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INDUSTRY CHARACTERISTICS AND ANTI-COMPETITIVE BEHAVIOR:

EVIDENCE FROM THE EU

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Abstract

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 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 takes into account economic analysis when deciding if anti-competitive behavior has taken place. The literature on industrial organization is very extensive and provides the theoretical and empirical background that associates industry features and the likelihood of practices that restrict competition. However, the literature evaluating the decisions by the competition authority is much scarcer and has focused mainly on the analysis of merger policy. Our paper attempts to fill this gap. To do so, we examined nearly 2000 cases submitted to the Commission for its consideration from January 1999 to February 2004 with the aim of determining which industry characteristics led the Commission to rule against the firms investigated on antitrust grounds.

Keywords: Competition Policy, Antitrust, European Commission, Mergers.

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1. Introduction

The task of ensuring there is free competition in the European Union (EU) has been entrusted to the European Commission by the 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 conduct by firms and impose conduct restraints and fines on 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 with restrictive agreements and practices that imply an abuse of market power.

The objective of this paper is to analyze 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 takes into account economic analysis when deciding if anti-competitive behavior has taken place. The literature on industrial organization is very extensive and provides the theoretical and empirical background that associates industry features and the likelihood of practices that restrict competition. However, the literature evaluating the decisions by the competition authority is much scarcer and has focused mainly on the analysis of merger policy. Our paper attempts to fill this gap. To do so, we examined nearly 2000 cases submitted to the Commission for its consideration from January 1999 to February 2004 with the aim of determining which industry characteristics led the Commission to rule against the firms investigated on antitrust grounds.

Coate and McChesney (1992) looked at 70 merger cases analyzed by the Federal Trade Commission and found that barriers to entry were an important factor when it came to blocking a merger, whereas 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". In a similar study in the UK, Weir (1993) used a probit analysis to determine whether efficiency reasons were the main considerations taken into account by the UK Monopolies and Mergers Commission (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 what regular sources of competition were taken into account by the MMC, he found great variability and concluded that the authorities were following a case-by-case approach. Khemani and Shapiro (1993) looked

at the decisions of the Bureau of Competition Policy in Canada. Using a probit model, they concluded that concentration and market share were the most important determining factors of the Bureau's decisions, followed in importance by input competition and barriers to entry. Davies et al. (1999) used data from 73 reports from the MMC. By applying a probabilistic model, the authors found that the market share of the investigated firm was one of the main factors that determined the MMC's decision. Their results also suggested that one could predict the result of the MMC's decisions with considerable accuracy. More recently, Bergman et al. (2003) looked at the European Commission's merger decision process and showed that the probability of deciding against a merger increased 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 determining factors 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 contains the conclusion.

2. Background

In order to apply antitrust regulation, the European Commission refers to 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 whose aim is to restrict 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 production facilities, joint ventures, etc. Hence, this article refers to both horizontal and vertical agreements and also includes agreements on matters such as price fixing and market sharing, and agreements that limit production, etc. It is commonly accepted in the economics literature that horizontal agreements are generally detrimental for social welfare, while this does not necessarily have to be the case for vertical agreements, which 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 to be allowed under Article 81. Current block exemptions refer to activities such as technology transfer and franchising agreements, and others refer to specific sectors (transport).

Article 82 prohibits abusive behavior. It includes practices such as price discrimination, tying and bundling, predation, exclusive dealership, exclusive territories and resale price maintenance.[1] One can find efficiency justifications for introducing many of the practices contemplated under this article, but all of them can be used by dominant players to reduce competition in the marketplace, particularly in vertical and related markets.

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

Until recently, the procedural rules[2] implementing Articles 81 and 82 of the EC Treaty provided for three ways of initiating action. Firstly, individuals and bodies corporate 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, the Commission can be informed of agreements and practices by at least one of the parties concerned. This notification system has been discontinued.[3]

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 uses a cross-section of industries and their characteristics to analyze the probability of the Commission determining that a behavior that breaches the antitrust legislation has taken place in a particular industry *i*. To do so, we considered 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 do not have an economic justification (they may be politically motivated, for instance). The dependent variable in our model is the decision reached in the cases examined by DG Comp. As we shall see, this poses 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 extensive theoretical literature on industrial organization indicating the industry characteristics $X_1, X_2,..., X_n$ 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 was 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 was modeled as a function of a set of industry *i* characteristics X_i and case variables C_j, such as the legal basis used, the type of anti-competitive practice that might have taken place and the application of possible exemptions:

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

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:

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[2] Council Regulation No. 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 this document, the main change in the procedural rules is that the new regime ends the notification system.

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

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 dependent variable y_{ij}, which is observable and takes value 1 or 0, depending on whether or not an anti-competitive practice is detected 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 $y^*_{ij} \geq 0$; otherwise $y_{ij} = 0$. To estimate Equation 2, we used data on the cases examined by the European Commission (EC) between January 1999 and February 2004. The information was supplied by the EC. For all the cases examined by the Commission we had information on the resolution, indicating whether or not there was a breach of Articles 81 or 82, information on the cause of the infringement (i.e. cartel, vertical agreements, abuse of a dominant position, etc.), and information on the legal basis for the case (Article 81 of the EU Treaty and others). The variables in *C* were case-based and included the characteristics of the decision made by the Commission and the nature of the case under examination. In particular, it included the legal basis used for the case and the type of practice that took 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 were affected by industry characteristics raised a potential problem: we did not use any information on the cases that had not been examined by the European Commission. We only observed the cases that were investigated and we knew whether or not anti-competitive practices had been found. There may very well have been situations in which the Commission decided that there was a competition infringement, but the case was 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* was chosen at random. This situation corresponds to the existence of a sample selection bias problem that can be summarized as follows.

