

Industry Characteristics and Anti-competitive Behavior: Evidence from the EU[♦]

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ABSTRACT

The objective of this paper is to whether and to what extent the European Commission decisions on anti-trust cases are consistent with economic theory. To do so, we use a unique data set that contains information on all the cases (almost 2000) that were submitted to the Commission for its consideration from January 1999 to February 2004. We have information not only on the cases that were analyzed by the Commission and for which a decision was finally public, but also on all the cases that were never pursued any further or the ones for which there is no public final decision. This allows us to determine not only whether the Commission follows the prescriptions of economic theory on its final decisions but also to see whether there is any type of bias on the selection of the cases that the Commission decides to pursue. Our results confirm that Commission decisions follow the predictions of the economic literature and that political variables do not seem to play a significant role.

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1. Introduction

The task of ensuring that there is free competition in the European Union (EU) has been entrusted to the European Commission by Member States. Hence, the Commission, and more precisely the Directorate General for Competition (DG Comp), monitors and investigates suspected breaches of competition law. The Commission may prohibit certain firm's conducts and impose conduct restraints and fines to the firms found guilty of anti-competitive practices. In the EU, competition policy is based on three main pillars: antitrust, merger control and monitoring state aid. Our analysis focuses on antitrust policy. In this context, the Commission is concerned about restrictive agreements and practices that imply an abuse of market power.

The objective of this paper is to analyze what are the main criteria used by the Commission when deciding on anti-competitive practices. In particular, our goal is to determine whether and to what extent the Commission decisions are consistent with economic theory. There is a very extensive industrial organization literature which provides the theoretical and empirical background that associates industry features with the likelihood of practices that restrict competition. However, the literature that evaluates the decisions by the competition authority is much scarcer and has focused mainly on the analysis of merger policy. Our paper contributes to fill this gap in the literature. To do so, we use a unique data set that contains information on all the cases (almost 2000) that were submitted to the Commission for its consideration from January 1999 to February 2004. We have information not only on the cases that were analyzed by the Commission and for which a decision was finally public, but also on all the cases that were never pursued any further or the ones for which there is no public final decision. This is crucial since it will allow us to determine not only whether the Commission follows the prescriptions of economic theory on its final decisions but also to see whether there is any type of bias on the selection of the cases that the Commission decides to pursue.

Our results confirm that Commission decisions follow the predictions of the economic literature and that political variables do not seem to play a significant role. As expected, the Commission is more inclined to judge against the cases that involve a horizontal practice than against those that imply a potential abuse of dominant position or a practice that could have efficiency justifications. Moreover, as we would expect from the economics literature, it is more likely to decide against a practice that involves a highly concentrated industry or an industry with high demand growth.

Coate and McChesney (1992) look at 70 merger cases analyzed by the Federal Trade Commission and find that barriers to entry were an important factor to block a merger, while the likelihood of future collusion was not. They concluded that many mergers were likely to be approved even above the critical level of concentration indicated in the "Merger Guidelines". Weir (1993), in a similar study for the UK, uses a probit analysis to determine whether efficiency reasons were the main considerations taken into

account by the MMC. The author found that a key element for blocking a merger bid was an expected decrease in competition. However, when he tried to determine which were the regular sources of competition taken into account by the Monopolies and Mergers Commission (MMC), he found great variability, concluding that the authorities were following a case-by-case approach. Khemani and Shapiro (1993) look at the decisions of the Bureau of Competition Policy in Canada. Using a probit model, they conclude that concentration and market share are the most important determinants of the Bureau's decisions, followed in importance by input competition and barriers to entry. Davies et al. (1999) use data from 73 reports from the UK Monopolies and Mergers Commission (MMC). Applying a probabilistic model, the authors find that market share of the investigated firm is one of the main determinants of the MMC decision. Their results also suggest that one can predict the result of MMC's decisions with high accuracy. More recently, Bergman et al. (2003) look at the European Commission's merger decision process and show that the probability of deciding against a merger increases with the parties' market shares.

The paper is arranged in 6 sections. Section 2, after this introduction, provides background on the antitrust policy of the EU. Section 3 develops and explains the methodology in detail. Section 4 discusses the variables which are key determinants of the likelihood of infringements of Articles 81 and 82, as well as their empirical measures. This section also discusses other variables to be used in the econometric analysis. The results are presented in section 5 and section 6 concludes.

2. Background on the European competition law

In order to apply the antitrust regulation, the European Commission counts on Articles 81 and 82 of the Treaty of the European Union (henceforth, EU Treaty), which prohibit restrictive agreements between undertakings, concerted practices to restrict or distort competition in the common market and abuses committed by undertakings holding a dominant position.

Article 81 deals with cartels and tacit collusion (explicit and non-explicit agreements between firms which have as an objective the restriction of competition, by means of delineation of markets, agreements not to reduce prices, etc.). It also deals with agreements between firms with the purpose of undertaking joint activities such as R&D, sharing of production facilities, joint ventures, etc. Hence, this article refers both to horizontal and vertical agreements and it includes agreements such as price fixing, market sharing, agreements that limit production, etc. It is commonly accepted in the economics literature that horizontal agreements are generally detrimental for social welfare, while that does not necessarily have to be the case for vertical agreements as these often contribute to enhanced efficiency. In order to take into account the fact that some agreements may be welfare enhancing, the Commission has introduced some *block exemptions* for article 81. These exemptions describe the conditions that certain agreements must satisfy

in order for them to be allowed under Article 81. Current block exemptions refer to activities such as technology transfers or franchising agreements and some of them relate to particular sectors (transport).

Article 82 prohibits abusive behavior. It includes practices such as price discrimination, tying and bundling, predation, exclusive dealership, exclusive territories or resale price maintenance¹. With many of the practices contemplated under this article one can find also efficiency justifications for their introduction, but all of them can be used as well by dominant players to reduce competition in the market place, particularly in vertical or related markets. There are no exemptions for cases under Article 82.

Until recently, the procedural rules² implementing Articles 81 and 82 EU Treaty provided for three ways of initiating action. Firstly, natural or legal persons who claim a legitimate interest may ask the Commission to take action against an agreement or a practice (complaints). Secondly, the Commission may take action on its own initiative (*ex-officio* procedure). Finally, agreements or practices could be notified to the Commission by at least one of the parties concerned (notification). This notification system has been discontinued³.

Once a case has been evaluated, the Commission can reach four main conclusions from more serious to less: there can be an *infringement* of the law, the Commission can issue a comfort *letter*, *negative clearance*, or it can conclude that an *exemption* applies to that particular case.

3. Methodology

3.1. Econometric specification

The goal of this paper is to examine the Commission's decisions on anti-competitive practices and to determine whether they are consistent with economic analysis. The paper is based on a probabilistic model that explains, on the basis of a cross-section of industries and their characteristics, the probability that the Commission decides that a behavior that breaches the antitrust legislation has taken place in a particular industry *i*. To do so we will consider two types of industry characteristics: first, those that, according to the economic literature, should have an impact on the probability of anti-competitive behavior. Second, those characteristics that might affect the Commission's decisions but that do not have an economic justification (they could have a political motivation, for instance). The dependent variable of our model is the decision reached in the cases examined by DGCOMP. This poses, as we will see

¹ Note that other practices, for example price squeezes, can be understood as a combination (price discrimination and predation) of those included above.

² Council Regulation N° 17 of 6 February 1962, OJ 13, 21.2.1962, p. 207.

³ The Council adopted a new Regulation implementing Articles 81 and 82 of the EC Treaty (Council Regulation (EC) No 1/2003 of 16 December 2002). This regulation replaces Regulation 17/62 and came into force on 1 May 2004. For the purpose of the present document, the main change to the procedural rules is that the new regime ends the system of notification.

below, a methodological problem since using Commission decisions as observables may create a sample selection bias which should be taken into account.

