CARTELS IN EU: STUDY ON THE EFFECTIVENESS OF LENIENCY POLICY

Abstract. *This paper is centered upon the analysis of Leniency's effectiveness in cartel agreements. The influences of this policy on cartel evolution and on the fine mechanism are the main topics to be studied. The first part of the research comprises several theoretical concepts about Competition Policy in the EU and the Commission's activity towards this scope. A brief description of the general legislation rules and competent regulatory institutions is also included. The research methodology comprises a quantitative and a qualitative analysis. The last part of this paper is represented by a case study. The evolution of cartels before and after the entering into force of this policy is analyzed at a macro-level. Afterwards, a more detailed study, at a micro- level, comprising the behavioral analysis of the cartelist companies and the Leniency's influence on the fine mechanism is conducted. A synthesis of the micro- level analysis is presented in order to underline the general trend depicted from this study. To a better understanding of the studied concepts, a qualitative analysis, which includes a classification by industry sector and types of goods and services provided by the cartelist companies, was enclosed.*

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1. Introduction

Competition represents the intrinsic motivation of businesses to offer the best possible range of goods and services at the best possible prices in order to attract and retain customers. In a free market, businesses should play a competitive game. Hence, free competition is the key element in an open market economy because it stimulates economic performance.

Unfortunately, sometimes companies try to limit competition by engaging in illicit practices. In order to avoid these situations, The European Commission, which is the competent authority in the EU to deal with this matter, must prevent and correct anti-competitive behaviour. Therefore, EU Competition Policy ensures that competition is not distorted in the internal market by making sure that similar rules apply to all the companies operating within it. To achieve this goal, the Commission monitors any type of horizontal agreements (concluded between companies situated on the same layer of the supply chain) or vertical agreements (concluded between companies on different layers of the supply chain, for example, between retailers and suppliers). There are several basic types of agreements between companies that restrict competition which are regulated by the EU. For example, Art. 101 of the TFEU prohibits the creation of cartel agreements, Art. 102 of the TFEU prevents abuses of dominant position (such as predatory pricing), Art. 107-109 of the TFEU claim the fair condition of state aid policy, and the updated Merger Regulation of 2004 bars the collusion of companies which affect the competition in a negative way (Aydin and Thomas, 2012).

It is worth mentioning that Competition Policy in the EU is one of the fewest policies which are not yet harmonized at EU level. Therefore, cooperation with national competition authorities (NCAs) in EU countries, who are also responsible for enforcing aspects of EU Competition Law, is very important. At international level, other institutions and networks responsible for the regulation of competition are: ICN (International Competition Network), OECD (Organization for Economic Cooperation and Development), UNCTAD (United Nations Conference on Trade and Development), WTO (World Trade Organization) etc. Bilateral agreements between these institutions and organizations are sometimes concluded in order to improve the efficiency and fairness of trade.

Cartels are agreements or concerted practices between two or more competitors aimed at coordinating their competitive behaviour on the market and influencing the relevant parameters of competition through practices such as: fixing purchase or selling prices or other trading conditions, allocating production or sales quotas, sharing markets including bid-rigging, restricting imports or exports or conducting anti-competitive actions against other competitors. Such practices are among the most serious violations of Article 81 EC (C101/2004).

Once limiting the competition that would naturally occur between them, undertakings avoid especially those pressures that lead them to innovate, both in terms of product development and of introduction of more efficient production methods

(C298/2006a). Therefore, these illegal activities result in more expensive raw materials and components for the Community companies that purchase from such producers. Higher profits acquired by the collusive agreement have a destabilizing effect as they induce cheating by cartel members (Davis, 2011). Consequently, on short term these practices result in artificial prices and reduced choice for the consumer. In the long run, they lead to a loss of competitiveness and reduced employment opportunities (Aubert, 2005). Due to all these reasons, the Commission believes that combating cartels is a crucial aspect of its endeavours to achieve the objectives set out in its 1993 White Paper on Growth, Competitiveness and employment (C207/1996). This explains why a substantial effort to detect cartels was put into this matter during the last years.

A recent innovation in anti-trust regulation is the guarantee of immunity from prosecution to companies engaging in cartels who report to the anti-trust authority the cartel in which they are taking part. The US Antitrust Division created a so-called "Leniency policy", also referred to as the "Amnesty Program" or "Corporate Immunity Policy", first in 1978 and then refined and extended it in 1993 (Apesteguia et al., 2007). Many other countries have adopted similar policies since then, and the collaboration within the OECD Competition Committee results in correlated development of anti-trust legislation throughout the OECD country members (OECD, 2002). The European Commission introduced leniency rules first in 1996 and subsequently in 2002 when a policy similar to the US policy was adopted. Therefore, the Leniency Notice in the EU establishes the framework for rewarding co-operation with the Commission's investigation for undertakings which are or have been party to secret cartels affecting the Community (Bigoni et al., 2012). The aim of this policy is to reduce the firms' incentives to collude in the first place by increasing the benefits resulted from the agreement's dissolution (Aydin and Thomas, 2012). Hence, Leniency's aims on short term reflect the desire for detection mechanism improvement and reduction of legal enforcement costs, and on the long run, firms' deterrence from antitrust abuse (Brenner, 2009). In order to encourage a member of a cartel to confess its breach of legislation and bring incriminating evidence regarding the other members concerning their illicit meetings and agreements, a reduction in fine is granted proportionally with the amount of relevant, new information delivered to the Commission and the moment of announcement. Other benefits for the whistle blower companies refer to a less restrictive order, or to complete immunity (Hinloopen, 2003).

In the following chapters the section of competition policy regarding cartels is being thoroughly analysed. Leniency's effectiveness and its effects on the current competitive environment are the main topics to be discussed.

2. Research methodology

The problem concerning the effectiveness of the leniency policy and of the mechanism was analyzed through quantitative and qualitative methods. Data from the sanctioned cases was collected from the Prohibition Decisions published on the

official website of the Directorate General Competition of the European Commission (DG COMP). The data was structured according to the following criteria: cartel case description (cartel case number, name, date, affected industry sector and type of infringement) and cartel characteristics (number of companies involved, number of countries affected, duration of cartel, basic fine, final fine and deterrence percentage). This information was used for the macro level analysis. As for the micro-level analysis, data for each company was structured using more detailed criteria.

A time series model was developed in order to trace a trend in the evolution of cartel behavior before and after the entering into force of the Leniency Notice (Mitruţ and Şerban, 2007). When developing a model like this, several types of changes may be determined: trend, cyclical fluctuations, seasonal and irregular fluctuations. This study was focused on the irregular variations.