Let's assume 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 possibly 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:

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

where vector W of industry variables may include part of 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 observable variable z_i takes value 1 when an industry is investigated and zero otherwise.

Not taking into account this sample selection bias leads to non-consistent estimates of β, to the extent that variables not included that influence the decision to investigate are correlated with other missing variables that explain the likelihood of detecting anti-competitive behavior, provided u and v are correlated. We assumed that u and v were i.i.d. and followed a bivariate

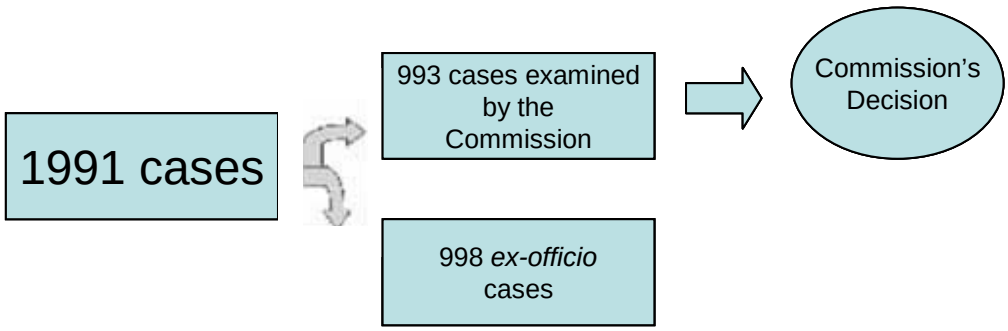
normal distribution with variances σ_u, σ_v and covariance ρ. To solve this problem, we followed Heckman[4] (1976). The Heckman correction is widely used in the economic literature and basically provides us with an estimator of a "corrector" for the sample selection bias. We used information on the cases for which there was no follow-up from the Commission (and hence, no decision) in order to determine if any selection bias existed and to correct for it if this was the case.

4. Data

4.1. Commission Decisions

As stated in the previous section, the dependent variable of our study was a binary variable that took the value of 1 if a practice that breached Articles 81 or 82 of the EC Treaty had 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) shared the same industry characteristics, and case-specific information was used to determine other relevant information about the nature of the business behavior under examination.

To measure the dependent variable, we used data from the cases examined by the European Commission from January 1999 to February 2004. The data was provided directly by the EC and, for all the cases that were examined, it contained information on the resolution of the case (indicating whether a practice that breached the above articles had taken place), the legal basis of the decision (Articles 81, 82 and others) and the kind of infringement that took place (e.g., cartel practices, exclusive purchase, selective distribution, etc.). We had information on 993 cases that had been examined by the Commission, and 998 additional cases that had not been followed up. These 998 cases included *ex-officio* procedures where the complaint had been withdrawn, the notified agreement or practice no longer existed, and the Commission had decided to stop the procedure for unstated reasons (238 cases). There was great variability in the number of cases examined by industry and in terms of the decisions of the Commission. Due to data-availability restrictions with regard to industry-level data, we focused our analysis on manufacturing industries, banking and telecommunications. Hence, we limited our study to 492 cases that had been examined by the Commission and 395 that had not been pursued.



[4] See Wooldridge, J.M., "Econometric Analysis of Cross Section and Panel Data", pages 560-566.

The advantage of using this data is that it is a unique source of information on the anti-competitive practices that have been detected by competition authorities. As mentioned in the methodology section, the main potential problem is the possibility of a sample selection bias. This problem occurs if there is some bias in the cases or industries "selected" by the Commission to be examined. If this is the case, it is likely to affect the estimates of the determining factors of anti-competitive conduct. For example, if the Commission used variables in its selection process such as the past occurrence of anti-competitive behavior in a given industry, or the size of the industry, this could lead to (upward) biased estimates of the determining factors of anti-competitive conduct which were positively correlated with these factors. Potential sources of bias and, therefore, of regressors for the sample selection equation, could be the size of the industry, the extent of intra-EU trade in the industry or the historical evidence (i.e. the sectors in which previous infringements had been detected). We used the data from the cases in which there had not been a follow-up to determine and correct any sample selection bias using the two-equation Heckman selection model outlined above. To do so, the sample selection equation had to include at least one variable that strongly affected the decision to investigate but not the likelihood of finding anti-competitive behavior.