For each potential antitrust practice (such as collusion, predatory pricing, tying, etc.), there is an extensive theoretical literature in industrial organization indicating which are the industry characteristics X_1, X_2, \dots, X_n that make its occurrence more likely. Examples of such industry features are the concentration of the industry, the existence of barriers to entry, market transparency, demand growth, etc. Hence, our goal is to use the theoretical predictions provided by the literature to specify and estimate a limited dependent variable model, where the probability P_{ij} of detecting anti-competitive practices in industry i and case j is modeled as a function of a set of industry i characteristics X_i and case variables C_j such as the legal base used, the type of anti-competitive practice that might have taken place or the application of possible exemptions:

$$P_{ij} = F(\alpha + X_i\beta + C_j\gamma) \quad \text{Equation 1}$$

where F is the cumulative probability function, X_i are industry variables that determine the likelihood of an infringement, C_j are case-specific variables and α , β and γ are parameters.

If equation 1 is estimated using a probit model the specification becomes:

$$P_{ij} = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\alpha + X_i\beta + C_j\gamma} e^{-\frac{u_{ij}^2}{2}} du_{ij} \quad \text{Equation 2}$$

where u_{ij} is normally distributed.

The specification of such a model will, of course, face an intrinsic difficulty, since anti-competitive practices are not directly observable. There is a dependent variable y_{ij} which is observable and takes value 1 or 0, depending on whether an anti-competitive practice is detected or not by the Commission, and an unobservable variable y^*_{ij} which is determined by $\alpha + X_i\beta + C_j\gamma + u_{ij}$. It is therefore assumed that $y_{ij} = 1$ whenever $y^*_{ij} \geq 0$ and $y_{ij} = 0$ otherwise. To estimate Equation 2 we use data on the cases examined by the European Commission (henceforth, EC) between January 1999 and February 2004. The information has been supplied by the EC. For all the cases that have been examined by the Commission we have information on their resolution indicating whether there was a breach of Articles 81 or 82 was found or not, information on which was the cause of the infringement (i.e. cartel, vertical agreements, abuse of a dominant position, etc) and information on which is the legal base for the case (article 81 of the EU Treaty or others). The variables in C will be case-based and include the characteristics of the decision taken by the Commission and the nature of the case under examination. In particular, it includes the legal base used for the case and the type of practice that has taken place, as assessed by the Commission. These two variables are discussed in more detail in section 4.1.

3.2. Sample selection bias

Using only the data on Commission's decisions to evaluate how these decisions are affected by industry characteristics raises a potential problem: we do not use any information on the cases that have not been examined by the European Commission. We only observe the cases that are investigated and, among those, we know whether an anti-competitive practice is found or not. There could very well be situations where the Commission could have decided that there was a competition infringement, but that were never examined, and this problem may be particularly acute in some specific industries. In fact, it is by no means clear that a particular case j in a given industry i is chosen randomly. This situation corresponds to the existence of a sample selection bias problem that can be summarized as follows.

Let us assume that the Commission takes into account industry characteristics X_i when deciding to investigate a particular industry. However, it does not know the parameter vector β from equation 1 and it is likely to take other variables into consideration, and maybe miss some of those included in X . For example, it may consider variables such as industry size and other indicators of economic relevance. We can therefore model the probability that a particular industry will be investigated by the Commission as follows:

$$Q_i = F(W_i\delta) = F(z_i^*) \text{ Equation 3}$$

where the vector W of industry variables may include part of the vector X and Q_i is the probability that an industry will be investigated. The non-observable variable z_i^* is determined by $(W_i\delta + v_i)$, where v_i is a random term, while the observable variable z_i takes value 1 when an industry is investigated and zero otherwise.

Not taking into account this sample selection bias would lead to non-consistent estimates of β , to the extent that non-included variables that influence the decision to investigate are correlated with other missing variables that explain the likelihood of detecting anti-competitive behavior. That is, if u and v are correlated. We assume that u and v are i.i.d. and follow a bivariate normal distribution with variances σ_u , σ_v and covariance ρ . To solve this problem we follow Heckman⁴ (1976). The Heckman correction is widely used in the economic literature and it basically provides us with an estimator of a "corrector" for the sample selection bias. We will use our unique data set to obtain information on the cases for which there has been no follow-up from the Commission (and hence, no decision) in order to determine if any selection bias exist and to correct for it, if this is the case.

⁴ See, Wooldridge, J.M. *Econometric Analysis of Cross Section and Panel Data*, pages 560-66.

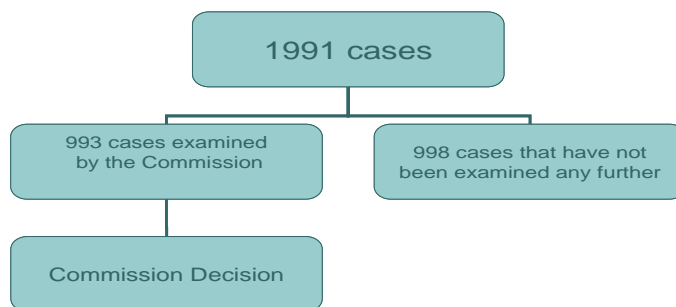
4. Data

4.1 Commission Decisions

Type of Decision

As we have established in the previous section, the dependent variable of our study is a binary variable that takes the value of 1 if a practice that breaches Articles 81 or 82 of the EU Treaty has been detected by the EC in a particular competition case, and 0 otherwise. All cases within the same industrial sector (measured at the three digit level following the NACE rev.1 codes) will share the same industry characteristics, and case specific information will be used to determine other relevant information about the nature of the business behavior under examination.

To measure the dependent variable we use data from the cases examined by the European Commission from January 1999 to February 2004. The data has been provided directly by the EC and, for all the cases that have been examined, it contains information on the resolution of the case (infringement, exemption, negative clearance or comfort letter), the legal base of the decision (articles 81, 82 or others) and the kind of infringement that has taken place (for example, cartel practices, exclusive purchase, selective distribution, etc.). We have information on 993 cases that have been examined by the Commission as well as on 998 additional cases that have not been followed up. These 998 cases include *ex-officio* procedures where the complaint has been withdrawn, or where the Commission decided to stop the procedure for unstated reasons (238 cases) or cases where the notified agreement or practice no longer exists.



There is great variability both on the number of cases examined by industry as well as on the decisions made by the Commission. Due to data availability restrictions with regard to industry-level data we will focus our analysis on the manufacturing industries, banking and telecommunications. Hence we will limit our study to 492 cases that have been examined by the Commission and 395 that have not been pursued.

The cases under examination can be classified in 15 different categories (see Box 1) according to whether a breach of competition rules was established or not, whether the decision was a formal one or not, and whether there were any fines or obligations imposed to one or more of the firms involved. A final distinction between decisions of the Commission is that they may or may not be published.

Box 1. Classification of the Commission Decisions			
Decision Type	Number of Cases	Num. Cases in Manufacturing, Telecommunications Services and Financial Intermediation	Anti-competitive Practice
There are reasons to take action			
<i>Formal decision</i>			
Formal decision prohibition with fines	44	25	YES
Formal decision prohibition without fines	11	6	YES
<i>Informal decision</i>			
Administrative letter. Minor community interest	32	17	YES
Discomfort Letter	24	13	YES
<i>Settlement</i>			
Settlement	60	36	YES
Total	171	97	
Exemptions			
<i>Formal decisions</i>			
Formal decision exemption with obligation	14	4	YES
Formal decision exemption without obligation	24	6	NO
<i>Informal decision</i>			
Comfort letter exemption with publication	14	7	NO
Comfort Letter exemption without publication	98	58	NO
Comfort letter. Group exemption	34	23	NO
Total	184	98	
No reasons to take action			
<i>Formal decision</i>			
Formal decision. Rejection of complaint	78	36	NO
Formal decision. Negative clearance	9	7	NO
<i>Informal decision</i>			
Negative Clearance without publication	270	133	NO
Negative Clearance with publication	36	17	NO
Rejection of complaint without decision	245	104	NO
Total	638	297	
Total Commission decisions with follow-up	993	492	

On the basis of the facts presented, the Commission has to decide whether a certain practice breaches competition rules or not. If the Commission comes to the conclusion that there are grounds to take action under the articles 81 or 82, it can then issue a *formal* decision or an *informal* one. Alternatively, the parties involved may decide to *settle*. In a formal decision, the Commission will *prohibit* the practice and may impose monetary penalties (*fines*) for the violation of the competition rules. The Commission issues informal decisions for actions that breach Articles 81 and/or 82 by means of an *administrative letter* or a *discomfort letter* (issued as an informal warning from the Commission). When the Commission decides that there are reasons to take action, this corresponds to a finding of anti-

competitive behavior (see Box 1) and the dependent variable of the regression analysis will take the value of 1.