In determining the factors' influence on the fine mechanism, an univariate analysis was used aiming to present a frequency distribution of the individual cases, which involved determining the number of cases in the sample which fell into each category of values of the variable. In several cases a percentage distribution was utilized, followed by a graphical representation. In order to determine which quantitative data tended to cluster around a value, measures of central tendency were used, as in Segal and Vasilache (2012). The factors analyzed were: duration, percentage of relevant sales, market shares, worldwide turnover, and geographic scope. We have chosen these factors because the fine mechanism is influenced by each and every one of them (C298/2006a). For the deterrence analysis, an aggregated influence of factors was studied. We used a time frame of 11 years was used in order to detect a trend and analyze the effectiveness of this policy.

To back up some assumptions, we also conducted a multiple regression analysis. This method was used in determining which factors have a significant influence on the mechanism of fine allocation according to the following general model: $\hat{Y} = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$. Two models were analyzed. In both of them $\hat{Y}$ stands for fine, with regressors the duration of cartel and the value of relevant sales for the first model and additionally, in the second model the average market share was considered regressor.

The final results are expected to mold a pattern for the cartelist behavior and to outline the change resulted from the leniency's applicability in this type of agreements.

3. Quantitative analysis

3.1. Macro level analysis

Here we analyze a trend of the general behavior of cartels before and after the entering into force of the Leniency Notice along with the impact of the fine mechanism upon the participating companies.

It is worth mentioning from the beginning that the fine amounts reflect the Judgements of the General Court and of the ECJ, and refer only to the cartel infringements under Article 101 TFEU (previously Article 81 resp. Article 85 of the Treaty). A decision concerns a single proceeding against various undertakings concerned, and may involve more than one infringement. Immunity applicants are also included in this assessment.

If we consider the as a time frame the period 1990 - 2012, we can notice that the total fines imposed increased significantly after the period 1995 - 1999 and this trend is strongly linked to the entering into force of the Leniency Policy (in 1996), which enabled the Commission to improve its efficiency by receiving relevant information from internal sources concerning the pending infringements.

Considering the period 1995-1999 a milestone we can state that the number of decisions tripled afterwards, and the number of undertakings involved also increased significantly. The rates of change expressed in percentages or in absolute values were also calculated for each period in Table 1. The average annual change for the number of decisions was 1.5 meaning that, on average, the number of decisions increased with 1.5 over the mentioned periods. We also need to take into consideration that the period 2010- 2012 includes only a two-year evaluation, therefore a relevant comparison to the previous period can only be made when data from 2010- 2014 will be available. Hence, we can draw the conclusion that after the entering into force of the leniency policy cartel's detection rate increased significantly.

Table 1

Time line data analysis for the period 1990 – 2012

Period	Fine amount (in '000' €)	Rate of change (%)	No. of undertakings	Rate of change (%)	No. of decisions	Rate of change (absolute)
1990-1994	344282	-	185	-	10	-
1995-1999	270963	-21.30	45	-75.68	10	0
2000-2004	3157348	1065.23	157	248.89	30	20
2005-2009	8369033	165.07	205	30.57	33	3
2010-2012	5358206	-35.98	120	-41.46	16	-17
Total	17499832	-	712	-	99	-

The top ten largest fines per cartel imposed in the whole activity of the Commission are presented Figure 1. As we can notice, all of these cases were sanctioned after 1996 and included infringements with reference to various industries and even though they comprise companies which produce a large range of products and services, we can notice that most of these products are used for mass-consumption and imply economies of scale and international trade. To create a more detailed perspective, it is worth mentioning that in most of these cases, the geographic scope included the entire EEA, with the exception of the 'Gas' and the 'Elevators and escalators' case, cartel duration varied from approximately one year to almost 20 years

and the average number of companies involved was 8.12. Summing it up, this is just an example which shows that Commission's activity was enhanced with leniency policy's support.
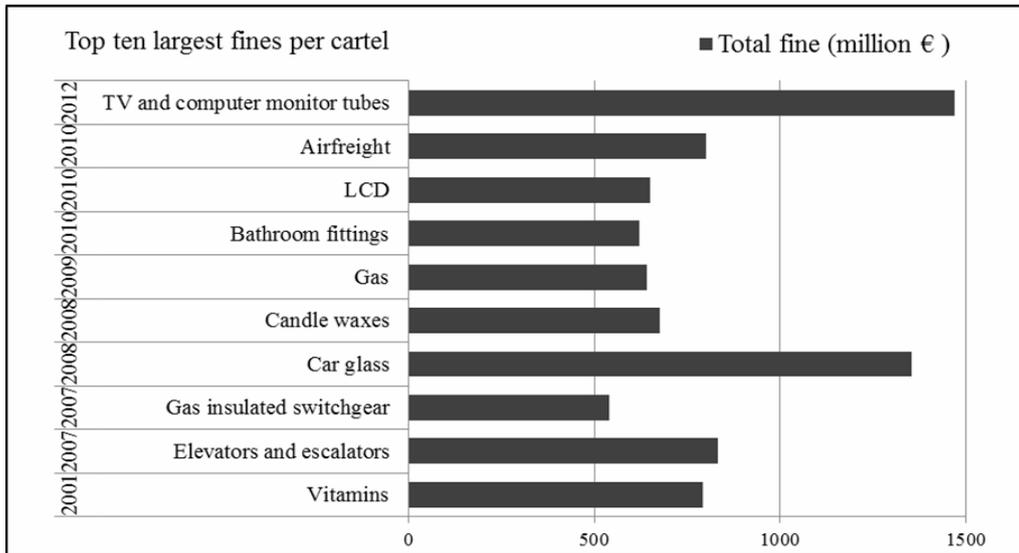

Figure 1. **Top ten largest fines per cartel**

All in one, from the Commission's statistics, noteworthy changes in the behaviour of the companies participating in illegal agreements can be observed as from the moment the Leniency Notice has entered into force. On one side, more companies engaged in illegal agreements and more cartels were formed, but on the other side, the cartels were detected more easily, and the size of fines increased enormously and concentrated over the period 2005-2009. As other studies show, the increasing number of concluded cartels in the recent years is mainly caused by economic and political events, by the fact that the barriers of trade and investment were lowered between national markets within EU, and by the accelerated market integration and liberalization at industry level (Brenner, 2009).

Because the competition policy, through its definition and aim involves the analysis of each particular case, in order to create a more in-depth study of leniency's influence a micro-level analysis was conducted.

3.2. Micro level analysis

A research study was conducted on 57 cartels (comprising 352 companies) sanctioned starting with 2000, which had available, non-confidential information published in English on DG COMP's official website as 'Prohibition Decisions'. A database was constructed using the information and all the following assessments are

based upon this source. Several factors are considered critical for the computation of fines applicable to cartels and amongst these we can mention: cartel duration, percentage of relevant sales, average market shares, worldwide turnover, geographic scope, aggravating and mitigating circumstances, settlement notice and leniency policy with the corresponding whistle blower (WB) position. Hence, each of these factors will be individually analyzed.