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

Table 1

Classification of the Commission Decisions

Decision Type	No. Cases	No. Cases in Manufacturing, Telecommunications Services and Financial Intermediation	Anti-Competitive Practice
Reasons to take action			
Formal decision			
Formal decision prohibition with fines	44	25	YES
Formal decision prohibition without fines	11	6	YES
Informal decision			
Administrative letter. Minor community interest	32	17	YES
Discomfort letter	24	13	YES
Settlement			
Settlement	60	36	YES
Total	**171**	**97**	
Exemptions			
Formal decisions			
Formal decision exemption with obligation	14	4	YES
Formal decision exemption without obligation	24	6	NO
Informal decision			
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 reason to take action			
Formal decision			
Formal decision. Rejection of complaint	78	36	NO
Informal decision. Negative clearance	9	7	NO
Informal decision			
Negative clearance without publication	270	133	NO
Negative clearance with publication	36	17	NO
Rejection of complaint without decision	245	104	
Total	**638**	**297**	
Total Commission decisions with follow-up	**993**	**492**	

On the basis of the facts presented, the Commission has to decide whether or not a certain practice breaches the competition rules. If the Commission comes to the conclusion that there are grounds to take action under 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 Table 1) and the dependent variable of the regression analysis takes 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 possible reasons: 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 provides for 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 for 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 also provides for automatic exemption from Article 81(1) for vertical agreements that involve companies with a 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 this formally or informally, using a *comfort letter* (administrative letter sent to the parties involved, confirming informally that the Commission sees no grounds for action). Table 1 provides a list of the classification of 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 codified the cases in which an exemption had been applied as zero. Whenever an exemption was allowed, we assumed, as we had been doing all along, that the Commission had correctly ascertained that the practice under investigation did not pose a threat to competition, which was precisely why the exemption was granted, i.e. because any possible competitive concern was outweighed by other efficiency gains. The only exception to this rule[5] was the case of formal exemptions from obligations, since in that case it was assumed that the imposition of obligations indicated a breach of the competition policy rules.

Finally, 813 out of the 993 cases also contained information on the type of agreement or practice that had been the subject of the examination by the Commission.[6] We found 44 different types of practices as classified by DG Comp (such as agency agreements, patent licenses, franchising, etc.) that could be classified in three categories. The first included horizontal agreements that were considered in all circumstances to be detrimental to consumer welfare. Cartels, trade associations and market-sharing agreements are examples of this type of horizontal practices. The second and third groups of practices included actions that were also anti-competitive, but could be justified on the grounds of efficiency gains under certain circumstances. These practices were either horizontal or vertical. We distinguished between practices involving several firms (such as exclusive distribution, franchising and joint ventures) and practices where only one firm was involved, which came under the heading of abuses of dominant position (like exclusive purchase and refusal to deal). Most of the practices with efficiency justification could have been prosecuted under Article 81 and Article 82. Table 2 presents a complete list of the practices found.

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[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 was a very limited number of cases.

[6] Of the 993 total cases analyzed by the Commission, 683 contained information on both the industry (3-digit Nace) and the type of practice. Only 492 of them corresponded to manufacturing industries, financial intermediation (NACE-3: 651 and 652) or telecommunications (NACE 3: 642).

With this classification, a practice belonged to only one of three mutually exclusive categories: a practice was either horizontal without an efficiency justification, vertical or horizontal with an efficiency justification, or an abuse of dominant position. Considering these broad general categories made sense in terms of the analysis of the relevant industry determining factors, but it also had an additional advantage: in some instances, more than one practice had been reported for the same case. 24% of the cases had been reported with more than one anti-competitive practice considered by the Commission and only 4.9% of them had been reported with more than 2. In particular, there were 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 was impossible to determine which classification these cases referred to, we used the other practices reported for the same case as a reference and classified the five former ones based on the category of the co-practices for the relevant case.

Table 2

Classification of Agreements and Practices

Horizontal practices without efficiency justification	**Practices with potential efficiency justifications**	**Exemptions**
	Several firms involved	
Crisis cartel	***Vertical relation***	
Other cartel practices	Trade-mark licences	Reg. 1400/02 on distribution and servicing of
Trade association	Patent licences	motor vehicles
Agency agreement	Copyright licences	Reg. 1475/95 on motor vehicle distribution
Specialization agreement	Know-how licences	Reg. 4056/86 on maritime transport
Market-share agreement	Other IPR licences	Reg. 823/00 on maritime transport
Information exchange	Selective distribution	Reg. 3975/27 on air transport
	Exclusive distribution	Reg. 1017/68 on transport by rail, road, etc
	Control of distributors	Reg. 2790/99 on exclusive purchasing
	Franchising	Reg. 2790/99 on franchising++
	Vertical agreements between	Reg. 2790/99 on exclusive distribution++
	different competitors	Reg. 3932/92 on insurance++
	Other vertical agreements	Reg. 240/96 on technology transfer+
	Horizontal relation	
	Joint ventures	
	Technology-transfer agreements	
	Joint R&D	
	One firm involved (Abuse of dominant position)	
Special cases	Refusal to deal	
*Beer supply**	Exclusive purchase	
*Other forms of cooperation**	Other purchase agreements	
*Pricing**	Technology-transfer agreement	
*Rebates and discounts**	Boycott	
*Other abuses**	Other sales conditions	

*When these practices were reported, in most cases they were another practice. We involved them on the basis of the classification of the additional practice reported.

++These exemptions applied to certain vertical agreements and hence the corresponding cases were considered cases where the Commission had examined a potential vertical agreement. We therefore classified them as such.

For the rest of the situations where more than one practice was reported, most could be classified in the same general category. Only ten of the cases reported practices that could be classified in two different groups.[7]

Finally, the last column of Table 2 includes the existing types of block exemptions. As previously discussed, exemptions were not considered a third type of practice. Rather, this heading covered cases in which the benefits of a practice outweighed its potential anti-competitive effects. We also included them in Table 2, because in some cases a certain practice was only classified according to the exemption that applied to it. We were able to use the type of exemption to approximately determine the kind of practice the Commission was considering. This was the case with exemptions on exclusive distribution, technology transfer, exclusive purchasing and franchising.