Alternatively, after examining the facts the Commission can decide that there is no reason to take action. This can be due to two possibilities: because the practice under examination does not restrict competition or because it falls under an exemption contemplated under the Block Exemption Regulation (BER) or under Article 81(3) of the EC Treaty. This article allows the exemption from the prohibition laid down in article 81(1) for some agreements if they create enough benefits to outweigh their anti-competitive effects. The BER provides conditions under which certain types of agreements are exempted from the prohibition in article 81(1). Examples of block exemptions include car distribution agreements and technology transfer agreements.

The BER provides also automatic exemption from article 81(1) to vertical agreements that involve companies with market share of less than 30%.

If the Commission concludes that there is no reason to take action because no anti-competitive practice has taken place it can either *reject* the complaint or issue a *negative clearance* either as a formal decision or informally. If it concludes that the practice under examination is subject to an exemption, the Commission can also communicate it formally or informally, using a *comfort letter* (administrative letters sent to the parties involved, confirming informally that the Commission sees no grounds for action). Box 1 provides a listing of the classification of the Commission decisions in terms of their formal treatment. The third column of the table corresponds to the dependent variable, a binary variable that takes the value of one if an anti-competitive practice has been detected and zero otherwise.

Note that we codify the cases where an exemption has been applied as zero. Whenever an exemption is allowed we assume, as we have been doing all along, that the Commission correctly ascertains that the practice under investigation does not pose a threat to competition, which is precisely why the exemption has been granted, i.e. because any possible competitive concern is outweighed by other efficiency gains. The only exception to this rule⁵ is the case of formal exemptions with obligations, since in that case it is assumed that the imposition of obligations indicates a breach of competition policy rules.

Type of anticompetitive practice

Out of the 993 cases analyzed by the Commission, 813 also contain information on the type of agreement or practice that has been the subject of concern⁶. We have encountered 44 different types of

⁵ We were advised by Commission officials to classify this case as 1. Moreover, using a different rule for this group of decisions would not change the results significantly since it is a very limited number of cases.

⁶ Out of the 993 total cases analyzed by the Commission, 683 contain information on both the industry (3 digit Nace) and the type of practice. Only 492 of those correspond to manufacturing industries, financial intermediation (NACE-3: 651 nad 652) or telecommunications (NACE 3: 642).

practices as classified by DGCOMP (such as agency agreements, patent licenses, franchising, etc.) that can be classified in three categories. The first of them includes those horizontal agreements (HOR) that are considered in all circumstances to be detrimental for consumer welfare. Cartels, trade associations or market sharing agreements are examples of this type of horizontal practices. The second and third groups of practices include actions that are also anti-competitive, but that may be justified on the grounds of efficiency gains under certain circumstances. We distinguish between practices where only one firm is involved, that come under the heading of abuses of dominant position (ADP), like exclusive purchase or refusal to deal; and practices involving several firms (such as exclusive distribution, franchising or joint ventures) these third group of practices that might have efficiency justifications (EFF) can be either horizontal or vertical. Most of the practices with efficiency justification can be prosecuted under both article 81 and article 82. Box 2 presents a complete list of the practices encountered.

Notice, that with this classification a practice belongs to only one of three mutually exclusive categories: a practice is either horizontal without an efficiency justification (HOR), vertical or horizontal with an efficiency justification (EFF), or an abuse of a dominant position (ADP).

Considering these broad general categories makes sense in terms of the analysis of the relevant industry determinants since most of the variables considered important by the economic literature do not vary across the 44 different practices and they are common for each of these three main categories. Moreover, there is also an additional advantage: in some instances, more than one practice is reported for the same case. 24% of the cases have been reported with more than one anti-competitive practice being considered by the Commission and only 4.9% of them have been reported with more than 2. In particular, there are five practices, labeled as “pricing”, “other abuses”, “other forms of cooperation”, “beer supply” and “rebates and discounts”, where the coding could correspond to either a horizontal practice with no efficiency justification or a practice that could be efficiency enhancing. Since it is impossible to determine to which of them these cases refer, we will use as a reference the other practices reported for the same case and we will classify the five former ones depending on the category of the co-practices for the relevant case.

Box 2. Classification of the Agreements and Practices

Horizontal Practices without efficiency justification (HOR)	Practices with potential efficiency justifications. Several Firms involved (EFF)	Practices with potential efficiency justifications. One firm involved (ADP)	Exemptions
	<i>Vertical Relation</i>	Refusal to deal	
Crisis Cartel	Trade mark licences	Exclusive purchase	Reg. 1400/2002 on distribution and servicing of motor vehicles
Other cartel practices	Patent licences	Other vertical agreements	Reg. 4056/86 on maritime transport
Trade association	Copyright licences	Other purchase agreement	Reg. 823/2000 on maritime transport
Agency agreement	Know-how licences	Technology transfer agreement	Reg. 3975/27 on air transport
Specialization agreement	Other IPR licences	Boycot	Reg. 1017/68 on transport by rail, road, etc
Market sharing agreement	Selective distribution	Other sales conditions	Reg. 1475/95 on motor vehicle distribution
Information exchange	Exclusive distribution		Reg. 3932/92 on insurance
	Control of distributors		Reg. 2790/99 on exclusive distribution++
	Franchising		Reg. 240/96 on technology transfer ++
	Vertical agreements between different competitors		Reg. 2790/99 on exclusive purchasing++
	Other vertical agreements		Reg. 2790/99 on franchising++
	<i>Horizontal Relation</i>		<i>Special cases</i>
	Joint ventures		<i>Beer supply*</i>
	Technology transfer agreements		<i>Other forms of cooperation*</i>
	Joint R&D		<i>Other abuses*</i>
			<i>Pricing*</i>
			<i>Rebates and discounts*</i>

* When these activities are reported, in most of the cases they come with another activity. We will classify them as vertical or horizontal depending on whether the co-practice reported is classified as vertical or horizontal, respectively

++ These exemptions apply to a certain vertical agreement and hence The corresponding cases have been considered as cases where the Commission has examined a potential vertical agreement and hence we have classified them as such

For the rest of the situations where more than one practice is reported, most of them can be classified within the same general category. Only 10 of the cases report practices that could be classified in two different groups⁷.

Finally, the last column of Box 2 includes the existing types of block exemptions. As previously discussed, exemptions are not considered as a third type of practice. Rather, this heading captures cases where the benefits of a practice outweigh its potential anti-competitive effects. We have also included them in Box 2 because in some cases a certain practice is only classified according to the exemption that applied to it. We can use the type of exemption to approximate the kind of practice that the Commission was considering. This would be the case of exemptions on exclusive distribution, technology transfer, exclusive purchasing or franchising.

4.2 Explanatory Variables

In this section we discuss the explanatory variables that determine the probability of detecting anticompetitive practices and those that determine the selection of the sample. The probability of deciding against an anti-competitive behavior depends both on case-specific and industry-specific variables. As indicated in the methodology, the selection of the industry variables is based on the long tradition of the industrial organization literature in this area. For each potential antitrust problem we will turn to the literature, both theoretical and empirical, to determine the industry-level conditions under which such

⁷ We have run our regressions with and without these 10 cases and no major differences have been encountered.

violations are more likely. We will then use suitable quantitative proxies for those conditions as our explanatory variables.