In order to have a holistic view about how the fine mechanism functions and why the selected variables were chosen for this analysis, short description of the process was included.

When determining the basic amount of the fine to be imposed, the Commission takes the value of the undertaking's sales of goods or services to which the infringement directly or indirectly relates in the relevant geographic area within the EEA. It normally takes the sales made by the undertaking during the last full business year of its participation in the infringement. Then, the basic amount of the fine will be related to a proportion of the value of sales, depending on the degree of gravity of the infringement, multiplied by the number of years of infringement. The assessment of case gravity will be made on a case-by-case basis for all types of infringement, taking account of all the relevant circumstances of the case. As a general rule, the proportion of the value of sales taken into account will be set at a level of up to 30 % of the value of sales. In order to decide whether the proportion of the value of sales to be considered in a given case should be at the lower end or at the higher end of that scale, the Commission will have regard to a number of factors, such as the nature of the infringement, the combined market share of all the undertakings concerned, the geographic scope of the infringement and whether or not the infringement has been implemented. Horizontal price-fixing, market-sharing and output-limitation agreements are by their very nature, among the most harmful restrictions of competition. As a matter of policy, they will be heavily fined. Therefore, the proportion of the value of sales taken into account for such infringements will generally be set at the higher end of the scale. In order to take fully into account the duration of the participation of each undertaking in the infringement, the amount determined on the basis of the value of sales will be multiplied by the number of years of participation in the infringement. In addition, irrespective of the duration of the undertaking's participation in the infringement, the Commission will include in the basic amount a sum of between 15 % and 25 % of the value of sales above in order to deter undertakings from even entering into horizontal price-fixing, market-sharing and output imitation agreements. This charge is also called an 'entry fee' (Morgan, 2009). The Commission may also apply such an additional amount in the case of other infringements (i.e. recidivism). Afterwards, the all the factors which may deter the basic fine amount are analyzed. These factors include: mitigating circumstances (i.e. limited role or conducted encouraged by legislation), aggravating circumstances (i.e. ring leader, repeated offender, obstruction of investigation), specific increase for deterrence (for firms with large turnover), legal maximum, leniency application (whistle blower position) and ability to pay (C210/2006).

3.2.1. Duration

Cartel duration or longevity is an essential factor in determining cartel effectiveness and the potential economic damage to markets. Cartel duration refers to the total life span of an effective illegal price-fixing agreement from its formation to abandonment, a longevity that may span multiple episodes. An episode is defined as a collusive period marked by the absence of changes in a cartel contract agreement. Cartel duration should not be confused with cartel stability, which is signalled by a low variability in prices or the overcharge rate within an episode, yet the determinants of cartel duration and stability may be similar. While it is not clear that cartel stability affects aggregate long term consumer loss, it is self-evident that long-lived cartels are in general more destructive than short-lived cartels with equal overcharges (Zimmerman and Connor, 2005).

The companies subject to our study were classified with respect to the number of years in which they have participated in the infringement. As it can be noticed from Figure 2, more than 50 percent of the companies take part in a cartel for a duration of maximum 5-7 years, but even so, there is still a great percentage of 9.09% of undertakings which conclude illegal agreements for even more than 15 years and this underlines that fact that gathering enough evidence to incriminate a company is time-consuming and effortful. The need to obtain more easily this information was one of the reasons that led to leniency's notice establishment.
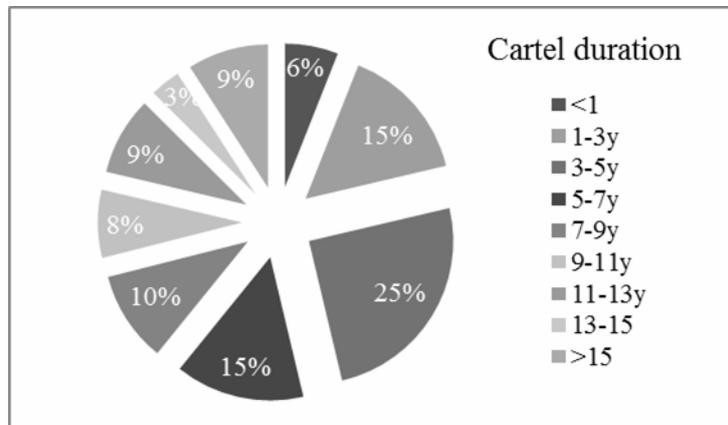

Figure 2. **Cartel duration per company- % out of total number of companies (years)**

Nevertheless, even with the existence of a whistle blower option, there are still several companies which are reluctant to adhere to its benefits, or companies that want to take advantage of their discriminatory position as long as possible in order to maximize their profits, and assume the risk of being caught meanwhile. Most of the companies prefer to end their implication in the cartel after a period of 3-6 years. After

a collaboration of more than 8 years, the proportion of the participating undertakings from the total diminishes significantly.

When calculating the basic fine amount, a multiplier which reflects the duration of the cartel in months is assigned for each company by the Commission, and the initial fine is upgraded to a higher level following the simple rule: the higher the cartel duration, the higher the fine (C210/2006).

3.2.2. Sales

Another important factor, which influences the cartel detection and the fine size, is the percentage value of relevant sales. Not all the Prohibition Decisions include non-confidential information about the real revenues of the companies involved. Therefore, the study upon this indicator will be conducted on a sample of only 106 companies.

Table 2

Value of relevant sales per company (million €)

Sales (million €)	<10	10-50	50-100	100-200	>200	Total
No. of companies	19	41	23	12	11	106
% out of total	17.92	38.68	21.70	11.32	10.38	100.00

The impact that these companies have on the markets they sell their products is influenced by a series of factors such as: company size, cartel duration, geographic scope etc. and further analysis in this field needs to be done. Due to data availability restrictions, this section of analysis is limited.

3.2.3. Market shares

If the percentage of relevant sales is not available, the average market share can also be a powerful indicator of one firm's activity. Due to the confidentiality clause, only a sample size of 101 companies was subject to this analysis. For a cartel to be formed, several important players in one industry need to conduct secret agreements. Other companies, holding an average market share of 5-15 percentages join them, in order to have a combined market power of usually more than 50 percent. Most of the companies participating in cartels hold an average market share of 20-30%, followed by companies holding 10-20%, and companies holding 0-10%. There are fewer companies that hold a high average market share such as 30-40%, 40-50% or more than 50% because usually this kind of companies do not have any interest to enter in cartel agreements, because they already have enough market power. As for the leniency policy, in most of the cartel cases the companies which hold the highest market shares and are prone to the highest fine amount in case of being

sanctioned, find it for their utter benefit to cooperate with the Commission in order to decrease as much possible the final fine.