4.2. Explanatory Variables

In this section we will discuss the explanatory variables that determined the probability of detecting anti-competitive practices and those that determined the selection of the sample. The probability of deciding against an anti-competitive behavior depends on case-specific and industry-specific variables. As indicated in the methodology, the selection of industry variables was based on the long tradition of the industrial organization literature in this area. For each potential antitrust problem we turned to the theoretical and empirical literature to determine the industry-level conditions under which such violations were most likely to occur. We then used suitable quantitative proxies for these conditions as our explanatory variables.

The regressors used in the sample selection equation included those defined in the literature, plus a set of additional variables that took into account the administrative context in which the Commission had implemented competition policy in the period under consideration.

4.2.1. Case-Specific Variables

As indicated in the methodology section, we included the type of practice that had taken place as a control factor in the model. We also included other case-specific variables related to the firms involved in each particular case (e.g., firm size and market share). However, this information was not in the database and could not be included in the analysis.

Type of Practice (EFF and ADP)

We included dummy variables that took into account the type of practice being considered in each case. In particular, we considered the three mutually exclusive categories defined in the previous section. We distinguished between horizontal agreements with no efficiency justification, vertical and horizontal agreements with efficiency justification and abuses of dominant position. We included a binary variable (EFF) that was equal to one if the practice was a vertical restraint or a horizontal agreement with efficiency justification; otherwise, this value was zero. Similarly, another binary variable (ADP) was given the value of 1 whenever a

[7] We ran our regressions with and without these ten cases and no major differences were found.

practice fell under the heading of abuse of dominant position. Horizontal practices with no efficiency justification were the excluded category.

As we shall see when discussing the main industry characteristics to be considered, the literature on 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 for different types of anti-competitive behavior. However, these same explanatory variables can have a different impact, depending on the kind of practice being considered. For instance, in general, one would expect practices where efficiency considerations are important to be less likely to lead to a finding of anti-competitive practice, given industry characteristics. The inclusion of EFF and ADP dummies allowed us to take this factor into account. In particular, we expected these dummies to have a negative effect on the probability that an anti-competitive practice had taken place. Moreover, in some cases the industry-level determining factors had an opposite effect when we were considering practices that could also have an efficiency-enhancing justification compared to when we were considering horizontal agreements. To capture this, these binary variables interacted with some of the explanatory factors.

This treatment of the dummies was equivalent to having three different regressions, one for each type of practice.

4.2.2. Industry Variables

The goal of our analysis was to study the decisions of the European Commission regarding antitrust practices and to determine whether they were consistent with economic fundamentals. Hence, we followed the existing literature on the economics of industrial organization and competition policy to determine the main industry characteristics considered relevant when analyzing the main ways in which competition could be threatened. On this basis, as advanced in Table 2, we first grouped the practices that breached Articles 81 or 82 of the EU Treaty in three main groups:

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

Second, the last two sets of practices were only considered a problem for competition policy when they had a negative effect on welfare.[8] The literature shows that none of these practices in itself is judged to be clearly against the public interest. For this to be the case, there has to be a certain abuse of individual market power (Article 82) or collective market power (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

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

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 determines the existence of both types of practices will not differ that much. In fact, we used the same econometric specification for all anti-competitive practices, with some minor adjustments which affected only a few of the explanatory variables.

The main industry-level explanatory variables we included in the econometric analysis were 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 Appendix A.

Concentration (CONC): We expected concentration in the market to positively affect the probability that an industry presents anti-competitive practices or agreements. The more concentrated firms are in the market, the easier it is for them to collude or for one of them to abuse its market power. Concentration is measured as the production of the five leading firms in the industry as a share of total 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 will be for them to agree on a common pricing policy. Moreover, given a collusive price, the incentives to deviate for the low-cost firms (or 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. Therefore, 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 interacted this variable with a dummy variable equal to one if the practice was an abuse of dominant position (ADP, see below).

There is no direct measure of firm asymmetry. However EUROSTAT's Structural Business Statistics[9] contains information on the number of firms in a certain size bracket[10] and the total value-added of firms of a certain size. In order to determine the approximate asymmetry between firms in one industry, we computed 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 used the standard deviation as a measure of asymmetry. The larger the standard deviation, the greater the asymmetry. Since average size differs greatly from one industry to another, the standard deviation also varies considerably, simply as a result of the size effect. To take this into account, we used a normalized measure of asymmetry across NACE3 with mean equal to 0 and variance equal to 1.

Entry Barriers (CAP): The harder it is for new firms to enter the market, the more likely it is for a practice that breaches competition to take place. We used a measure of capital intensity as a proxy for entry barriers.

[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. Our data analysis used the following ones: European Commission (1994) and Peneder's WIFO taxonomy (1999). Both sets of data have been extensively used in the industrial organization literature and by the European Commission (see the EC's 2000 and 2001 Competitiveness Reports).

Product Differentiation (RD and ADV): The more differentiated the products in an industry, the less likely it is for anti-competitive behavior to take place, since companies focus competition on characteristics other than price and the diminished rivalry on price can lead to less need for softening competition through increased 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 such a case one would expect a negative relationship between the likelihood of anti-competitive practices and measures of product differentiation.

