of the internet operations of the firms would be divested, but only to a European firm! Furthermore, the US government agreed to share the responsibility in enforcing this divestiture¹⁰.

⁹The Boeing-McDonnellDouglas Merger was one of the first conflicts between the two national authorities given the political and economic significance of the case. The EU eventually agreed not to block the merger in return for the US government's decreased complaints of the subsidies given to Airbus at the WTO.

¹⁰MCI Worldcom sold the internet operations of old MCI to Cable & Wireless, a British firm. However, a year

The EU legislation and regulation support the theoretical model we presented in the previous section. The important determinants (criteria 1 and 2) that the EU Commission uses in merger regulation are the impact on the consumers and the European producers in global as well as the European markets. Furthermore, both the EU and the US regulators are aware of international externalities of their policies and of the need to coordinate their activities. The agreements and the following efforts clearly testify to this.

4 Data and Variables

The aim of this paper is to provide a theoretical and empirical analysis of the extent of the externalities transmitted through competition policies as we stated earlier. Our focus is on the impact on the welfare of a country of a merger between two companies that operate in international markets. The theoretical section of the paper identified several economic variables that are expected to be important in creating international externalities and therefore influence the actions of domestic anti-trust authorities to a foreign merger. These variables are the nationalities of the firms in question, the market share of merging firms, the share of domestic firms in the domestic and foreign markets and the relative size of the domestic market. In the empirical section of the paper, we use a dataset that involves the merger investigations of the EU Competition DG over the last five years.

The threshold for EU investigation identified in the previous section is relatively low since there are hundreds of mergers that take place every year between firms with joint revenues over 2.5 billion Euros and European revenues over 25 million Euros. Therefore, the EU Commission acts very selectively in deciding on which cases to investigate, especially given its limited budget and staff. Our dataset includes 209 of the largest completed mergers and acquisitions (M&A) over the last five years (1996-1999) involving at least one American firm¹¹ as an acquiring or the acquired. The dependent variable we are using is the decision of the EU Commissions to investigate the merger. Of these 209 mergers, 52 of them were investigated and the EU Competition DG made divestiture later the EU claimed that MCI Worldcom did not transfer all of the promised assets and this was one of the reasons behind their opposition to the MCI Worldcom - Sprint merger.

¹¹We omitted several cases that involved corporate reorganizations that were technically acquisitions and instances of large minority investments without actual takeovers.

demands in 13 of the case in order to approve them. The independent variables are various firm and market characteristics and we use a discrete choice model to estimate the probability of investigation by EU as a function of these variables.

The data set includes 42 observations from 1995, 35 from 1996, 45 from 1997, 42 from 1998 and 45 from 1999. Of these, 25 involved the European acquisition of an American firm and 13 involved the American acquisition of a European firm. In eight cases a firm from a third country was involved while the rest are between two American firms. The first variable we use is the size of a deal which is traditionally determined by the market capitalization of the smaller firm in a merger and by the capitalization of the acquired firm in an acquisition. The size of the transactions increased rapidly over the years partially due to booming stock markets. The largest merger in 1995 was only \$13.5 bn while it was \$79 bn in 1999. This naturally affects the cut-off points for each year.

The sectoral distribution of the mergers was also interesting. There are 139 firms from service sectors and 70 from various manufacturing sectors. A large portion of the service sector cases involve the financial sector (56 cases), communications and media (38) and utilities (14) following the rapid consolidation in these areas. Manufacturing is more widely distributed with large cases involving auto, oil, pharmaceutical and defense companies.

The first set of variables reflect the competitive characteristics of the merging firms in the local markets. The market presence of both firms in Europe are obviously important variables in determining the EU response. To obtain a variable to reflect this, we collected the geographic distribution (the US, the EU and the rest of the world) of the revenues for all firms from the documents filed with the SEC (forms 10-K) for American firms and from the annual reports for foreign firms. If the data was not available, we inferred from the next year's geographic distribution of the surviving firm. Instead of using the percentage share of market in total revenue as a variable, we divided the firms into three categories for each market. For example, among the acquiring firms 14 had no and weak presence in the US, 165 had medium presence (had at least 10% of their revenues in the US) and 30 had very strong presence (at least 25% of their revenues in the US and were included in the Dow Jones global index for that industry). On the other hand, 120 had no presence in Europe, 72 had a medium presence (at least 10% of their revenues in Europe) and had a strong presence (at least 25% of their revenues in Europe and were included Dow Jones index).

Of the acquired firms, 15 had no presence in the US; 181 had a medium presence and 13 had a strong presence. 150 of the acquired firms had no presence in Europe, 58 had a medium presence and only 1 had a strong presence.