3.2.4. Models for the fine mechanism

Using Statistical software, two multiple regression models were developed. The regression output follows in the Appendixes. The first model has the cartel duration and the value relevant of sales as regressors and the fine as dependent variable. If we use the values from the model in the general formula, we get the following equation:

$$\textit{Estimated Fine = 8.4451 + 0.3034} \times \textit{duration + 0.1492} \times$$
$$\times \textit{value of relevant sales + } \varepsilon.$$

As we can see, the fine is linearly (or positively) depending on duration and on the value of relevant sales as well. This means that if the duration increases with 1 year, the fine will also increase with 0.0334 units, and if the value of relevant sales increases with 1 unit, the fine will also increase with 0.1492 units. There is a medium to high intensity correlation between the variables (R square = 0.5991), which means that 59.91% of the fine variation in the sample is explained by the regressors when we consider only the duration and the value of relevant sales as having a influence, all other factors being constant.

If we consider other factors' influence over the fine, the regressors explain only 59.14% (adjusted R Square) of the fine variation. The unexplained variations are represented by SS Residual (Sum of Squares Residual) which is 354682.3598 and represents the sum of all errors from the regression. Significance F probability is very close to 0, and in the same time smaller than 0.05 or even 0.01, which means that the computed probability to make a Type 1 error is very small. Therefore, the model is valid.

As for the inference of the sample to the population, the p-value for the duration is 0.00085, and the one for the value of relevant sales is also close to zero. Both values are lower than both 0.05 and 0.01, which means that we have enough sample evidence to support the hypothesis that there are at least two slopes significantly different than 0 for both confidence classes and significance levels. The normal distribution of residuals "chi-square" test (or Jacque – Bera statistics) shows that there is a small skewness to the left, so a slight tendency to small errors. Therefore, this assumption is being slightly violated. For the value of relevant sales line fit plot, we can observe a constant variance of errors along the line, hence, the model is homoskedastic and this assumption is not violated either. For the duration of the cartel line fit plot, we can see that the points are randomly scattered along the line, therefore, the model is heteroskedastic. As for the independence assumption, referring to the analysis of the relevant value of sales residual plot, the points are randomly scattered around 0, therefore, there is no correlation between the errors.

The second model has the cartel duration and the average market share as regressors and the fine as dependent variable. If we use the values from the model, we get the following equation:

$$Estimated\ Fine = 0.2108 + 0.2071 \times duration + 1.2772 \times$$
$$\times\ average\ market\ share + \varepsilon.$$

As we can see, the fine is linearly (or positively) depending on duration and on the average market share as well. This means that if the duration increases with 1 year, the fine will also increase with 0.2071 units, and if the average market share increases with 1%, the fine will also increase with 1.2772 units. The coefficient of linear correlation multiple R = 0.5025 shows that there is a medium intensity correlation between the variables. R square = 0.2525, which means that 25.25% of the fine variation in the sample is explained by the regressors when we consider only the duration and the average market share as having a influence, all other factors being constant, the model proved to be valid. Providing that the confidence intervals for the slope induced by duration variable: (0.0971755, 0.3170594) and (0.06158222, 0.35265268) do not comprise the value 0, we can state that in 95% of the cases and respectively in 99% of the cases, the additional fine for one additional percentage in the duration rate will not be 0. Because the confidence intervals for the slope of average market share: (0.65741629, 1.89712338), (0.45674111, 2.097798566) do not comprise the value 0, we can state that in 95% of the cases and respectively in 99% of the cases, the additional fine for one additional percentage in the average market share will not be 0. Therefore, inference can be made, and the slope exists.

The normal distribution of residuals "chi – square" test (Jacque – Bera) shows that there is a small skewness to the left, so a slight tendency to small errors. Therefore, this assumption is being slightly violated. This analysis refers to the normal probability plot graph included in the Appendixes. For the average market share line fit plot, we can observe a constant variance of errors along the line, hence, the model is homoskedastic and this assumption is not violated. The same thing can be observed for the cartel duration line fit plot. As for the independence assumption, referring to the analysis of the average market share residual plot, the points are randomly scattered around 0, therefore, there is no correlation between the errors. Other information used for this analysis is enclosed in the Appendixes section under the regression models along with the final output of the both regression models

3.2.5. Geographic scope

Around 16 percent of the companies had an influence only on the internal markets of one country, 70 percent affected several countries of the EEA or the entire EEA, and the rest affected even more countries. Because the structure of EEA changed in time, and its membership increased, the companies which had engaged in cartels after 2004 affected 28 countries, and the ones after 2007 affected 30 countries.

In some cases there were also other non-European markets affected, such as Japan on USA. Given the fact that the geographic scope comprises most of the times a very large number of countries or markets, gathering incriminating information becomes a daunting task for the members of the European Commission and the leniency policy proves to be very useful with regard to this matter. As for the fine mechanism, a simple regression analysis showed that the geographic scope has no significant influence in fine calculation (the model was not valid).

After taking into consideration the previously mentioned factors and conducting an individual analysis upon each case, the European Commission comes to a conclusion in what it may concern the basic fines allocated for each company participating in the infringement.

3.2.6. Deterrence factor analysis

Further on, this basic fine is adjusted according to the existence of some aggravating and mitigating factors. Situations such as recidivism, taking a lead position in the cartel, not cooperating with the European Commission, obstructing investigation or hiding relevant information may increase the basic fine up to even more than 100%. The fine can also be decreased by situations in which the firm had a limited role in the cartel or presented a conduct encouraged by legislation. The basic fine can also be decreased if the companies apply for the leniency clause, a reduction of 100% being granted for the first applicant (also named 'whistle blower'), up to 50% for the next, 20-30% for the third, and up to 20% for the others. Some companies prefer to also apply for the Settlement Notice and benefit from a reduction of 10% out of the basic fine. Hence, the Table 3 shows the conduct of the 352 companies analysed in the sample.

Table 3

Deterrence factor analysis (no. of companies)

Total	Aggra-vating circum.	Mitigating circum.	Settlement reduction	WB 1	WB 2	WB 3	WB 4	WB 5	WB 6	Leni-ency
352	70	84	28	58	50	32	13	11	2	166
%	19.89	23.86	7.95	16.48	14.20	9.09	3.69	3.13	0.57	47.16

One company can be influenced by both aggravating and mitigating circumstances, and benefit in the same time from the leniency policy and the settlement notice. There are also cases in which a company does not suffer any deterrence form the initial fine amount. Therefore, 47.16% of the companies involved in the study applied for leniency and had a correspondent decrease in the initial fine. Out of 57 cartels, 53 were discovered due to the leniency notice. There were 58 companies which had given first incriminating information (because in some cartels there were 2 companies which came first with evidence), and out of those cases, in 50

there was also a second whistle blower, in 32 cases a third one existed, in 13 cases even a forth one, and in 11 cases also a fifth one. As a percentage of the total, 19.89% of the companies had aggravating circumstances, 23.86% mitigating circumstances and 7.95% had a Settlement reduction.