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

In practice this means that we introduced both R&D and advertising intensity as independent regressors. However, we also interacted 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 and R&D spending.[11]

Demand Growth (DEM): we expected demand growth to be positively related to the probability of anti-competitive behavior (Ivaldi et al., 2003), mainly because, for a fixed number of players, in a growing market the profits from deviating today are small compared with the costs of being punished in the future, when the market is much bigger and, hence, when the potential profits from colluding could be much greater.[12] The data used came from the Structural Business Statistics (SBS) produced by Eurostat. The period considered was 1999-2001.

Trade Exposure (TRADE): In general, we expected likelihood of anti-competitive behavior to be lower in industries where imports represented an important part of total domestic consumption. To analyze this issue, we constructed a variable TRADE that measured the weight on extra-EU

[11] The interaction did not come out as statistically significant for the case of advertising which, as discussed 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 was also important to consider entry barriers in our econometric specification since in a market with low barriers, demand growth might encourage entry and obstruct collusion.

imports on EU-wide apparent domestic consumption (i.e., production minus exports plus imports). This variable was constructed with data from Unido (production data) and Eurostat (trade). The figures corresponded to 2000.

4.2.3. Variables for the Sample Selection Equation

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

As for the determining factors of complaints, in general we were likely to observe complaints precisely in industries where there were industry conditions that facilitated infringements. Therefore, the key point was: when did the Commission accept a complaint? First of all, many complaints were rejected because they were poorly drafted. Second, complaints were rejected if they did not have "a Community interest". What this meant was that the size of the industry in question, or the geographical scope, implied that the infringement (if it existed) was rather small or was geographically limited, and could be dealt with by national courts. These determining factors were well captured by the variables industry size (SIZE) and importance of intra-EU trade in the sector (INTRA). The size of the industry was measured as turnover (source: SBS from Eurostat, year 2001), and the importance of intra-EU trade was measured as intra-EU imports over total EU apparent consumption (same source and year as TRADE).

Another important factor was of a sectoral nature. All other things being equal, the Commission may have reacted more favorably to complaints coming from end users, as compared to intermediate consumers. In practice, this may have implied that consumer-oriented industries (i.e., those in which advertising played a more important role) may have been subject to greater scrutiny. In order to capture this consumer-goods effect, we included an advertising variable (ADV).

The nature of the infringement was another criteria for the decision to consider the complaint, and in particular cartel behavior was almost always prosecuted. To capture this possibility, we included 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 Basis (ART): For 885 out of 993 cases, the information provided by the EC also included the legal basis 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, Article 81 was the only one considered, whereas in 9% of them, the legal basis included both Articles 81 and 82. On the

other hand, only 10% of the cases include Article 82 as the only legal basis considered, but 28% of the cases included Article 82 in their legal basis.

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 included a dummy which took the value 1 if Article 81 had been applied, and 0 otherwise, because this captured the idea that the Commission was more likely to investigate cases that could potentially lead to the prosecution of cartel-type behavior.

In short, after examining in detail the Commission's decision to investigate, we concluded that the sample selection equation should not only include variables capturing size (SIZE) and intra-EU trade (INTRA), but also an advertising variable that accounted for the consumer-goods effect (ADV), and a case-based variable to capture the cartel effect (ART).

5. Results

5.1. The Empirical Model

The econometric specification we used for the regression on the probability of detecting anti-competitive behavior (equation 1) was as follows.

$$P = F(\beta_0 + \beta_1 EFF + \beta_2 ADP + \beta_3 CONC + \beta_4 ASYM + \beta_5 (ASYM*ADP) + \beta_6 CAP +$$

$$+ \beta_7 RD + \beta_8 (RD*CONC) + \beta_9 ADV \pm \beta_{10} DEM + \beta_{11} TRADE)$$

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 regard to their inclusion in the regression. And the same goes for the negative sign on demand growth and trade. We also included the interaction of *CONC* and *RD*. The interpretation of this last parameter was as follows. $\beta_3 + \beta_8 RD$ gave us how the probability of anti-competitive practice changed with an increase in *CONC* and $\beta_7 + \beta_8 CONC$ indicated how the probability of anti-competitive practice changed with an increase in R&D intensity. We expected β_3 and β_7 to be positive, but parameter β_8 to be negative.

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

We also included practice-specific parameters. As explained above, we expected the parameters for both EFF and ADP to be negative. Given a set of industry determining factors, the likelihood of anti-competitive practices was lower whenever efficiency considerations were taken into account. These practice-specific parameters also allowed us to control for the fact that some of the industry-level explanatory variables could have different effects depending on

the anti-competitive practice we were analyzing. Consider the effect of asymmetry. In general it was negative. However, it could turn out to be positive when we considered cases of abuse of dominant position (ADP). This implied that even if β_4 was negative, we expected $(\beta_4 + \beta_5)$) to be positive. Table 3 summarizes the signs expected for each parameter.

Table 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)	Uncertain
β_{10}	Demand growth (DEM)	Positive
β_{11}	Exposure to extra-EU trade (TRADE)	Negative

5.2. Description of the Data and Results

Data

Table 4 shows the descriptive statistics corresponding to the main variables used in the econometric analysis, with a focus on the industry determining factors of 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 (manufacturing, telecommunications services and financial intermediation) that were actually used in the regression analysis (some cases were discarded because not all explanatory variables were available).