The second important variable in terms of international externalities is the industry specific market share of the European firms in Europe and the US. We divided the dataset into a total of 22 industries. Then we divided the industries into three groups according to the share of the European firms in the American market: weak, medium, strong and created a dummy variable for each one. Similarly, for each industry we created dummy variables if the American firms have a weak, medium or strong presence in the European market. These variables were constructed from the total geographic distribution of revenues of all firms in the Dow Jones Global Indices for different sectors. For example, in most service industries (such as banking, insurance and communications) European firms have a weak presence in the American market while they have a medium or strong presence in most manufacturing sectors (pharmaceuticals, chemicals and automotive). This pattern reflects the global trade patterns (relative to total consumption) we observe.

The theoretical section identified the share of European consumers in the market as a significant variable. However, for this variable to have any econometric significance, it needs to have different values for different industries. In most cases, the European share of a market is proportional to its population (relative to the US) and there is very little variance across industries. Therefore, we omitted this variable from the econometric model.

We created dummy variables for the nationalities of firms where 25 of the acquiring and 13 of the acquired firms were European. We also created dummy variables for the years, for mergers in the defense industry which might have political significance and for mergers in the service sector which has different characteristics as identified above. A summary of the variables can be found in the Appendix.

5 Econometric Model

The decision by the EU to review a merger falls naturally into the class of logit or probit models. Consider the following scenario underlying the EU's review process. Based on conjectures 2 and 3, the EU prepares an index, y^* , that measures the impact of the merger on the welfare of consumers

and producers in the European union. The index may be a linear combination of variables, X , that capture the impact of the merger, i.e.

$$y^* = \beta_0 + \beta X + \varepsilon,$$

where ε is a zero mean error term. If the index is negative, i.e. the merger imposes a cost on the European market, the EU reviews the merger. If the index is positive, the merger is not reviewed. The EU index is a latent variable and is unobserved, however, we do observe the zero-one outcomes of the decision to review or not to review, i.e. we observe

$$y = \begin{cases} 0 & \text{if } y^* > 0 \quad \text{Do not Review} \\ 1 & \text{if } y^* < 0 \quad \text{Review} \end{cases}$$

Using our knowledge of the underlying index, we can express the conditional probability of review in terms of a cumulative distribution function of the error term in the latent index,

$$\begin{aligned} P(y = 1|X) &= P(y^* < 0|X) \\ &= P(\varepsilon < -(\beta_0 + \beta X) | X) \\ &= G(-(\beta_0 + \beta X)) \end{aligned}$$

where G is the cumulative distribution function of ε . If we assume that ε has a Weibull (normal) distribution we obtain the logit (probit) model. In this paper we use the logit model to estimate the parameters of the model and we use the information in conjectures 2 and 3 to obtain suitable explanatory variables.

In addition to the decision to review a merger, the EU also can request that the merging firms divest business units in order to maintain sufficient competition within an industry. In the context of the model above, the EU index of the merger impact, y^* , is used to determine one of three possible decisions. If the EU benefits (or is not expected to be severely harmed) from the merger, the merger is not reviewed. If the merger imposes a cost on the EU, the merger is reviewed and if the cost is above a certain threshold, divestiture demands are made. Based on the EU's decision we observe the following variable:

$$y = \begin{cases} 0 & \text{if } y^* > 0 \quad \text{Do not Review} \\ 1 & \text{if } C < y^* < 0 \quad \text{Review} \\ 2 & \text{if } y^* < C \quad \text{Review and Divest} \end{cases}$$

where C denotes a cost threshold. We use the ordered logit model to estimate the relationship between the review process and the explanatory variables suggested by conjectures 2 and 3.

It is important to recognize that the logit and probit models are highly nonlinear and that the coefficients can not be interpreted as regression coefficients. Our analysis makes use of the following methods of interpreting this class models: First, we can interpret the sign of the coefficient of each variable e.g. if the coefficient on the price of the merger is positive it implies that a the probability of review increases with the price of the merger. Second, we can interpret the t-statistic of each variable for statistical significance. Third, the ratio of two coefficients reflects the relative change in the probability of review as each variable changes, e.g. if the X_1 has a coefficient of 2 and X_2 has a coefficient of 3, then effect of a one unit change in X_2 on the probability of review is 1.5 times bigger than the effect of a one unit change in X_1 . Fourth, the most useful method for 'comparative statics' is to calculate the change in the probability of review as one of the variables changes. It is also important to keep in mind that due to the nonlinearity of the model, the sensitivity of the probability of review to a one unit change in an explanatory variable may vary with its own level and that of the other variables. Finally, as a proxy for the R^2 we compute the correlation between y and its predicted value where the predictions equal one if the predicted probability of review is greater than 0.5 and zero otherwise.