In what it may concern the deterrence percentage from the initial fine caused by the aggregated influence of all the factors which had an impact in the computation of the final fine, Figure 3 depicts the evolution of fines for the 293 companies involved in this analysis (only for this number of companies the basic fine was also available).
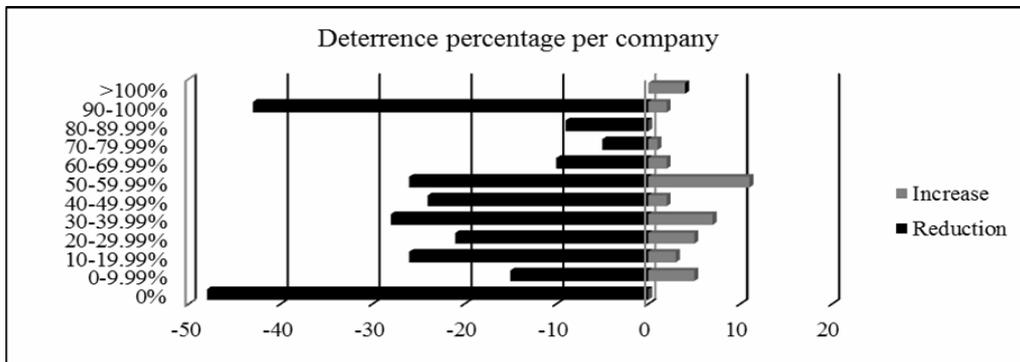

Figure 3. **Deterrence percentage per company**

Out of the total, 85.55% of the companies benefited from a reduction in fine, and the rest of 14.45% suffered an increase in the basic fine amount. These numbers show that the leniency policy had a significant impact upon the deterrence of imposed fines.

To a more in-depth analysis, we can observe that there were a large number of undertakings which were granted full immunity from fines (16.86%), but also on the other side, a large number of companies which were granted no reduction (18.82%). As for the increase, we can notice a peak at 50-59.99% (11 companies), followed by the 30-39.99% range (7 companies).

3.2.7. Final fine amount

After all these steps are being followed, the final fine is being calculated and its evolution as per Figure 4. As shown in Figure 4, the largest number of companies (22.72%) is sanctioned with an amount up to 5 million euro.
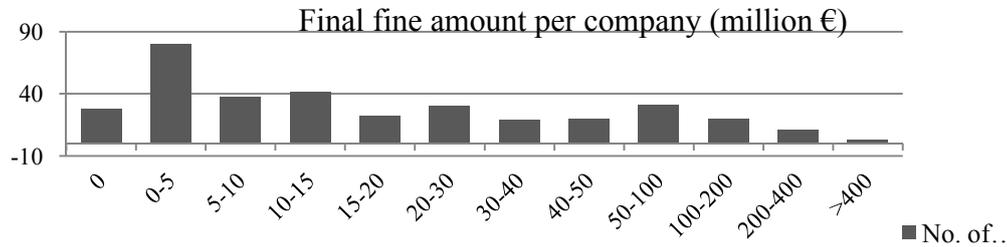
Figure 4. **Final fine amount per company – absolute value (unit measure- million €)**

There were also a considerably large percentage of 10.8% companies which were granted full immunity from fine. As the fine increases, we can observe that there are some fluctuations in the number of companies sanctioned. There is also a surprisingly large number of companies (9.65%) sanctioned with very large fines, which are over 100 million euro.

3.2.8. Worldwide turnover

Another factor influencing the final fine is the worldwide turnover. The Regulation 1/2003 establishes that fines may not exceed 10 percentage points out of the firm's annual aggregate worldwide turnover, and that they should be assigned with regard to the gravity and the length of the infringement (Motta and Langus, 2007). The reform of Regulation No. 1/2003 represents a major opportunity for the Commission to modernise its anti-cartel enforcement regime to substantially increase both its efficiency and deterrent effects (Riley, 2010).

The Prohibition Decisions included data for this analysis only for 256 companies. Therefore, all the further comments will refer to this sample size. Most of the companies (23.05%) have a worldwide turnover between 1000 and 5000 million euros, 21.88% have a turnover between 10000 and 50000, followed by companies earning between 100- 500 million euro revenue (14.45%) or less than 100 million (14.06%).

It is worth mentioning that companies which have very large worldwide turnovers are subject to a specific increase in fines, applied to the final purpose of diminishing the revenues made through the illegal agreements concluded. Figure 5 depicts the distribution of the worldwide turnover for each cluster of companies.
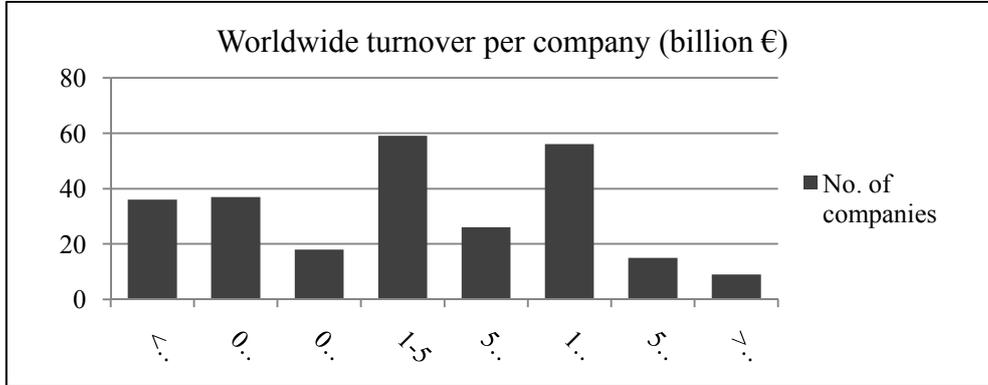
Figure 5. **Worldwide turnover per company – absolute values (billion €)**

3.2.9. Final fine as percentage of worldwide turnover

As previously mentioned, the imposed fine can go up to maximum 10% out of the worldwide turnover. Figure 6 presents the graphical distribution of fine as percentage of turnover. Due to the existence and applicability of leniency policy, 14.06% of the companies were exempted from fines, and a very high percentage of 53.12% were sanctioned with a minimum fine between 0 -1.99% of gained turnover. This is the indirect effect of a large number of applicants for immunity.