The regressors to be used in the sample selection equation may include those determined in the literature, plus a set of additional variables that take into account the administrative context in which the Commission has implemented competition policy in the period under consideration.

4.2.1 Case-specific variables

As we have indicated in the methodology section, we will include in the model as control factors the type of practice that has taken place. It might also be interesting to include other case-specific variables related to the firms involved in each particular case (for example firm size or market share), however this information is not in the database and could not be included in the analysis.

Type of practice (EFF and ADP)

We include dummy variables that take into account the type of practice being considered in each case. In particular, we consider the three mutually exclusive categories that have been defined in the previous section. We distinguish between horizontal agreements with no efficiency justification, vertical and horizontal agreements with efficiency justification and abuses of dominant position. We will include a binary variable (EFF) that equals one if the practice is a vertical restraint or a horizontal agreement with efficiency justification and zero otherwise. Similarly, another binary variable (ADP) takes the value 1 whenever a practice falls under the heading of abuse of dominant position. Horizontal practices with no efficiency justification will be the excluded category.

As we will see when discussing the main industry characteristics to consider, the literature of industrial organization provides us with a set of relevant industry explanatory variables to determine the existence of anti-competitive practices. These relevant factors do not differ that much across different types of anti-competitive behaviors. However, these same explanatory variables can have a different impact depending on the kind of practice we are considering. For instance, in general, one would expect practices where efficiency considerations are important to be less likely (given the industry characteristics) to lead to a finding of anti-competitive practice. The inclusion of EFF and ADP dummies will allow us to take this into account. In particular, we expect both dummies to have a negative effect on the probability of an anti-competitive practice to take place. Moreover, in some cases the industry-level determinants have an opposite effect when we are considering practices that could also have an efficiency enhancing justification than when we are considering horizontal agreements. To capture this, these binary variables will be interacted with some of the explanatory factors.

Italy Dummy (IT): There might be several reasons why the Commission might deviate from the prescription of the economic theory on its decisions such as “political” variables. Following the previous literature (see, for instance, Bergman et al. 2003) and because our period of analysis includes the Italian leadership, we have included a dummy equal to one if one of the firms involved in the case had Italian headquarters. If the Commission follows economic theory principles when evaluating possible anticompetitive behaviors, *IT* should not be statistically different from zero.

4.2.2 Industry variables

The goal of our analysis is to study the decisions of the European Commission regarding antitrust practices and to determine whether they are consistent with economic fundamentals. Hence, we will follow the existing literature in the economics of industrial organization and competition policy to determine the main industry characteristics that are considered relevant when analyzing the main ways in which competition may be threatened. On this basis, we will first, and as advanced in Box 2, aggregate the practices that breach Article 81 or 82 of the EU Treaty in three main groups:

- Horizontal agreements, that usually restrict competition and reduce welfare (in our econometric specification, this will be the benchmarking case),
- Vertical agreements whose benefits might outweigh their anti-competitive costs (determined by the EFF dummy),
- Potential abuses of dominant position that may have an efficiency enhancing justification (captured by the ADP dummy).

Second, the last two set of practices, should only be considered as a problem for competition policy when they have a negative effect on welfare⁸. From the literature, none of these practices on itself is judged to be clearly against the public interest. For this to be the case, there should be a certain abuse of market power, individual (article 82), or collective (article 81), that restricts competition substantially, in excess of any potential efficiency gain derived from the practice or vertical restraint. Since individual or collective market power is a necessary condition for the existence of anti-competitive behavior in the case of dominant positions and vertical restraints, it is clear that the set of explanatory variables that will determine the existent of both types of practices is not going to differ that much. In fact, we will use the same econometric specification for all anti-competitive practices, with some minor adjustments which will affect only a few of the explanatory variables.

⁸ As indicated in the background section, this is the spirit of the regulation and many exemptions have already been included to take this into account.

The main industry-level explanatory variables that we include in the econometric analysis are the following: concentration, asymmetry of firms, barriers to entry, product differentiation, demand growth and trade exposure. A summary of the data used is presented in Table A.1 in the appendix

Concentration (CONC): We expect concentration in the market to affect positively the probability that an industry presents anti-competitive practices or agreements. The more concentrated the firms in the market, the easiest it is for them to collude or that one of them abuses its market power. Concentration is measured as the production of the five leading firms in the industry as a share of the whole EU production.

Asymmetry between firms (ASYM): The more asymmetric the firms, the less likely it will be for them to collude. The more different the firms, the more difficult it might be for them to agree to a common pricing policy. Moreover, given a collusive price, the incentives to deviate for the low-cost ones (or for those that offer a higher quality product) are much higher. Finally, when firms are not very similar, it becomes very hard for them to identify any deviation from the collusive behavior and hence, the probability of being caught if a firm deviates from the agreement is lower. This reduces the likelihood of cooperative agreements. It must be noted, however, that when there is substantial asymmetry it may become easier for the leading firm or firms to exploit their dominant position. Hence, in this case, although the explanatory variable (ASYM) is important and the same for all practices, the sign is just the opposite for practices that qualify as abuses of dominant position. In order to take this into account in the econometric model, we will interact this variable with a dummy variable equal to one if the practice is an abuse of dominant position (ADP, see below). Hence, we expect *ASYM* to have negative sign and the interaction of *ASYM*ADP* to be positive.

We do not have a direct measure of firm asymmetry. However EUROSTAT's Structural Business Statistics⁹ contains information on the number of firms in a certain size bracket¹⁰ as well as on the total value added of the firms of a certain size. In order to approximate asymmetry between firms in one industry we will compute the average size of a firm in each of the brackets (average value added per firm), as well as the average size of the industry and we will use the standard deviation as a measure of asymmetry. The larger the standard deviation, the higher the asymmetry. Since the average size differs greatly across industries, the standard deviation varies a lot across them simply due to the size effect. In order to take this into account we use a normalized measure of asymmetry across NACE3 with mean 0 and variance 1.

Entry Barriers (CAP): The harder it is for new firms to enter the market, the easier to sustain anticompetitive practices. We use a measure of capital intensity as a proxy for entry barriers. If the Commission's decisions follow the predictions of economic theory, *CAP* should have a positive sign.

⁹ The dataset used in this paper corresponds to 2001.

¹⁰ We have 11 different size brackets.

There are several data sources that provide information on the capital intensity of industries at the 3 digit Nace level. The data analysis uses the following ones: European Commission (1994) and the WIFO taxonomy of Peneder (1999). Both sets of data have been extensively used in the industrial organization literature and by the European Commission (see the Competitiveness Reports of the EC 2000 and 2001).

Product Differentiation (RD and ADV): The more differentiated the products in an industry, the less likely it is that anti-competitive behavior takes place since companies focus competition on characteristics different than price and the diminished rivalry on price can lead to less need for the softening of competition by coordination between companies. Nevertheless, product differentiation is very difficult to measure. These general statements apply to a world where products are “exogenously” differentiated, and in that case one would expect a negative relationship between the likelihood of an anticompetitive practice and measures of product differentiation.

A broader model of product differentiation, however, should take into account the fact that differentiation is in itself a source of market power, and therefore it is developed endogenously by companies, through investment in R&D and advertising assets (see Sutton, 1991). R&D investment often leads to new product introductions, and advertising to the differentiation of existing products or services. Both investments in intangibles involve different degrees of sunk costs and can become important entry barriers, thus leading potentially to the observance of less competitive behavior. As Sutton (1991) has shown, both R&D and advertising competition can lead –through what is known as endogenous sunk cost competition- to the concentration of a given industry and it is therefore not surprising that in the past both R&D and advertising spending have also been considered good proxies for entry barriers.

In practice this means that we will introduce both R&D and advertising intensity as independent regressors. However, we will also interact them with the measure of industry concentration. Given a certain level of concentration, the higher the level of R&D (or advertising intensity) the lower the impact of concentration on the probability of anti-competitive practice, since concentration is the result of strong competition in sunk advertising or R&D spending¹¹.