6 Summary Statistics for the Data

Table 2 contains the sample averages of the variables for the complete sample, the review and no-review subsamples and the divestiture subsample. Out of the 209 mergers, 52 were reviewed by the EU commission, i.e. the unconditional probability of review is 0.331. Out of the 52 reviewed mergers, only 13 required divestitures. The price of the merger is denominated in billions of US dollars and is highly skewed: the average price is \$8.6 bn, but the median is only \$5.2 bn. Thus we prefer to use the natural log of the price ($\log\text{price}$) in the econometric analysis. The average of $\log\text{price}$ is 1.726 (\$5.62 bn) which is closer to the median of the price variable. The average $\log\text{price}$ of the mergers that were not reviewed is \$4.85 bn. In contrast, the average $\log\text{price}$ for the reviewed mergers is almost twice as large and is \$8.74 bn. As expected, the average $\log\text{price}$ of the mergers that were reviewed and required a divestiture is the largest of the three groups and is \$10.475 bn.

The averages of the dummy variables can be interpreted as probabilities. The overall mean is simply the proportion with a particular characteristic or the probability of having that characteristic. The mean of the (no) review column is the probability of having a particular characteristic given that a merger was (not) reviewed. For example, 0.655 of the mergers took place in the service industry, but the probability of the merger being in the service industry, given that the merger was reviewed, is only 0.308. On the other hand, given that the merger was not reviewed, the probability of the merger taking place in the service industry is 0.771. Although we are not interested in predicting the conditional probability where the conditional information is that the merger was or was not reviewed, large differences between these probabilities suggest important differences between the subsamples, differences that may be important for the estimation and the prediction of review.

Many of the weak or no presence and strong presence variables have too little data and are likely to be discarded in the statistical analysis. For example, the proportion of acquired firms with a strong European presence is only 0.004; this is equivalent to only one observation so this variable is unlikely to be used in the estimation of the model. In the case of the presence and strong presence of the acquiring firms in Europe, there is a big difference in the means between the review and no review groups. We expect this information to be informative in the logit model in helping us to predict reviews. This point also applies to the presence of the acquired firm in Europe and the medium level of market share in the US and Europe.

Finally, the dummy variables for the years show that approximately 20% of the mergers took place within each of the five years of our sample. There was a decrease in the number of mergers that were reviewed from 1995 to 1996, but thereafter the proportion of reviewed mergers per year increases every year. The decrease from 1995 to 1996 is consistent with the consolidation in the banking sector of the service industry. Mergers within the service industry are less likely to be reviewed because they are less likely to reduce competition in Europe. In the logit analysis, we omit D95, the dummy for 1995, and regard it as the base year.

The column labelled divestiture contains the sample means for the 13 mergers where the EU required a divestiture. The most striking average is that of the presence of an acquired firm in Europe: it equals one, i.e. in every divestiture the acquired firm had a presence in Europe. In contrast, in none of the divestitures did the acquired or acquiring firms have a weak or no presence

in Europe. In general we find that the proportions for the divestitures tend to mirror those of the review column and highlight the importance of the market share and presence variables in the review process.

7 Estimation Results

7.1 The Logit Model

Our modelling strategy is to include all the variables that are conjectured to be important in the initial model. Some variables are omitted because of too little data or singular-matrix problems, e.g. AQR_US_SP and AQR_EURO_SP. For each of the groups of dummy variables, the lowest category was omitted and used as a base case and due to the skewness of the price variable we include the natural log of price. The parameter estimates of the initial model are contained in Table 2.

None of the industry dummies and year dummies are statistically significant although the coefficients of the industry dummies do have the expected sign. The negative coefficient of the service dummy is consistent with the argument that markets are segmented and products are less likely to be tradeable, thus these mergers are less likely to reduce welfare in the EU. The coefficient of the defense industry dummy is positive as a sign of the political sensitivity in Europe towards the restructuring of the American defense industry in the 1990s. The negative coefficient of the British Utility dummy is consistent with the third criterion of the "Community Dimension" of Section 3, i.e. the mergers involving British Utilities fall under British jurisdiction because 100% of the revenues are earned within the UK and therefore the EU does not review them. We should note that cases involving the acquisition of a European firm by an American firm are all investigated by the EU Commission without an exception¹².

To reduce the complexity of the model we test the joint hypothesis that the industry and year dummies have no explanatory power. We fail to reject the null hypothesis using both the likelihood ratio test and the Wald test. For the likelihood ratio statistic, the log-likelihood of the initial model

¹²Also, several other high profile acquisitions such as Coca Cola's purchase of Cadbury Schweppes' operations in several countries were prevented by the EU.

is -21.520 and decreases to -28.948 for the reduced model, but this difference is not statistically significant. The correlation between the predicted and actual reviews is 0.829 for the initial model and 0.767 for the reduced model so there is little loss in explanatory power from the omission of the industry and year dummies.

The parameter estimates of the reduced model are contained in Table 3. It is interesting to note that there is little change in the estimated coefficients for the logprice of the merger and the presence of the acquired and acquiring companies, but there are important changes in the statistical significance of the coefficients of the market share and nationality variables. The service industry dummy and the medium market share of US companies in Europe are strongly correlated so once the service dummy is omitted, the market share variable becomes statistically significant.