Figure 6. **Percentage of final fine out of worldwide turnover per company**

Considering the micro- level analysis, several conclusions can be drawn with respect to the behaviour of the companies participating in cartel agreements. First of all, the duration, the percentage of value of relevant sales and the average market share have the greatest influence in determining the fine. Two multiple regression analysis

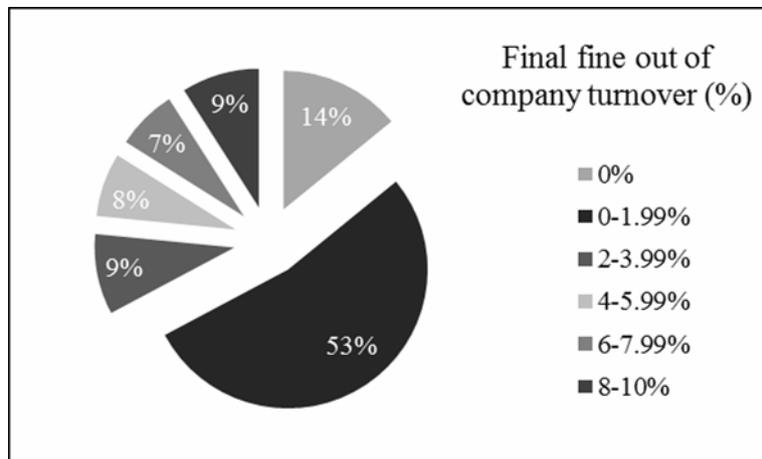conducted into this purpose had the output of valid models and confirmed this hypothesis. Secondly, there was a very large number of cartels which were detected due to the whistle blowers (92.9% of the cartels subject to this study). This shows that the Leniency Notice has been very effective so far. Next, due to a large number of leniency applicants (47.16% out of the 352 companies involved in the study), a high level of fine reductions were granted. Therefore, this policy has had a large impact upon the infringements and has also shortened the duration of several cartels. Finally, due to these mass reductions in sanctions, the percentage of fines out of the company's worldwide turnover has been concentrating around the segment 0-1.99%, which makes the impact of the sanction less harmful for the company.

3.3. Synthesis of analysis

This study was conducted on 47 cartels which had aggregated, available, non-confidential information published in the Prohibition Decisions starting with the year 2000.
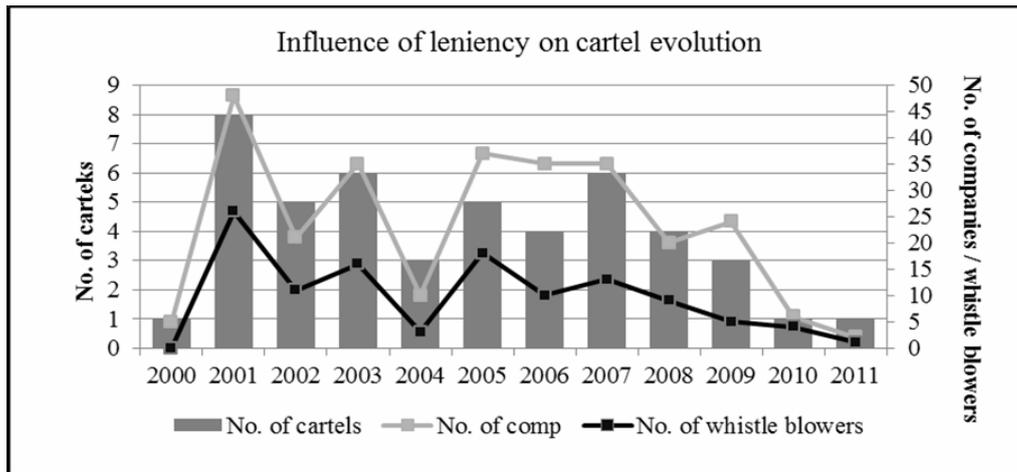
Figure 7. **Influence of leniency on cartel evolution**

As we can observe (Figure 7), for the evolution of cartels from 2000 to 2011, the largest number of sanctioned cartels occurred in 2001, followed by the years 2003 and 2007. The number of companies participating in illegal agreements peaked in 2001, and the largest number of whistle blowers was registered in 2005. As compared to the number of companies involved in a cartel per year, in 2010, 66.67% of the companies were WB, followed with the year 2001, when 54.17% of the companies applied for leniency, and the year 2002 (52.38% WB companies). As an absolute value, the highest difference between the companies involved and the number of whistle blowers were registered in the years 2006, 2007 and 2001. Out of these 47 cartels, in 91.48% of cases there was at least one whistle blower, which means that the

leniency notice was very frequently used. It is worth mentioning that because cartels are discovered after 8.23 years on average, a quite large time lag exists between the effects of the companies on the respective markets and their punishment. Nevertheless, the fines imposed are thoroughly calculated and are meant to discourage the firms to engage in another cartel afterwards.

Figure 8. **Fine evolution**

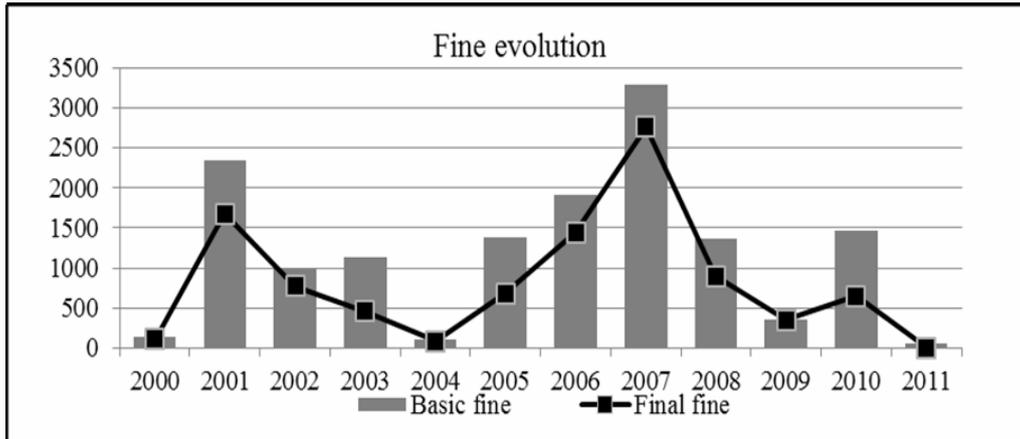Concerning the evolution of the aggregated fines over 11 years, Figure 8 shows two peaks, one registered in the year 2007 and one in 2001. The highest deterrence percentage from the initial fine was registered in the year 2011, followed by the years 2003 and 2010. As an absolute value the largest difference from the basic fine was registered in 2010, followed by the years 2005, 2003 and 2001. If we compare Figure 7 and 8, we can observe that the peaks of the fine evolution graph match the ones that occur in the other graph. This means that the leniency policy influenced directly the fine mechanism application. A positive correlation between these two can also be noticed.