Demand Growth (DEM): we expect demand growth to be positively related to the probability of anti-competitive behavior (Ivaldi et al., 2003). This is so because, for a fixed number of players, in a growing market the profits from deviating today are small compared to the future ones, when the market is much bigger and hence, when the potential profits from colluding could be much larger¹². The data

¹¹ The interaction did not come out as statistically significant for the case of advertising which, as discussed later in the results, may indicate that this variable captures mostly product differentiation and not barriers to entry.

¹² Notice, however, that this conclusion from the literature is subject to the assumption of a fixed number of players. It could very well be the case that entry (and hence the likely breakdown of collusion) is easier in growing markets. In order to control for this it is important to consider also entry barriers in our econometric specification since in a market with low barriers, demand growth might encourage entry and obstruct collusion

used comes from the Structural Business Statistics (SBS) produced by Eurostat. The period considered is 1999-2001.

Trade exposure (TRADE): In general, we would expect that industries where imports represent an important part of total domestic consumption are industries where the likelihood of anti-competitive behavior is smaller. To analyze this issue we construct a variable TRADE that measures the weight on extra-EU imports on EU wide apparent domestic consumption (that is production minus exports plus imports). This variable has been constructed with data from Unido (production data) and Eurostat (trade). The figures correspond to 2000.

4.2.3 Variables for the sample selection equation

One of the main advantages of our data set is that it allows us access not only to the cases where a public decision has been reached, but also to the cases that were never followed-up by the Commission. This permits us to test whether there is any type of bias on the Commission's decisions not only for the cases that it pursues but also for the cases that it decides not to follow-up any further. This is, to our knowledge, the first time that such a selection bias has been empirically studied for Commission's antitrust decisions.

In order to determine what variables can be relevant for the sample selection equation, we have had conversations with the relevant Commission officials. Apparently, most of the decisions to investigate are motivated by leniency applications (30%) or complaints (60%), and the ex officio investigations represent only 10%. Moreover, only about 10% of complaints are in fact investigated while most of the leniency cases are. So the right question to ask in order to estimate if a sample selection bias occurs is what determines leniency applications, and what determines both complaints and their acceptance. As for leniency applications, the leniency regime is in place since 1996, and was beefed up in 2002, thus increasing substantially the number of applications. Our data set includes the period from January 1999 to February 2004 and therefore includes probably a substantial number of cases investigated due to leniency applications. However, the industry-level determinants of a leniency application are bound to be very similar to the industry-level determinants of the existence of a cartel. It is very unlikely therefore that we will find through the leniency route a new and different regressor which can be used in the sample selection equation, given that the main determinants of a cartel are already included as explanatory variables in *Equation 1*.

As for the determinants of complaints, in general we are likely to observe complaints precisely in industries where there are industry conditions that facilitate infringements. The key point is, therefore: when will the Commission accept a complaint? First of all, many complaints are rejected because they are poorly drafted. Second, they may be rejected if they do not have "a Community interest". What this means is that the size of the industry in question, or the geographical scope, implies that the infringement

–if it exists- is rather small in magnitude or is geographically limited, and could be dealt with by national courts. These determinants are well captured by the variables industry size (SIZE) and importance of intra-EU trade in the sector (INTRA). The size of the industry is measured as turnover (source: SBS from Eurostat, year 2001), and the importance of intra-EU trade is measured as intra-EU imports over total EU apparent consumption (same source and year as TRADE).

Another important dimension is of a sectorial nature. Other things being equal, the Commission may react more favorably to complaints coming from end users, as compared to intermediate consumers. In practice, this may imply that consumer oriented industries (ie those with a larger role for advertising) may be subject to more scrutiny. In order to capture this consumer good effect, we will include an advertising variable (ADV).

The nature of the infringement is another criteria for the decision to consider the complaint, and in particular cartel behavior is almost always prosecuted. To capture this possibility, we will include a case-based variable to capture the cartel effect (the variable ART defined below). Finally, when accepting a complaint the Commission also considers broad information about the market, but this is no different from what is done in the *ex officio* procedure.

Legal Base (ART): This variable is case specific. For 885 out of the 993 cases, the information provided by the EC also includes the legal base used. This could be article 81, 82 or other articles in the EC Treaty, or a combination of more than one article. In 68% of the cases, the Article 81 was the only one considered while in 9% of them the legal base included both articles 81 and 82. On the other hand, only 10% of the cases include article 82 as the only legal base considered, but 28% of the cases included the article 82 in their legal base.

It is important to include this characteristic as an explanatory factor of the decision to investigate because an investigation under a certain article implies that the Commission already assumes that certain characteristics exist that may have lead to a certain problem. We have included a dummy which takes the value 1 if Article 81 has been applied, and 0 otherwise, because this captures the idea that the Commission is more likely to investigate cases that may potentially lead to the prosecution of cartel-type behavior.

In sum, after examining in detail the Commission decision to investigate, we conclude that the sample selection equation should include not only variables capturing size (SIZE) and intra-EU trade (INTRA), but also an advertising variable capturing the consumer good effect (ADV), and a case-based variable to capture the cartel effect (ART). Finally, we will include also the Italy dummy (IT) to control for other political variables.

Italy Dummy (IT). In some specifications we also include the Italy dummy in the selection specification to control for some “political” aspects that could affect the decision to investigate a case.

5. Results

5.1. The empirical model

The econometric specification that we use for the regression on the probability of detecting anti-competitive behavior (equation 1) for a firm i in industry j is as follows.

$$P_{ij} = F(\beta_0 + \beta_1 \text{EFF}_{ij} + \beta_2 \text{ADP}_{ij} + \beta_3 \text{CONC}_j + \beta_4 \text{ASYM}_j + \beta_5 (\text{ASYM}_j * \text{ADP}_{ij}) + \beta_6 \text{CAP}_j + \beta_7 \text{RD}_j + \beta_8 (\text{RD}_j * \text{CONC}_j) + \beta_9 \text{ADV}_j + \beta_{10} \text{DEM}_j + \beta_{11} \text{TRADE}_j + \beta_{12} \text{IT}_{ij})$$

The above specification reflects the fact that the relevant industry-level explanatory variables suggested by the industrial organization literature are the same for all the anti-competitive practices. However, it also allows us to control for the fact that these characteristics can have different effects in different types of practices. In this respect, the positive signs that correspond to concentration, capital intensity and R&D intensity conform with the explanations provided above with regards to their inclusion in the regression. And the same goes for the negative sign on demand growth and trade. We also include the interaction of *CONC* and *RD*. The interpretation of this last parameter is as follows. $\beta_3 + \beta_8 \text{RD}$ gives us how the probability of anti-competitive practice changes with an increase in *CONC* and $\beta_7 + \beta_8 \text{CONC}$ indicates how the probability of anti-competitive practice changes with an increase in R&D intensity. We expect β_3 and β_7 to be positive, but the parameter β_8 to be negative.

This implies that the effect of increased concentration on the probability of anti-competitive behavior is smaller in high R&D intensive industries, because part of that concentration reflects endogenous sunk cost competition. Similarly, the anti-competitive effect of increased R&D intensity (through the creation of entry barriers) should be smaller for concentrated industries, for the same reason.

We also include practice specific parameters. As previously explained, we expect the parameters for both *EFF* and *ADP* to be negative, since given a set of industry determinants, the likelihood of anti-competitive practices is smaller whenever efficiency considerations are taken into account. These practice specific parameters also allow us to control for the fact that some of the industry-level explanatory variables can have different effects depending on the anti-competitive practice that we are analyzing. Consider the effect of asymmetry. In general it is negative, however, it should turn out to be positive whenever we consider cases of abuse of dominant positions (*ADP*). This implies that even if β_4 is negative, we expect $(\beta_4 + \beta_5)$ to be positive. Box 3 summarizes the expected signs of each of the parameters.