Now we will walk through Table 3 and discuss the relationship between the probability of review and each explanatory variable. The probability of review is positively related to the price of the merger. This is consistent with our expectations because price may act as a proxy for the degree of market power that the merged firm has. Also, price is highly correlated with the public profile of the merger which might lead the authorities to pay close attention. Turning to the nationality of the companies, we find that a merger is more likely to be reviewed if the acquired firm is European, but the nationality of the acquiring firm has no statistically significant relationship.¹³ This variable would probably be better estimated if the dataset included mergers between European firms. Unfortunately this data is harder to gather compared to the data on American firms.

Next we turn to the market presence of the acquiring firms in the US and Europe. We find that the presence in Europe is more important for the review process than presence in the US. For example, the presence and strong presence of the acquiring firm increases the probability of review significantly. Furthermore, the probability of review is much more responsive to the strong presence than presence because the coefficient of strong presence is 1.4 times bigger than the coefficient of presence. On the other hand the presence and strong presence of the acquiring firm in the US

¹³One interesting point is that the Acquired Euro coefficient changes dramatically from the initial model to the reduced model. This is due to the inclusion of the British utility variable in the initial model. We have 13 cases where the acquired firm is European of which 4 of them are British utilities. These are not reviewed by the EU and the other 9 are. When we exclude the British Utility variable in the reduced model, acquired Euro variable becomes significant and has the right magnitude.

has no statistical relationship with the probability of review¹⁴. This might be due to several facts. First, European authorities have the resources and incentive to only care about the mergers that involve the European market. Also, the American authorities receive notification of all of these mergers and conduct the appropriate investigations if their national interests are harmed. Second, if the acquiring firm is European and has a market presence in US, then the European authorities have no incentive to investigate since no harm is to European consumers. If it is an American firm, they only care only in cases where other European firms have a strong market share in that market. This effect does not seem to be very strong as we see from the estimation.

The market presence of the acquired firm is also important for the review process again if the presence is in Europe, but plays no role when the presence is in the US. The coefficient of the presence of the acquired firm in Europe is approximately the same size as the coefficient of the strong presence of the acquiring firm in Europe, thus it has a similar quantitative effect on the probability for review. The coefficient of the acquired firm's presence in the US is positive, but not statistically significant. The reasons for this pattern would be similar to the case of the acquiring firms.

Next we consider the market share variables of all European and American firms. The first set of variables measure the market presence of American firms in Europe. In general, mergers are more likely to be reviewed if the market share of the US company in Europe is at a medium level. The coefficient of the strong US market share in Europe is positive, but the p-value is 0.162. A merger in a market benefits other firms by decreasing competition. If other American firms have a significant presence in that market, they accrue these benefits (as opposed to European firms) and increase the opposition from EU authorities.

The other side of the coin reflects the share of the European firms in the American market. We find that the market share in the US has no relationship with the probability of review. The coefficients of medium and strong market shares of European companies in the US have negative coefficients as expected, but they are not statistically significant.¹⁵. These results imply that global

¹⁴The presence of the acquiring firm in the US has a p-value of 0.140 which may indicate a weak relationship, and the coefficient is negative which indicates a relationship in the correct direction.

¹⁵It is interesting to note that the medium and strong US market share in Europe variables have negative coefficients in the initial model and strong is statistically significant

market share appears to be less important than domestic market share. Again, the inclusion of the mergers between European firms would increase the precision of the estimates.

In conclusion, these are the main results in Table 2: The probability of review is *positively* related to

1. whether the **acquired** firm is European.
2. the presence of the **acquired** firm in Europe.
3. the presence and strong presence of the **acquiring** firm in Europe
4. the **market share** of US firms in Europe.

On the other hand, the probability of review is *unrelated* to

1. the presence of the acquired or acquiring firm in the US.
2. the **market share** of European firms in the US.

7.2 The Ordered Logit Model

The parameter estimates of the initial ordered logit model are contained in Table 4. In general, the relative sizes of the coefficients and the signs of the coefficients mirror the results for the logit model. Except for the dummy for 1997, the same group of variables that have statistical significance in logit model display significance in the ordered logit model. The large negative coefficient of D97 is consistent with the reduction in the number of mergers reviewed by the EU in 1997 due to the consolidation within the financial sector in the United States. These mergers are less likely to be reviewed because they are less likely to have impact in Europe. We discuss the predictions of the model in the next section.

8 Comparative Statics

The main advantage of the logit model in this scenario is the ability to obtain different probabilities conditioned on different combinations of explanatory variables based on the results of the regular

logit model¹⁶. This methodology is very similar to simple comparative statics analysis in the sense that we can observe which significant variables have more relative influence on the probability of review. In this section, we look at the effect of the following as identified in the previous section: (1) the nationality of the acquired firm - European vs. American, (2) the degree of the market presence of the acquiring firm in Europe, (3) market presence of the acquired firm and (4) the market presence of all American firms in Europe. Before going any further, we should make an important note about other variables. Logprice was a very significant variable in the regular logit model as we discussed previously. Therefore, all of the probabilities of review are calculated for two different price levels. The first model (low price model) has the logprice set at 1.726148 (\$5.618 bn) which is the mean price for all mergers while the second model (the high price model) has it set at 2.167878 (\$8.740 bn). This is the mean price of all reviewed mergers. All of the results we discuss are documented in Table 5. Also, in all of the scenarios, the acquiring firm is not European and all other variables are set at weak/no presence level. These are (1) acquiring firm's presence in the US market, (2) acquired firm's presence in the US market and (3) all European firms' presence in the US.