The table also provides the results of the T-test of differences in means, which illustrates the fact that the key industry variables did not appear to be significantly different if we considered the group of investigated cases and those not investigated. This might indicate that the two samples were in fact very similar, in the sense that both of them might have been randomly

drawn from the same population. If this was the case, the sample selection problem might be less important, as mentioned in the discussion above.

Table 4

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	32.612	-0.247
	13.486	12.874	(0,8052)
ASYM	0.063	0.149	0.605
	0.888	1.078	(0,5455)
CAP	18.588	18.454	-0.081
	11.321	10.347	(0,9359)
RD	3.934	3.800	-0.310
	2.867	2.897	(0,7568)
RD*CONC	131.529	128.715	-0.185
	102.221	98.893	(0,8535)
ADV	0.623	0.541	-1.119
	0.486	0.502	(0,2643)
DEM	0.138	0.136	-0.097
	0.989	0.100	(0,9232)
TRADE	0.163	0.196	1.174
	0.184	0.189	(0,2417)
INTRA	0.277	0.273	-0.192
	0.137	0.134	(0,8478)
SIZE	160.241	181.113	0.504
	258.499	317.888	(0,6150)
ART	0.907	0.934	0.642
	0.291	0.250	(0,5216)

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

Table 5 also shows the descriptive statistics at the industry level and distinguishes those cases in which an anti-competitive practice was detected and those in which no such practice was detected. As before, the information is provided for all cases involving the manufacturing industry, telecommunications services and financial intermediation sectors that were used in the regression analysis due to data availability.

Table 5

Sample Means and Standard Deviations for Manufacturing Industries, Telecomunications Services and Financial Intermediation Included in the Regression

	Cases where anti-competitive practice was detected	Cases where anti-competitive practice was NOT detected	T-Test of difference in means (p values)
C5	32.998	33.131	0.049
	15.235	13.121	(0,9614)
ASYM	-0.036	0.086	0.677
	0.870	0.894	(0,4994)
CAP	17.076	18.931	0.809
	9.536	11.694	(0,4195)
RD	4.785	3.741	-1.813
	3.964	2.533	(0,0717)
RD*C5	156.390	125.879	-1.481
	161.161	83.178	(0,1405)
ADV	0.500	0.652	1.548
	0.509	0.478	(0,1236)
DEM	0.120	0.142	1.081
	0.095	0.100	(0,2815)
TRADE	0.259	0.141	-3.271
	0.226	0.167	(0,0013)
EFF	0.467	0.803	3.9511
	0.507	0.399	(0,0001)
ADP	0.233	0.121	-1.5909
	0.430	0.328	(0,1136)
ASYM*ADP	-0.056	0.051	1.3934
	0.103	0.413	(0,1654)
INTRA	0.317	0.268	-1.799
	0.146	0.134	(0,0739)
SIZE	133.6	166.3	0.625
	265.9	257.4	(0,5328)
ART	0.833	0.924	1.553
	0.379	0.257	(0,1225)

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

Results

Table 6 presents the results of the analysis with the estimate of the main model alone (specification 1), as well as the main model plus the sample selection equation (specifications 2, 3 and 4). All regressions were estimated using standard errors corrected for potential heterocedasticity problems, given the cross-sectional nature of the database. Several alternative specifications for the main equation and the selection were tested and the parameters were found to be very stable across the different specifications.

The results in Table 6 confirm that the overall fit of the model is quite good: most of the parameters were statistically significant and of the expected sign. Given the fact that we were considering a cross-section of industries and that the way these industries were defined was quite different from the way markets are defined for antitrust purposes, the robustness of the results is quite remarkable.

Table 6

Econometric Results

	Probit		Probits (correcting for sample selection)							
	(1)		(2)		(3)		(4)		(5)	
	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error	Coeff	Std. Error
EFF	-1.2299	0.3372	-1.2882	0.3364	-1.2709	0.3327	-1.2739	0.3324	-1.2672	0.3357
ADP	-0.7049	0.4201	-0.8426	0.4053	-0.8622	0.3939	-0.8619	0.3947	-0.8621	0.3901
CONC (with c5)	0.0342	0.0207	0.0324	0.0197	0.0346	0.0194	0.0343	0.0194	0.0319	0.0194
ASYM	0.2180	0.2458	0.1143	0.2341	0.1413	0.2245	0.1369	0.2248	0.1271	0.2296
ASYM*ADP	-2.9784	0.7878	-2.8002	0.7679	-2.7241	0.7293	-2.7302	0.7303	-2.7145	0.744
CAP	-0.0334	0.0359	-0.0310	0.0332	-0.0342	0.0327	-0.0341	0.0329	-0.0291	0.0346
RD	0.1087	0.1351	0.1315	0.1330	0.1375	0.1268	0.1363	0.1273	0.1339	0.1275
RD*CONC	-0.0024	0.0034	-0.0031	0.0035	-0.0027	0.0032	-0.0027	0.0032	-0.0027	0.0031
ADV	-0.6654	0.3890	-0.5336	0.3597	-0.5709	0.3460	-0.5686	0.3446	-0.05532	0.3527
DEM	6.9213	3.5257	6.1589	3.2829	6.6080	3.2389	6.5590	3.2726	6.0598	3.5927
TRADE	3.6948	1.0530	3.2967	1.0283	3.3432	0.9949	3.2649	1.0236	3.3219	1.1127
_cons	-1.9357	0.8074	-1.9720	0.7757	-2.1852	0.7678	-2.1530	0.7650	-2.1345	0.7554
N	163		162		162		162		162	
Pseudo R2	0.25									
Prob >Chi2	0.0000		0.0000		0.0000		0.0000		0.0000	
Chi2	61.15		71.14		80.11		79.84		79.66	
Selection equation variables										
CONC			0.0102	0.0145	0.0188	0.0070	0.0162	0.0064		
ASYM			-2.2283	0.9056	-1.4321	0.5287	-1.2379	0.4711		
CAP			0.0112	0.0196	-0.0074	0.0080	-0.0078	0.0080		
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
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
ART			0.2269	0.2094	0.2815	0.1706	0.2765	0.1676	0.2807	0.1701
SIZE			0.0066	0.0030	0.0046	0.0018	0.0039	0.0016	-0.0003	0.0002
_cons			-1.1700	0.7622	-1.8808	0.5424	-1.6728	0.4819	-0.9103	0.2270
N-censored			119		148		148		157	
Chi2			1.03		2.14		2.12		1.15	
Prob>chi2			0.3094		0.1438		0.1455		0.2845	
Rho			0.4388		0.5338		0.5278		0.5518	