Box 3. Probability of detecting anti-competitive practices: regressors and expected sign		
	Regressors	Expected sign
β_1	Vertical and horizontal practices with efficiency justification (EFF)	Negative
β_2	Abuse of dominant position (ADP)	Negative
β_3	Concentration (CONC)	Positive
β_4	Asymmetry (ASYM)	Negative
β_5	Asymmetry*ADP (ASYM*ADP)	Positive
β_6	Capital intensity (CAP)	Positive
β_7	R&D intensity (RD)	Positive
β_8	R&D intensity*Concentration (RD*CONC)	Negative
β_9	Advertising intensity (ADV)	Negative
β_{10}	Demand growth (DEM)	Positive
β_{11}	Exposure to extra-EU trade (TRADE)	Negative
β_{12}	Italy (IT)	Not significant

5.2. Description of the data and results

Data

Table 1 provides the descriptive statistics corresponding to the main variables used in the econometric analysis, with a focus on the industry determinants of both the probability of detecting an anti-competitive practice and the probability that a particular industry is investigated. The table reports the averages for the cases involving these sectors (manufactures, telecommunication services and financial intermediation) that have been actually used in the regression analysis (some cases are discarded because not all explanatory variables are available).

The table provides also a T-test of differences in means, which illustrates the fact that the key industry variables do not appear to be significantly different if we consider the group of investigated cases and those not investigated. This could indicate that the two samples are in fact very similar, in the sense that both them could be random draws from the same population. If that is the case, this implies that the sample selection problem will be less of a concern, as anticipated in the discussion above.

Table 2 shows also the descriptive statistics at the industry level distinguishing those cases where an anti-competitive practice has been detected and those where that has not been the case. As before, the information is provided for all cases involving the manufacturing industry and the telecommunications services and financial intermediation sectors that have been used in the regression analysis due to data availability. Here the data already presents some significant differences between these cases where the Commission found an anti-competitive behavior and those where none was encountered.

Results

Table 3 presents the results of the analysis undertaking both the estimation of the main model alone (specification 1), as well as the main model plus the sample selection equation (specifications from 2 to 6). All regressions have been estimated using standard errors corrected for potential heteroscedasticity problems, given the cross-section nature of the database. Several alternative specifications for both, the main equation and the selection have been tested and the parameters have been found to be very stable across the different specifications.

The results of Table 3 confirm that the overall fit of the model is quite good: most of the parameters are statistically significant and have the expected sign. As expected, the coefficients for both EFF and ADP are negative, indicating that for a given set of industry determinants, when we take into account efficiency considerations, there is a lower likelihood of anti-competitive practices. Moreover, the EFF coefficient is significantly more negative than the ADP one. This allows us to establish a clear ranking across the three types of practices regarding their likelihood of leading towards a negative decision by the Commission: everything else equal, the most likely practices to lead to a decision of anti-competitive behavior are the horizontal ones without an efficiency justification, followed by those that could imply and abuse of dominant position and, finally, those that could have a potential efficiency justification.

Our results also confirm the fact that anti-competitive practices are more likely to take place in more concentrated industries (CONC). The coefficient for ADV is negative, indicating that where there is more product differentiation, there is a lower incentive to undertake restrictive practices. Also, as expected, demand growth (DEM) increases the likelihood of an anti-competitive behavior in the industry.

There are, however, two regressors that do not present the expected sign: the one corresponding to trade exposure and the ASYM*ADP one. Regarding the coefficient for, TRADE, it is apparent that the selected variable is probably a very crude measure of the competitive pressure exerted by foreign competition¹³, and therefore it is probably capturing other omitted variables.

¹³ It does not include, for example, the role of non-EU firms based in the EU and therefore the role of intra-firm trade.

As indicated in section 4.2.2, we expected the ASYM*ADP coefficient to be positive. In fact, if we consider only the manufacturing industries this is exactly the case (see results in Appendix B). However, when we include telecommunication services (NACE 642) and financial intermediation (NACE 651 and 652), the sign of the coefficient becomes negative indicating that, given a certain asymmetry level, in these industries an abuse of dominant position is more easily tolerated since it may be naturally explained by the economics and the history of the industries. For instance, in telecommunication services the cost structure of some of its players and the regulatory tradition explain that certain firms play a dominant role in the market. Something similar happens with the financial intermediation industry, where historical reasons have allowed some of the firms to have a leading role in their domestic market.

The Italy dummy is not significant, which confirms the fact that the Commission follows mostly economic criteria when deciding on anti-trust behavior.

Regarding the selection equation, the results are also as expected. The Commission is more likely to evaluate a case if it affects a large industry (SIZE). It also appears to be more inclined to examine it if it might directly affect the welfare of the final consumer (captured by ADV) or if there is some concern about a cartel (ART). Once again, Italy is not significant.

Finally, the results of the probits correcting for sample selection are very consistent with the ones without correcting for it. This seems to indicate that the problem of sample selection is not important. This view is, in fact, reinforced by the analysis of the descriptive statistics as shown in tables 1 and 2. Altogether, therefore, it is not surprising that the changes in the magnitude of the parameters when comparing models with and without sample section is small.

Interpretation of the results

Since we have estimated a probit model, the parameters of tables 3 cannot be readily interpreted in terms of the magnitude of the effect of changes in the explanatory variables on the probability of detecting anti-competitive behavior. In this model, the change in the probability caused by a change in any of the coefficients will depend on where we start. As a starting point, in Table 4 we evaluate each independent variable on the dependent variable at the mean of the data and report what would be the new sample mean of the dependent variable (the estimated probability) if there was a change of one standard deviation for each of the explanatory variables.

As expected, the model predicts that the probability of detecting an anti-competitive behavior by the Commission is higher when we are considering cases with a potential horizontal practice without efficiency justification followed by those where there is a possibility of abuse of dominant position and, finally, those where an efficiency justification exists. In fact, the Commission is 7 times more likely to decide against a horizontal practice than against one with a potential efficiency justification. With regards to horizontal practices, Table 4 shows clearly that the strongest quantitative impact on the likelihood of

detecting anticompetitive behavior comes from changes in the extra-EU trade and concentration variables. It is interesting to note also that the impact of the advertising and CAP variables, which work in the opposite direction, is also very important (however the interpretation of the magnitude has to take into account also the statistical significance of the coefficient and the one for CAP is not significantly different from zero in table 3, so the parameter is less reliable). This highlights the fact that it is important to assess market structure variables taking into consideration also the nature of competition in each industry, and making sure that the effect of product differentiation and competition through new product development pas factors which soften the tendency towards anti-competitive practices is properly recognized.

If we consider practices with potential efficiency justifications and the abuse of dominant position, the most important independent variables are more or less the same, but it is worthwhile indicating that in most cases changes in the independent variable appear to have a relatively stronger effect in the estimated probability than what happens in the benchmark case.

6. Conclusions

This paper has focused on analyzing the decisions made by the European Commission regarding the existence of anti-competitive practices, on the basis of a set of relevant industry-level variables. Our main objective was to determine whether Commission decisions follow what the economic literature would predict. The results of this paper suggest that, by and large, this seems to be the case and that political variables do not seem to play a significant role. As expected, the Commission is more inclined to judge against the cases that involve a horizontal practice than against those that imply a potential abuse of dominant position or a practice that could have efficiency justifications. Moreover, as we would expect from the economics literature, it is more likely to decide against a practice that involves a highly concentrated industry or an industry with high demand growth. However, it is less likely to decide against a sector with lots of advertising.

Our results also confirm that the Commission is more likely to tolerate a potential abuse of dominant position given a certain asymmetry level, in sectors like financial intermediation and telecommunication services where such an asymmetry may be easily explained by the economics and the regulatory history of these industries.