There are several general comments we need to make about Table 5. Columns 1 and 3 look at the low price scenario while columns 2 and 4 are based on the high price scenario. Furthermore, columns 1 & 2 assume acquired firm is American and 3 & 4 assume it is European. The first three rows assume all the market presence of American firms is weak in Europe while the last three assume it is medium. Strong presence is omitted since it was not statistically significant. Rows 1 and 5 (2 and 6) assume acquiring firm medium (strong) presence in Europe with no/weak presence by the acquired firm in Europe. Rows 3 and 7 (4 and 8) assume acquiring firm has no/weak (medium) European presence while the acquired firm has medium presence. Comparison of rows 1 and 2 (or 5 and 6) enables to analyze the effect of acquiring firm's presence in Europe while the comparison of rows 1 and 4 (or 5 and 8) helps us with the analysis of the acquired firm's presence. Thus this table enables us to present the impact of all of our relevant variables in a compact format.

¹⁶We will not be using the results from the ordered logit since the qualitative results in terms of significance did not change and the regular logit model has nicer predictive powers.

8.1 Nationality of the Acquired Firm

First significant variable we analyze is the nationality of the acquired firm: American vs European. The appropriate comparisons are between columns 1 & 3 for the low price model and between 2 & 4 for the high price model. Changing the nationality of the acquired firm from American to European has a significant effect in all cases since the probabilities are higher in column 3 (4) compared to column 1 (2). The relative magnitude of this variable depends on the circumstances. It has a stronger effect when (i) the American firms' presence in Europe is medium (as opposed to weak), (ii) the price is high and (iii) the acquired firm has a strong presence in Europe (as opposed to medium). This implies that these three variables are complementary to the nationality variable in creating externalities since they reinforce each other.

We can conduct the following exercise to see this fact more clearly. Suppose that the American firms have weak presence in the relevant European market and the acquiring firm has a medium presence in Europe (row 1 of panel I). Then the probability of review increases from 0.010 to 0.251 when we change the nationality of the acquired firm to European. However, the probability increases from 0.048 to 0.624 if the acquired firm has strong presence (row 2 of panel II) showing the complementary effect of the two variables. Similarly, the effects are stronger for the high price model. Furthermore, it is interesting to note that European nationality for the acquired firm with some sort of presence for either of the merging firms almost guarantees review with the probabilities ranging between 0.970 and 0.996!

8.2 Market Presence of All American Firms in Europe

This variable can be analyzed by comparing the four rows of panel I with those of panel II. It also has a significant impact since all probabilities increase with the growing market presence of American firms from weak to medium. The effect is the strongest when (i) the price is high, (ii) acquiring firm has a strong presence in Europe, (iii) the acquired firm is European and (iv) the acquired firm has a presence in Europe. In other words, all of the other significant variables from the logit model are also complementary to this variable and increase its impact. For example, suppose the acquired firm is American and the price is high. If the acquiring firm has medium presence in Europe, increasing the market presence of American firms to medium would cause the probability

to increase from 0.032 to 0.373. On the other hand, the probability of review would increase from 0.141 to 0.746 if the acquired firm had a strong presence showing the complementarity.

There are several further interesting observations. If the price is high and both merging firms have at least medium presence in Europe, the probabilities are all between 0.909 and 1.000. The market presence of other American firms become irrelevant since these other variables dominate everything else. In other words, other American firms matter only if one of the merging firms has weak presence in Europe.

8.3 Market Presence of the Acquiring Firm in Europe

This is our third significant variable from the logit estimation and the relevant comparisons are between rows 1 & 2 of panel I and II. The probabilities increase considerably for all cases when the presence of the acquiring firm in Europe grows from medium to strong. Again, this variable is also complementary to other significant variables. For example, suppose price is high and acquired firm is American (column 2). If American firms have medium presence in Europe, then changing the presence of acquired firm to strong increases the probability from 0.032 to 0.141. On the other hand, if American firms have medium presence, then probability goes from 0.373 to 0.746. Similar patterns exist with other significant variables.

This variable has relatively important effects in two separate instances. The first one is when American firms have weak presence in Europe and the acquired firm is European. (rows 1 & 2 and columns 3 & 4). The probability increases from 0.251 to 0.624 (0.520 to 0.843) in the low (high) price model. The second case is when American firms have medium presence in Europe but the acquired firm is American (rows 4 & 5 and columns 1 & 2). If the price is low (high) the probability increases from 0.155 to 0.477 (0.373 to 0.746).