In conclusion, during these last 11 years we can notice two major fluctuations in the influence of leniency on cartel evolution and respectively on the fine evolution. These reversed 'U' shaped curves occurred with a time lag of 3, and 6 years in between. This is a direct consequence of the evolution of cartel duration. In what it may concern the effectiveness of the leniency policy we can draw the conclusion that even though the number of whistle blowers per cartel followed a decreasing trend line, the policy has been applied in over 90% of the cartels subject to this study.

Other studies have also shown that with the Commission having limited resources and being unable to prevent collusion (Motta, 2007), the use of leniency programs improves welfare, by sharply increasing the probability of interrupting collusive practices and by shortening the investigation periods (Motta and Polo, 2003).

4. Qualitative analysis

This part presents a qualitative data analysis. Hence, a different classification of the companies involved in cartel agreements will be presented as a function of industry sectors, types of goods and services provided, and impact on established markets.

Taking into consideration the DG COMP sector classification for the sanctioned cases and the sample of 57 cartels previously analyzed, the industry sector classification comprises mainly services, manufacturing sector, and other sectors (5.26%). The largest percentage of goods (80.7%) belongs to the manufacturing sector. This sector comprises various raw materials such as thread, organic peroxide, citric acid and others; work in process goods such as chloroprene rubber or car glass, and finished goods as bathroom fittings, industrial bags, power transformers etc. These goods are produced at an economy of scales level, and are designed for mass consumption. In most of the cases the manufactured products are used for the production of various other goods, therefore, the impact of the cartel agreement is much more powerful. Compared to the goods industry, the service industry holds a small percentage of the concluded cartels (14.04%). Services refer mainly to the financial activities, auctions, transporting and storage activities.

With regard to the leniency policy, the cartels which have not applied for immunity are the ones concerning the 'French beer market', 'PO/Viandes Bovines Françaises', 'Österreichische Banken', 'PO/Amino acids', and 'Carglass'. As we can see, these cartels belong to the goods sector but also to the service sector ones. Given the high proportion of manufacturing companies concluding cartels, and the large number of leniency applicants, most of the companies benefitting from fine reductions belong to the manufacturing sector.

Before the entering into force of the leniency Notice, the companies had no incentive to stop the cartel agreement and engaged in this type of illegal activity for as long as possible (for example, the longest cartels lasted for almost 35 years). After 1996, many companies applied for immunity because the idea of benefitting from a fine reduction seemed and more profitable and involved fewer risks. The fine mechanism is not affected by the type of industry in which the company activates. Only the impact that the respective company/cartel had on the market is relevant. To measure this impact the percentage of relevant sales or the achieved market shares are taken into account, combined with the duration of the cartel.

To conclude, the Leniency Notice has been widely applied in various the economic sectors, but concentrated in the manufacturing one. Its effectiveness is reflected in the large number of immunity applicants and the rising percentage of detected cartels due to its enforcement.

5. Conclusions

The European Commission's activity is driven by the desire to assure for the entire European community the same competition environment. Its aim is to maximize the social welfare and minimize the occurrence of illegal agreements between firms. In order to achieve these goals, a set of common policies were established and implemented at European level. Concerning the illicit practices comprised in the framework of the competition policy, the behaviour of cartels during time was analysed in this paper.

The macro-level analysis showed that significant changes in the conduct of the companies participating in cartels have occurred after the entering into force of the Leniency Notice. The inside information given by the whistle blowers had considerable 'added value' for the DG COMP and brought to the surface a large number of cartels. Therefore, even though more companies engaged in this type of agreements, their detection rate increased enormously once the Leniency policy has entered into force and the overall amount of fines per year fluctuated as a consequence of the variation in the number of sanctioned cartels per year.

At micro level, the cartel duration, the value of relevant sales, and the market shares proved to be the main influencers of the fine. Concerning the geographic scope, the leniency policy proved to be very effective in collecting important pieces of information, which would have otherwise needed large amounts of resources allocated by the Commission to gather the necessary incriminating evidence. As for the deterrence analysis, around half of the companies involved in this study applied for leniency, and out of the total around 85 per cent of the companies benefited from a reduction of fine. This shows that the leniency policy influenced the fine mechanism directly and proportionally. Consequently, the percentage of fine out of the worldwide turnover concentrated around the lower limit, meaning between 0 and 2 per cent. This could be interpreted in two different ways. On one hand the impact created on the sanctioned companies will not be that harmful, and their economic activity will not be destabilized after paying the fine, but on the other hand not having to pay a higher fine, some undertaking have the strong tendency towards recidivism.

The qualitative analysis has shown that most of the undertakings engaging in cartels belong to the manufacturing sector, and consequently most of the whistle blower companies. Various industries were affected, but the elements that all had in common were: economy of scales production, mass consumption and international trade.

So far, the following trends and effects of this policy were noticed amongst the cartelist companies and the markets they had an impact on. First of all, the 'protection from punishment' effect also named the 'deviator amnesty' effect (De, 2010) was observed in the behavior of the cartelist companies. This refers to the fact that companies engaging in illicit agreements have been given the opportunity to benefit from immunity if they chose to end the cartel and report themselves and the other members. So, on one side, the whistle blowers have the financial incentives to stop the cartel after profiting as well from the period of the active cartel agreement.

The decision of reporting to the Commission comes down to the type of strategy the upper management of the involved undertakings is willing to apply (Dima, 2010). If the company is not risk averse, it will be willing to take the risk of being reported by another member of the cartel. But, one the other side, given the fact that at any moment one of the other members of the cartel could report the others, the leniency notice has a strong destabilizing effect on the duration of the cartels. And this study has shown that in more than 90 per cent of the already formed cartels there is at least one whistle blower. The conclusion, the leniency notice is widely applied, and around half the undertakings involved in cartels find the exemption from fine more attractive than taking the risk of being reported. This leads us to another effect, namely the 'cartel amnesty' effect (Motta and Polo, 2003), which suggests that the expected profit from collusion will actually increase due to the expected penalty reduction under the leniency program.

Despite that, the 'reporting as a threat' effect still occurs. This effect refers mainly to the fact that the whistle blowing company will also have other correlated benefits. Being competitors in the same industry, the companies sanctioned with a higher fine will encounter more difficulties in integrating back in the market after paying the fines. Not to mention that their brand image will be seriously affected by the fact that the company has engaged in the first place in an illegal agreement. In this scenario, rivalry amongst the cartelist companies is encouraged. As a conclusion from this effect, the leniency policy is highly effective in destroying the cartelist's confidence in maintaining the initial agreement intact.