Moreover, the estimation has been undertaken taking fully into consideration the fact that there might be biases in the way the Commission decides which cases to investigate. That is to say, the effect of some determinants of finding an antitrust breach could be due not to a fundamental relation, but rather to the bias caused by the way the Commission decides which industries to investigate. Our analysis confirms that Commission appears to be more likely to investigate cases related to large industries, sectors that affect the final consumer and those situations that could involve a cartel. However, the results also show

that the sample selection bias does not appear to be very significant and it does not have a big impact on the probit coefficients.

There are, inevitably, some caveats in our analysis. Two points, in particular, are of our concern and both are related to data availability. The first one involves our definition of the product market. In this analysis, we have considered as the relevant market the one corresponding to the industry as defined by its NACE 3-digit code. This definition is needed if we want to measure most of our variables, particularly concentration and trade. Unfortunately, due to data constraints, we have not been able to use alternative product market definitions.

A second possible criticism of this study is that we have not covered all services due to data availability. Nevertheless, the good performance of the model for all the sectors considered provides some confidence regarding the ability to apply the methodology for a broader range of industries, even if the information available at the sector level is more limited.

Finally, it would be extremely interesting to undertake a similar study including firm-specific information on top of industry characteristics. This would allow us to take into account the effect on antitrust infringements of the actual competitive interaction of companies in the marketplace.

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Table 1. Industry Descriptive Statistics (sample means and standard deviations for Manufacturing Industries, Telecommunications Services and Financial Intermediation used in the regression)

	Cases investigated by the Commission	Cases NOT investigated by the Commission	T-Test of difference in means (p values)
CONC (C5)	33,106 [13,486]	32,612 [12,874]	-0,247 [0,805]
ASYM	0,063 [0,888]	0,149 [1,078]	0,605 [0,545]
CAP	18,588 [11,321]	18,454 [10,347]	-0,081 [0,936]
RD	3,934 [2,867]	3,800 [2,897]	-0,310 [0,757]
RD*CONC	131,529 [102,221]	128,715 [98,893]	-0,185 [0,854]
ADV	0,623 [0,486]	0,541 [0,502]	-1,119 [0,264]
DEM	0,138 [0,989]	0,136 [0,100]	-0,097 [0,923]
TRADE	0,163 [0,184]	0,196 [0,189]	1,174 [0,242]
INTRA	0,277 [0,137]	0,273 [0,134]	-0,192 [0,848]
SIZE	160,241 [258,5]	181,113 [317,888]	0,504 [0,615]
ART	0,907 [0,291]	0,934 [0,250]	0,642 [0,522]
IT	0,033 [0,023]	0,068 [0,020]	-1,004 [0,316]

None of the means of the two groups of cases is statistically different (at 5% level of significance)

Table 2. Sample means and standard deviations for Manufacturing Industries, Telecommunications Services and Financial Intermediation included in the regression

	Cases where anti-competitive practice is detected	Cases where anti-competitive practice is NOT detected	T-Test of difference in means (p values)
C5	32,998 [15,235]	33,131 [13,121]	0,049 [0,961]
ASYM	-0,036 [0,870]	0,086 [0,894]	0,677 [0,499]
CAP	17,076 [9,536]	18,931 [11,694]	0,809 [0,419]
RD	4,785 [3,964]	3,741 [2,533]	-1,813 [0,072]
RD*C5	156,390 [161,160]	125,879 [83,178]	-1,481 [0,141]
ADV	0,500 [0,509]	0,652 [0,478]	1,548 [0,124]
DEM	0,120 [0,095]	0,142 [0,100]	1,081 [0,282]
TRADE	0,259 [0,226]	0,141 [0,167]	-3,271 [0,001]
EFF	0,467 [0,507]	0,803 [0,399]	3,9511 [0,000]
ADP	0,233 [0,430]	0,121 [0,328]	-1,5909 [0,114]
ASYM*ADP	-0,056 [0,103]	0,051 [0,413]	1,3934 [0,165]
INTRA	0,317 [0,146]	0,268 [0,134]	-1,799 [0,074]
SIZE	133,6 [265,9]	166,3 [257,4]	0,625 [0,533]
ART	0,833 [0,379]	0,924 [0,257]	1,553 [0,123]
ITALY	0,069 [0,022]	0,067 [0,046]	0,040 [0,969]

Shaded results indicate that the means of the two groups of cases are statistically different (at 5% level of significance)

Table 3. Results

	Probit		Probits (correcting for sample selection)									
	(1)	(2)	(3)	(4)	(5)	(6)						
	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error
EFF	-1,230	0,337	-1,288	0,336	-1,271	0,333	-1,274	0,332	-1,267	0,336	-1,264	0,325
ADP	-0,705	0,420	-0,843	0,405	-0,862	0,394	-0,862	0,395	-0,862	0,390	-0,862	0,381
CONC (with c5)	0,034	0,021	0,032	0,020	0,035	0,019	0,034	0,019	0,032	0,019	0,032	0,019
ASYM	0,218	0,246	0,114	0,234	0,141	0,225	0,137	0,225	0,127	0,230	0,121	0,213
ASYM*ADP	-2,978	0,788	-2,800	0,768	-2,724	0,729	-2,730	0,730	-2,715	0,744	-2,628	0,707
CAP	-0,033	0,036	-0,031	0,033	-0,034	0,033	-0,034	0,033	-0,029	0,035	-0,032	0,032
RD	0,109	0,135	0,131	0,133	0,138	0,127	0,136	0,127	0,134	0,128	0,131	0,122
RD*CONC	-0,002	0,003	-0,003	0,003	-0,003	0,003	-0,003	0,003	-0,003	0,003	-0,002	0,003
ADV	-0,665	0,389	-0,534	0,360	-0,571	0,346	-0,569	0,345	-0,055	0,353	-0,547	0,332
DEM	6,921	3,526	6,159	3,283	6,608	3,239	6,559	3,273	6,060	3,593	6,158	3,153
TRADE	3,695	1,053	3,297	1,028	3,343	0,995	3,265	1,024	3,322	1,113	3,071	0,97
ITALY											-0,149	0,53
N	163		162		162		162		162		162	
Pseudo R2	0,255											
Prob >Chi2	0,000		0,000		0,000		0,000		0,000		0	
Chi2	61,15		71,14		80,11		79,84		79,66		83,22	
Selection equation variables												
CONC			0,0102	0,0145	0,0188	0,0070	0,0162	0,0064			0,017	0,006
ASYM			-2,2283	0,9056	-1,4321	0,5287	-1,2379	0,4711			-1,289	0,471
CAP			0,0112	0,0196	-0,0074	0,0080	-0,0078	0,0080			-0,008	0,008
RD			-0,0324	0,0857								
RD*CONC			-0,0011	0,0023								
ADV			0,6392	0,2392	0,3932	0,1536	0,4037	0,1537	0,3697	0,1316	0,412	0,154
DEM			-3,1896	1,9497								
TRADE			-0,2341	0,6155	0,3108	0,4546						
INTRA			0,6060	0,9617	1,3184	0,6096	1,4331	0,5710	2,0910	0,4896	1,456	0,569
ART			0,2269	0,2094	0,2815	0,1706	0,2765	0,1676	0,2807	0,1701	0,272	0,161
SIZE			0,0066	0,0030	0,0046	0,0018	0,0039	0,0016	-0,0003	0,0002	0,004	0,002
ITALY											0,266	0,247
N-censored			119		148		148		157		148	
Chi2			1,03		2,14		2,12		1,15		3,03	
Prob>chi2			0,309		0,144		0,146		0,285		0,082	
Rho			0,439		0,534		0,528		0,552		0,619	

Robust standard errors. Shadowed area indicated that the coefficients are statistically different from zero (10% level of significance)

Table 4. Interpretation of the Results

	At the mean	Increasing one Std. Deviation of:						
		CONC (C5)	ASYM	CAP	RD	ADV	DEM	TRADE
Prob. of horizontal practice without efficiency justification	35,20%	53,19%	39,74%	22,06%	50,40%	25,46%	99,99%	58,71%
Prob. practice with potential efficiency justification	4,85%	11,70%	6,30%	2,07%	10,38%	2,68%	99,99%	14,69%
Prob. abuse dominant position	9,18%	19,22%	11,31%	4,36%	17,36%	5,48%	99,99%	23,27%