Finally, unlike previous variable which had no impact under certain circumstance, this variable can affect the probability of review under every cases. The implication is that it is an important variable followed by the EU authorities as it would be in a closed economy scenario as well.

8.4 Market Presence of the Acquired Firm in Europe

The final variable to analyze is the market presence of the acquired firm in Europe and we follow the same steps as in the previous sections. The appropriate comparisons are between rows 1 & 4 and 5 & 8. As it was the case in the previous sections, market presence of the acquired firm is also complementary with other variables. As an example, assume the US firms have weak presence in Europe, acquiring firms has medium presence in Europe and the acquired firm is American. If the price is low, the probability of review increases from 0.010 to 0.756 when the acquired firm reaches medium market presence. If the price is high, the increase is from 0.032 to 0.909 showing the complementarity.

Furthermore, this is the strongest one among all of the statistically significant variables. The jumps in probabilities from row 1 to 4 and from row 5 to 8 (when the acquired firm reached medium presence level) are very large, especially if the acquired firm is American. We should note that the all acquired European firms already have at least medium presence so the probabilities are high anyway. Finally, when both merging firms have at least medium presence and the price the probability of review is almost always above 0.9 implying these are the two most significant variables as they would be in anti-trust policy of a closed economy as well.

8.5 Ordered Logit

For the ordered logit we can predict three probabilities: the probability of no review, the probability of review and no divestiture and the probability of review and divestiture. These three probabilities sum to one. Although we do not report these results, we find that when we omit the industry dummies we obtain similar predictions to those of the logit model, i.e. the probability of review versus no review are almost identical and the probability of review and divestiture is negligible. The only difference occurs for the following two combinations: first, the acquired firm is European, the acquiring firm has a strong presence in Europe and the US company's market share in Europe is medium, and second, the acquired firm is European, the acquired firm has a presence in Europe and the US company's market share in Europe is medium. In these two cases the probability of no review is effectively zero, but the probability of review is 0.7 and the probability of review and divestiture is 0.3. Once again the predictions of our models point to the fact that the greater the

degree of market power of the merged firms in Europe, the more likely the merger is reviewed and divestitures are required.

9 Conclusion

There has been growing interest among policymakers and the international economists on the international externalities caused by domestic policies. The demands for multilateral coordination of environmental, labor and tax laws is a natural consequence of integrated markets and the global impacts of domestic laws of large countries. Despite the importance and the attention, there are few empirical studies on these issues. By focusing on the competition policies, we aim to fill the gap.

The main purpose of the paper was to identify which economic variables are significant in creating international externalities when two firms merge. We used a database of large mergers involving American firms some of which were investigated by the EU commission for possible impact on Europe. We expect that the EU will investigate only the mergers with the most significant impact given its the limited administrative resources although all of the mergers qualify according to the legal criteria established. Through a discrete choice model we could see which economic variables (among the ones we pointed out in the theory section) are significant in determining the likelihood of review by the EU. These variable were (1) the size of the merger, (2) the nationality of the acquired firm, (3) the market presence of the merging firms in Europe and (4) the market presence of all American firms in that specific industry in Europe. The last variable is the most important for international externalities as the other ones are relevant for closed economies as well. Furthermore, as one of the most important findings in this paper, we show that these variable are strategic complements and strongly reinforce each other.

Other variables, such as the nationality of the acquiring firm, the market presence of the merging firms in the US and the all European firms' presence in the US are not significant. This might be due to lower integration level of the national markets or the role of the American authorities in anti-trust enforcement. If a merger will have an impact in the US, then American authorities will take the necessary precautions and EU has no reason to include this in their decisions. This is actually what the agreement between the EU and the US propose in terms of coordination of their

anti-trust efforts.

This paper is intended to be a first effort in a very interesting and important dimension of international economics. We aim to theoretically identify what variables are important and empirically determine their absolute and relative significance. These findings should be important in any policy debate over competition and other domestic policies.

10 Tables

Table 1: Sample Averages of the Explanatory variables for the entire sample, the reviewed and unreviewed mergers, and the reviewed mergers where divestiture where required

Variable	Sample Average			
	Overall	No Review	Review	Divestiture
Sample Size	209	157	52	13
Price (US\$bn)	8.622	6.489	15.061	21.646
LogPrice	1.726148	1.579843	2.167878	2.349126
Service	0.655	0.771	0.308	0.154
Defense	0.038	0.019	0.096	0.077
British Utilities	0.019	0.025	0.000	0.000
D95	0.200	0.216	0.154	0.231
D96	0.167	0.191	0.096	0.077
D97	0.215	0.248	0.115	0.077
D98	0.201	0.184	0.250	0.307
D99	0.215	0.159	0.384	0.307

Table 1(cont.):