Moreover, the size of the fine is a debatable aspect. The Council Regulation 1/2003 has set an upper limit of 10 per cent from the company's worldwide turnover. The main reason for that lays in the original motivation of the Commission to preserve the health of the competition environment. If a significantly higher fine had been applied, the sanctioned company could have encountered several difficulties in repositioning itself on the market. First of all, the payment of the fine diminishes the firm's cash deposits and affects its liquidity accordingly, and even leads to insolvency on the long run. Then higher unemployment rates may occur and the overall effect on the market will be a negative one.

Next, under imperfect financial markets with limited financial resources, the payments of the fines will reduce the firm's assets, and therefore the opportunities for further investments in R&D or product developments and innovation will be significantly reduced. Once again, this will create a negative effect on the society as a whole. Referring strictly to the length of the investigation procedures, the legal cost incurred by the company could also be a problem, because most of the times, substantial amounts of resources need to be allocated into this matter. Wrapping all up, there are many negative effects for a firm participating in cartel agreements, but once again, this type of agreements are illegal, so a company already knows the risks and the consequences of being caught. The positive effects of an effective leniency policy were also noticed at the EC's level. Due to an increasing detection rate caused by the enforcement of the leniency notice, the resources of the Commission canalized

towards the identification of cartel agreements and gathering the necessary incriminating evidence are significantly reduced. This improves the efficiency of DG COMP's overall activity and optimizes the existing legislative procedures.

All in one, before the leniency notice was enforced, companies had no financial incentive to stop the cartel. The risks were taken, and the longer the cartel lasted, the higher were the profits for each participating company, and the more destabilized was the competition environment in that industry. After 1996, a trend towards 'whistle-blowing' has begun to emerge. When comparing all the effects of this policy upon the cartelist companies, upon the activity of the Commission and on the created trade environment we can conclude that the leniency policy has been very effective so far. Nevertheless, future empirical work should comprehensively address the issue of leniency's effectiveness in order to obtain more clear results and be able to make further improvements to the existing studies.

Acknowledgements

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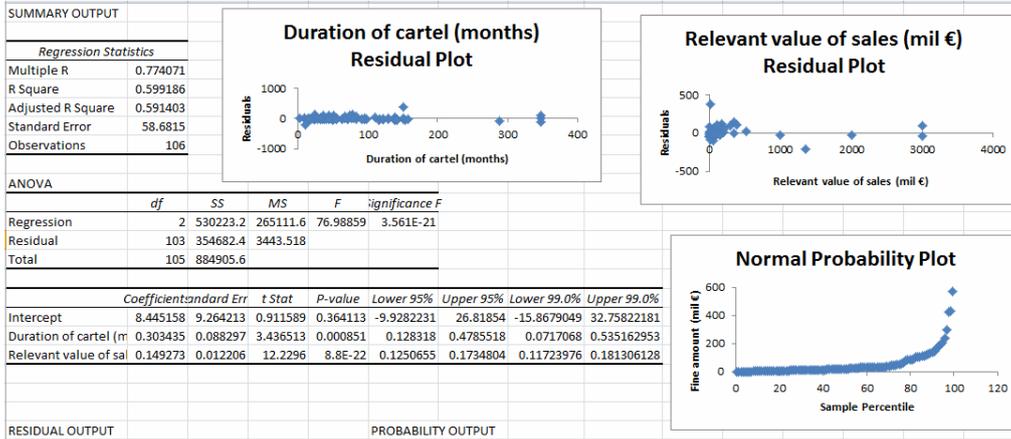Mitrut, C., and Serban, D. (2007), *Basic econometrics for business administration*, Editura ASE, Bucuresti

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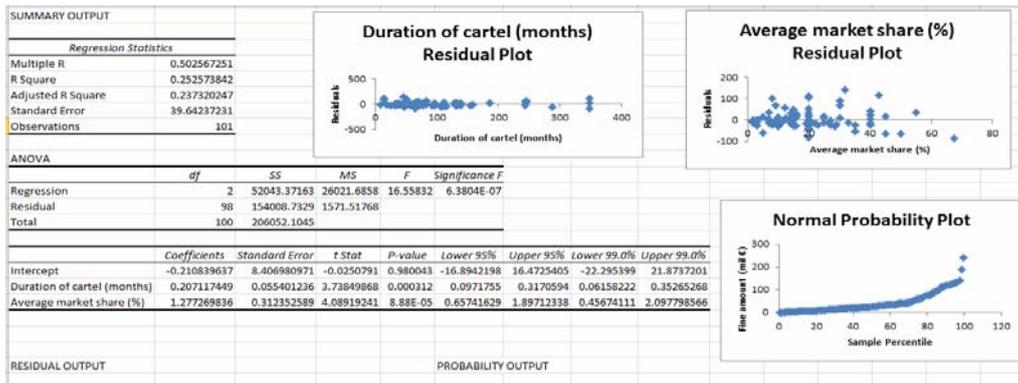
Appendix

Multiple regression: Model 1

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.774071							
R Square	0.599186							
Adjusted R Square	0.591403							
Standard Error	58.6815							
Observations	106							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	2	530223.2	265111.6	76.98859	3.561E-21			
Residual	103	354682.4	3443.518					
Total	105	884905.6						
	Coefficients	*Standard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 99.0%*	*Upper 99.0%*
Intercept	8.445158	9.264213	0.911589	0.364113	-9.9282231	26.81854	-15.8679049	32.75822181
Duration of cartel (m	0.303435	0.088297	3.436513	0.000851	0.128318	0.4785518	0.0717068	0.535162953
Relevant value of sal	0.149273	0.012206	12.2296	8.8E-22	0.1250655	0.1734804	0.11723976	0.181306128
RESIDUAL OUTPUT				PROBABILITY OUTPUT				

Multiple regression: Model 2

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.502567251							
R Square	0.252573842							
Adjusted R Square	0.237320247							
Standard Error	39.64237231							
Observations	101							
ANOVA								
	df	*SS*	*MS*	*F*	*Significance F*			
Regression	2	52043.37163	26021.6858	16.55832	6.3804E-07			
Residual	98	154008.7329	1571.51768					
Total	100	206052.1045						
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 99.0%*	*Upper 99.0%*
Intercept	-0.210839637	8.406980971	-0.0250791	0.980043	-16.8942198	16.4725405	-22.295399	21.8737201
Duration of cartel (months)	0.207117449	0.055401236	3.73849868	0.000312	0.0971755	0.3170594	0.06158222	0.35265268
Average market share (%)	1.277269836	0.312352589	4.08919241	8.88E-05	0.65741629	1.89712338	0.45674111	2.097798566
RESIDUAL OUTPUT				PROBABILITY OUTPUT				

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