Probabilities estimated by evaluating specification (4) from Table 3 at the mean of the studied cases (in Table 1)

ANNEX A

Table A.1 Industry-level explanatory variables

	Manufactures	Banking	Telecommunications
Capital intensity (CAP)	Average ratio of gross investment in tangible goods to value added at factor cost (million EUR) 1999-2000 <i>Eurostat, Structural Business Statistics, Annual enterprise statistics</i>	Average ratio of gross investment in tangible goods to value added at factor cost (million EUR) 1999-2000 - for the countries with availability of data NACE 65 <i>Eurostat, Structural Business Statistics, Annual enterprise statistics</i>	Average ratio of gross investment in tangible goods to value added at factor cost from 1999 to 2002 in million euros <i>Eurostat, Structural Business Statistics, Annual enterprise statistics</i>
R&D intensity (RD)	1. Average ratio of expenditures on R&D to total sales from 1993-95 for the US manufacturing industries <i>European Commission (1994) and WIFO taxonomy of Peneder (1999)</i>	1. R&D intensity using value added for Sector J (NACE 65,66,67) <i>OECD STAN Indicators Database (1999)</i>	1. R&D intensity using value added for NACE 64: Post and telecommunications <i>OECD STAN Indicators Database (1999)</i>
	2. (dummy) Data only for UK and Italy, relative to the national apparent consumption <i>Davies and Lyons (1996)</i>	2. dummy according to the relative classification of these sectors among the manufacturing sectors	2. dummy according to the relative classification of these sectors among the manufacturing sectors
Advertising intensity (ADV)	(dummy) Data only for UK, expressed relative to UK apparent consumption <i>Davies and Lyons (1996)</i>	(dummy) Calculated using several reports on a ranking of advertising in Europe <i>Own elaboration from various sources</i>	(dummy) advertising expenditure (million €) for the Spanish telecom sector 2002-05 <i>Own elaboration from various sources</i>
C5 (CONC)	Production of the five leading firms in the industry as a share of the whole EU production <i>Davies and Lyons (1996)</i>	Market share of the five leading companies (%) - Europa 15 1996 <i>Gual, J. (2004)</i>	Calculated as the sum of turnovers of the five leading european companies generated in their home countries on the total turnover of the telecommunications market in the EU15 <i>Own elaboration from various sources</i>
Exposure to extra-EU trade (TRADE)	Weight of extra-EU imports on EU wide apparent domestic consumption (production minus exports plus imports) <i>Unido (production) and Eurostat (trade) (2000)</i>	Weight of extra-EU imports on EU wide apparent domestic consumption (production minus exports plus imports) 2000 Financial services <i>Statistical tables from EU INTERNATIONAL TRADE IN SERVICES, Eurostat</i>	Weight of extra-EU imports on EU wide apparent domestic consumption (production minus exports plus imports) 2000 Telecommunications services <i>Statistical tables from EU INTERNATIONAL TRADE IN SERVICES, Eurostat</i>
Asymmetry (ASYM)	The information available is the number of firms in a certain size bracket as well as the total value added of those firms. We compute the average size of a firm in each of the brackets (average value added per firm) and the average size of the industry, and use the standard deviation as a measure of asymmetry <i>EUROSTAT's Structural Business Statistics (2001)</i>	Number of enterprises broken down by size classes of balance sheet total AND Balance sheet total for NACE j6512_652 "Total credit institutions" in million euros from 2000-01 for the Europe15 countries except for Ireland and Finland <i>Eurostat, Structural Business Statistics - Annual enterprise statistics: breakdown of the number of enterprises</i>	Services broken down by employment size classes: Number of enterprises AND Number of persons employed for NACE i642 from 2000-01 for Europe15 countries except for Greece, Ireland and Luxembourg <i>Eurostat, Structural Business Statistics - Annual enterprise statistics: breakdown of the number of enterprises</i>
Demand Growth (DEM)	Growth in turnover (V12110) from 2000-01 <i>EUROSTAT's Structural Business Statistics</i>	Growth in turnover (interest income+fees and commissions receivable) 2000-01 <i>OECD Bank Profitability</i>	Growth in turnover in the EU15 (million EUR) 2000-01 <i>Eurostat, Structural Business Statistics, Annual enterprise statistics</i>
Size	Turnover or gross premium written (v12110) <i>EUROSTAT's Structural Business Statistics (2001)</i>	Sum "interest income" + "fees and commissions receivable" in millions of national currency, 2001 (all banks of UE15 minus Finland and Luxembourg) <i>OECD Bank Profitability</i>	Turnover in million EUR, 2001 for NACE 64.2 (comprises the totals invoiced by the observation unit during the reference point, and this corresponds to market sales of goods or services supplied by third parties) <i>Eurostat, Structural Business Statistics, Annual enterprise statistics</i>

ANNEX B

Table B. Econometric Results (including only manufacturing sectors)

	Probit		Probits (correcting for sample selection)					
	(1)	(2)	(2)	(3)	(3)	(4)	(4)	
	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error
EFF	-1.3950	0.4044	-1.2643	0.7065	-1.1910	0.2930	-1.3052	0.3850
ADP	9.1684	5.0635	8.2890	4.1702	8.8042	3.9435	8.2581	4.1389
CONC (with c5)	0.0382	0.0211	0.0364	0.0211	0.0364	0.0184	0.0310	0.0184
ASYM	-0.3546	0.3646	-0.5001	0.2954	-0.4625	0.2802	-0.5143	0.3336
ASYM*ADP	51.6438	28.0650	50.0703	22.0866	50.0699	21.2934	47.6616	22.7779
CAP	-0.0843	0.0447	-0.0777	0.0604	-0.0761	0.0327	-0.0555	0.0484
RD	0.0967	0.1557	0.0995	0.1452	0.0889	0.1480	0.1035	0.1403
RD*CONC	-0.0022	0.0037	-0.0016	0.0037	-0.0014	0.0033	-0.0019	0.0031
ADV	-0.8728	0.4115	-0.6968	0.3598	-0.6542	0.3414	-0.6713	0.3648
DEM	6.3783	3.4662	4.9896	3.6326	5.2082	2.6432	4.6260	2.8036
TRADE	3.7293	0.9764	2.6782	1.1192	2.7356	0.6735	3.0281	0.9406
_cons	-1.2071	0.8764	-1.4730	0.8992	-1.5914	0.7266	-1.6295	0.8145
N	138		137		137		137	
Pseudo R2	0.33							
Prob >Chi2	0.0000		0.0000		0.0000		0.0000	
Chi2	47.07		41.69		59.39		46.53	
Selection equation variables								
CONC			0.0278	0.0089	0.0291	0.0083		
ASYM			-0.8542	0.4572	-0.9315	0.3453		
CAP			-0.0580	0.0211	-0.0578	0.0187		
RD								
RD*CONC								
ADV			0.4350	0.1593	0.4224	0.1611	0.3711	0.1439
DEM								
TRADE			-0.1726	0.5844				
INTRA			2.6686	0.8258	2.5952	0.7854	2.8882	0.6963
ART			0.3720	0.1806	0.3745	0.2269	0.4144	0.2317
SIZE			0.0022	0.0026	0.0027	0.0018	-0.0017	0.0006
_cons			-1.4393	0.6385	-1.5387	0.4953	-1.1525	0.3044
N-censored			110		110		119	
Chi2			0.17		0.39		1.92	
Prob>chi2			0.6782		0.5345		0.1659	
Rho			0.9881		0.5278		0.8195	

Robust standard errors. Shadowed area indicated that the coefficients are statistically different from zero (10% level of significance)

*the Chi2 is quite low and hence, the outcome that we obtain by correcting for selection is not very different from the one that we obtain without correction. The rho is also quite close to 1 emphasizing that the correction for selection might not be needed here.