Variable	Overall	No Review	Review	Divestiture
Acquired_EURO	0.062	0.025	0.173	0.231
Acquiring_EURO	0.120	0.102	0.173	0.231
AQR_EURO_WNP	0.574	0.739	0.077	0.000
AQR_EURO_P	0.344	0.217	0.731	0.615
AQR_EURO_SP	0.081	0.044	0.192	0.384
AQD_EURO_WNP	0.718	0.911	0.135	0.000
AQD_EURO_P	0.282	0.089	0.865	1.000
AQD_EURO_SP	0.004	0.000	0.019	0.077
AQR_US_WNP	0.067	0.063	0.077	0.077
AQR_US_P	0.789	0.841	0.635	0.461
AQR_US_SP	0.143	0.095	0.288	0.461
AQD_US_WNP	0.072	0.070	0.077	0.077
AQD_US_P	0.866	0.911	0.731	0.538
AQD_US_SP	0.062	0.019	0.192	0.384
EURO_IN_US_WEAK	0.751	0.866	0.400	0.307
EURO_IN_US_MED	0.200	0.108	0.481	0.538
EURO_IN_US_STRNG	0.048	0.025	0.115	0.154
US_IN_EURO_WEAK	0.550	0.713	0.057	0.000
US_IN_EURO_MED	0.239	0.172	0.442	0.461
US_IN_EURO_STRNG	0.210	0.115	0.500	0.538

Table 2: Estimates of the Initial Logit Model

Explanatory Variable	Expected Relationship	Coefficient	P-value
Intercept	+/-	-14.081	0.004
LogPrice	+	2.936	0.003 ^c
Service	-	-1.121	0.407
Defense	+	2.524	0.625
British Utility	-	-66.039	1.000
D96	+/-	-0.793	0.707
D97	+/-	-1.838	0.206
D98	+/-	0.678	0.662
D99	+/-	1.788	0.279

The Initial Logit Model contains all the variables suggested by conjectures 2 and 3 that are considered to have explanatory power for the probability of review. A superscript *a*, *b* and *c* denote statistical significance at the 10%, 5% and 1% level, respectively. As a proxy for the R^2 we compute the correlation between y and its predicted value where the predictions equal one if the predicted probability of review is greater than 0.5 and zero otherwise.

Table 2 (ctd): Estimates of the Logit Model

Explanatory Variable	Expected Relationship	Coefficient	P-value
Acquired_EURO	+	36.749	1.000
Acquiring_EURO	-	1.814	0.223
AQR_EURO_P	+	3.586	0.049 ^b
AQR_EURO_SP	+	4.279	0.105
AQD_EURO_P	+	6.694	0.000 ^c
AQR_US_P	-/0	-2.405	0.182
AQR_US_SP	-/0	1.033	0.640
AQD_US_P	-/0	0.297	0.848
US_IN_EURO_MED	+	-0.424	0.737
US_IN_EURO_STRNG	+	-3.147	0.097 ^a
EURO_IN_US_MED	-/0	4.363	0.049 ^b
EURO_IN_US_STRNG	-/0	2.797	0.205
Log likelihood		-21.520	
Correlation		0.829	

Table 3: Estimates of the Reduced Logit Model

Explanatory Variable	Expected Relationship	Coefficient	P-value
Intercept	-/+	-12.879	0.000 ^c
LogPrice	+	2.654	0.000 ^c
Acquired_EURO	+	3.485	0.044 ^b
Acquiring_EURO	-	0.513	0.673
AQR_EURO_P	+	3.718	0.004 ^c
AQR_EURO_SP	+	5.321	0.014 ^b
AQD_EURO_P	+	5.710	0.000 ^c
AQR_US_P	-/0	-2.125	0.140
AQR_US_SP	-/0	0.652	0.733
AQD_US_P	-/0	0.642	0.627
US_IN_EURO_MED	+	2.885	0.033 ^b
US_IN_EURO_STRNG	+	2.092	0.162
EURO_IN_US_MED	-/0	-0.506	0.603
EURO_IN_US_STRNG	-/0	-1.516	0.311
Log likelihood		-28.948	
Correlation		0.767	

Table 4: Estimates of the Initial Ordered Logit Model

Explanatory Variable	Expected Relationship	Coefficient	P-value
LogPrice	+	1.432	0.005 ^c
Service	-	-1.127	0.407
Defense	+	0.684	0.641
British Utility	-	-41.596	1.000
D96	+/-	-0.907	0.439
D97	+/-	-1.950	0.063 ^a
D98	+/-	-0.061	0.955
D99	+/-	-0.329	0.738

The Initial Ordered Logit Model contains all the variables suggested by conjectures 2 and 3 that are considered to have explanatory power for the probability of review. A superscript *a*, *b* and *c* denote statistical significance at the 10%, 5% and 1% level, respectively. As a proxy for the R^2 we compute the correlation between y and its predicted value where the predictions equal one if the predicted probability of review is greater than 0.5 and zero otherwise.