Robust standard errors. Shaded areas indicate that the coefficients were statistically different from zero (at a significance levell of 10%).

As expected, the coefficients for EFF and ADP were both negative, indicating that for a given set of industry determining factors, when we took into account efficiency considerations, there was less likelihood of anti-competitive practices. Moreover, the EFF coefficient was significantly more negative than the ADP one. This allowed 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 being equal, the practices most likely to lead to a decision of anti-competitive behavior were horizontal ones without an efficiency justification, followed by those that could imply abuse of dominant position and, finally, those that could have a potential efficiency justification.

Our results also confirmed the fact that anti-competitive practices are more likely to take place in more concentrated industries (CONC). The coefficient for ADV was negative or not significant, and this fits with the interpretation that this variable is capturing the extent of product differentiation, which softens price competition and the incentive to undertake restrictive practices. Also, as expected, demand growth (DEM) increased the likelihood of anti-competitive behavior in the industry.

There were, however, two regressors that did not present the expected sign: the one corresponding to trade exposure and ASYM*ADP. Regarding the coefficient for TRADE, it is apparent that the selected variable was probably a very crude measure of the competitive pressure exerted by foreign competition,[13] and it therefore probably captured other variables that were omitted.

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

The results were also as expected for the selection equation. The Commission was more likely to evaluate a case if it affected a large industry (SIZE). It also appeared to be more inclined to examine one if it directly affected the welfare of the end consumer (captured by ADV) or if there was some concern about a cartel (ART).

Finally, the results of the probits that corrected for sample selection were very consistent with the ones that did not correct for it. This seems to indicate that the problem of sample selection was not important. This view is, in fact, reinforced by the analysis of the descriptive statistics shown in Tables 4 and 5. Altogether, therefore, it is not surprising that only minor changes were observed in the magnitude of the parameters when comparing models with and without sample section.

Interpretation of the Results

Since we estimated a probit model, the parameters of Table 6 could not 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 depended on where we started. As a starting point, we evaluated the effect of each independent variable on the dependent variable at the mean value of the data (Table 7) and reported on the new sample mean value of the dependent variable (the estimated probability) if there was a change of one standard deviation for each of the explanatory 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 expected, the model predicted that the probability of detecting anti-competitive behavior by the Commission was higher when cases were considered with a potential horizontal practice without efficiency justification, followed by those in which there was a possibility of abuse of dominant position and, finally, those where an efficiency justification existed. In fact, the Commission was seven times more likely to decide against a horizontal practice than against one with a potential efficiency justification. With regard to horizontal practices, Table 7 clearly shows that the strongest quantitative impact on the likelihood of detecting anti-competitive behavior came from changes in extra-EU trade and concentration variables. It is also interesting to note that the impact of the advertising and CAP variables, which work in the opposite direction, was also very important (however, the interpretation of the magnitude also had to take into account the statistical significance of the coefficient and the one for CAP was not significantly different from zero in Table 6, so the parameter was less reliable). This highlights the fact that it is important to assess market-structure variables and take into account the nature of competition in each industry, while making sure that the effect is properly recognized of product differentiation and competition through new product development as factors that soften the tendency towards anti-competitive practices.

If we consider practices with potential efficiency justifications and the abuse of dominant position, the most important independent variables were more or less the same, but it is worth pointing out that in most cases changes in the independent variable appeared to have a relatively stronger effect on the estimated probability than what happened in the benchmark case.

Table 7

Interpretation of the Results

		Increasing one Std. Deviation of:						
	At the mean	CONC (C5)	ASYM	CAP	RD	RD*CONC	ADV	TRADE
Prob. of horizontal practice without efficiency justification	35.20%	53.19%	39.74%	22.06%	50.40%	25.46%	25.46%	58.71%
Prob. practice with potential efficiency justification	4.85%	11.70%	6.30%	2.07%	10.38%	2.68%	2.68%	14.69%
Prob. abuse dominant position	9.18%	19.22%	11.31%	4.36%	17.36%	5.48%	5.48%	23.27%

Probabilities estimated by evaluating specification (4) from Table 6 at the mean value of the cases studied (in Table 4).