Table 4 (ct): Estimates of the Initial Ordered Logit Model

Explanatory Variable	Expected Relationship	Coefficient	P-value
Acquired_EURO	+	3.056	0.007 ^c
Acquiring_EURO	-	0.157	0.884
AQR_EURO_P	+	2.051	0.053 ^a
AQR_EURO_SP	+	3.868	0.015 ^b
AQD_EURO_P	+	4.475	0.000 ^c
AQR_US_P	-/0	-1.498	0.206
AQR_US_SP	-/0	-0.179	0.894
AQD_US_P	-/0	-0.055	0.951
US_IN_EURO_MED	+	1.341	0.252
US_IN_EURO_STRNG	+	0.186	0.891
EURO_IN_US_MED	-/0	0.087	0.910
EURO_IN_US_STRNG	-/0	-0.533	0.675
Log likelihood		-54.911	

Table 5: Comparative Statics of the Probability of Review

		Probability of Review			
		column 1	column 2	column 3	column 4
Conditioning		Low Price	High Price	Low Price	High Price
Variables		Acquired	Acquired	Acquired	Acquired
		American	American	European	European
when		Panel I			
US.IN.EURO.WEAK					
AQR.EURO.P		0.010	0.032	0.251	0.520
AQR.EURO.SP		0.048	0.141	0.624	0.843
AQD.E.P & AQR.E.W		0.070	0.195	0.710	0.888
AQD.E.P & AQR.E.P		0.756	0.909	1.000	0.996
when		Panel II			
US.IN.EURO.MED					
AQR.EURO.P		0.155	0.373	0.857	0.970
AQR.EURO.SP		0.477	0.746	0.967	0.994
AQD.E.P & AQR.E.W		0.574	0.813	0.977	0.996
AQD.E.P & AQR.E.P		0.982	0.994	0.999	0.999

11 Appendix - List of the Variables

- *Price* - the price of the merger calculated by the market capitalization of the smaller (or the acquired) firm
- *Logprice* - the natural log of the price of the merger
- *Service* - a dummy variable that equals 1 if the merger takes place between companies in the service industry and zero otherwise.
- *Defense* - a dummy variable that equals 1 if the merger takes place between companies in the defense and aerospace industry and zero otherwise.
- *D_i* is a dummy for year *i* where $i = 95, \dots, 99$. (In the estimation we omit *D*₉₅ and treat it as the base year).
- *Acquired_Euro* - a dummy variable that equals one if the **acquired** company is European and zero otherwise.
- *Acquiring_Euro* - a dummy variable that equals one if the **acquiring** company is European and zero otherwise.
- *AQR_EURO_WNP* - a dummy variable that equals one if the **acquiring** company has a weak or no presence in Europe and zero otherwise. (see the Data section on how these are defined)
- *AQR_EURO_P* - a dummy variable that equals one if the **acquiring** company has a medium presence in Europe and zero otherwise.
- *AQR_EURO_SP* - a dummy variable that equals one if the **acquiring** company has a strong presence in Europe and zero otherwise.
- *AQD_EURO_WNP* - a dummy variable that equals one if the **acquired** company has a weak or no presence in Europe and zero otherwise.
- *AQD_EURO_P* - a dummy variable that equals one if the **acquired** company has a medium presence in Europe and zero otherwise.

- *AQD_EURO_SP* - a dummy variable that equals one if the **acquired** company has a strong presence in Europe and zero otherwise.
- *AQR_US_WNP* - a dummy variable that equals one if the **acquiring** company has a weak or no presence in the US and zero otherwise.
- *AQR_US_P* - a dummy variable that equals one if the **acquiring** company has a medium presence in the US and zero otherwise.
- *AQR_US_SP* - a dummy variable that equals one if the **acquiring** company has a strong presence in the US and zero otherwise.
- *AQD_US_WNP* - a dummy variable that equals one if the **acquired** company has a weak or no presence in the US and zero otherwise.
- *AQD_US_P* - a dummy variable that equals one if the **acquired** company has a medium presence in the US and zero otherwise.
- *AQD_US_SP* - a dummy variable that equals one if the **acquired** company has a strong presence in the US and zero otherwise.
- *EURO_IN_US_WK*- a dummy variable that equals one if all European companies have a weak market share in the US and zero otherwise
- *EURO_IN_US_MED* - a dummy variable that equals one if all European companies have a medium market share in the US and zero otherwise
- *EURO_IN_US_STRG*- a dummy variable that equals one if all European companies have a strong market share in the US and zero otherwise
- *US_IN_EURO_WK* - a dummy variable that equals one if all American companies have a weak market share in Europe and zero otherwise
- *US_IN_EURO_MED* -a dummy variable that equals one if all American companies have a medium market share in Europe and zero otherwise
- *US_IN_EURO_STRG* - a dummy variable that equals one if all American companies have a strong market share in Europe and zero otherwise

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