6. Conclusions

This paper has described the analysis of the decisions made by the European Commission regarding the existence of anti-competitive practices, based on a set of relevant industry-level variables. Our main objective was to determine whether Commission decisions follow what the predictions of the economic literature. The results of this paper suggest that, by and large, this seems to be the case. As expected, the Commission is more inclined to rule against cases that involve horizontal practices than against those that imply a potential abuse of dominant position or a practice that could have efficiency justifications. Moreover, as expected from the economics literature, the Commission is more likely to rule against a practice that involves a highly concentrated industry or an industry with high demand growth. However, it is less likely to rule against a sector with considerable 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 such as financial intermediation and telecommunications services, where such an asymmetry may be easily explained by the economics and the regulatory history of these industries.

Moreover, the estimate was undertaken by taking fully into consideration the fact that there might be biases in the way the Commission decides on which cases to investigate. In other words, the effect of some determining factors 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 on the industries it will investigate. Our analysis confirms that the Commission appears to be more likely to investigate cases related to large industries, sectors that affect the end consumer and 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 major impact on the probit coefficients.

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

A second possible criticism of this study is that we did not cover 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 to 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 that includes firm-specific information in addition to 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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APPENDIX A

Table A. 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 *Eurostat, Structural Business Statistics, Annual enterprise statistics*	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 *Eurostat, Structural Business Statistics, Annual enterprise statistics*	Average ratio of gross investment in tangible goods to value added at factor cost from 1999 to 2002 in million euros *Eurostat, Structural Business Statistics, Annual enterprise statistics*
R&D Intensity (RD)	**1**. Average ratio of expenditures on R&D to total sales from 1993-95 for the US manufacturing industries *European Comission (1994) and WIFO taxonomy of Peneder (1999)*	**1**. R&D intensity using value added for Sector J (NACE 65,66,67) *OECD STAN Indicators Database (1999)*	**1**. R&D intensity using value added for NACE 64: Post and telecommunications *OECD STAN Indicators Database (1999)*
	2. (dummy) Data only for UK and Italy, relative to national apparent consumption *Davies and Lyons (1996)*	**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 *Davies and Lyons (1996)*	(dummy) Calculated using several reports on a ranking of advertising in Europe *Own elaboration from several sources*	(dummy) Advertising expenditure (million €) for the Spanish telecom sector 2002-05 *Own elaboration from various sources*
C5 (CONC)	Production of the five leading firms in the industry as a share of the whole EU production *Davies and Lyons (1996)*	Market share of the five leading companies (%) – Europe-15, 1996 *Gual, J. (2004)*	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 European *Own elaboration from various sources*
Exposure to Extra-EU Trade (TRADE)	Weight of extra-EU imports on EU-wide apparent domestic consumption (production minus exports plus imports) *Unido (production) and Eurostat (trade) (2000)*	Weight of extra-EU imports on EU-wide apparent domestic consumption (production minus exports plus imports) 2000 Financial services *Statistical tables from EU INTERNATIONAL TRADE IN SERVICES, Eurostat*	Weight of extra-EU imports on EU-wide apparent domestic consumption (production minus exports plus imports) 2000 Telecommunications services *Statistical tables from EU INTERNATIONAL TRADE IN SERVICES, Eurostat*
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 computed the average size of a firm in each of the brackets (average value-added per firm) and the average size of the industry, and used the standard deviation as a measure of asymmentry. *EUROSTAT's Structural Business Statistics (2001)*	Number of enterprises broken down by size classes of Balance sheet total and Balace sheet total for NACE j6512_652 "Total credit institutions" in million euros from 2000-01 for the Europe-15 countries except Ireland and Finland. *Eurostat, Structural Business Statistics - Annual enterprise statistics: breakdown of the number of enterprises*	Services broken down by employment size classes: Number of enterprises AND Number of persons employed for NACE i642 from 2000-01 for the Europe-15 countries except for Greece, Ireland and Luxembourg. *Eurostat, Structural Business Statistics - Annual enterprise statistics: breakdown of the number of enterprises*
Demand Growth (DEM)	Growth in turnover (V12110) from 2000-01 *EUROSTAT's Structural Business Statistics*	Growth in turnover (interest income+fees and commissions receivable), 2000-01 *OECD Bank Profitability*	Growth in turnover in the EU15 (million EUR) 2000-01 *Eurostat, Structural Business Statistics, Annual enterprise statistics*
Size	Turnover or gross premium written (v12110) *EUROSTAT's Structural Business Statistics (2001)*	Sum "interest income" + "fees and commissions receivable" in millions of national currency, 2001 (all banks of EU-15 countries except Finland and Luxembourg). *OECD Bank Profitability*	Turnover in millon 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) *Eutostat, Structural Business Statistics, Annual enterprise statistics*

APPENDIX B

Table B. Econometric Results (Including Only Manufacturing Sectors)

	Probit		Probits (correcting for sample selection)					
	(1)		(2)		(3)		(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. Shaded areas indicate that the coefficients were statistically different from zero (at a significance level of 10%).

* The Chi2 value was quite low and, hence, the outcome we obtained by correcting for selection was not very different from the one we obtained without correction. The Rho value was also quite close to 1, thus indicating that correction for selection might not have been needed here.