



## The Role of Economics in Cartel Detection. A Review of Cartel Screens

Iuliana Zlatcu<sup>1</sup>, Marta-Christina Suciu<sup>2</sup>

<sup>1,2</sup>Bucharest University of Economic Studies, Romania

**Abstract.** In their desire to gain market share and profit, companies often resort to certain anti-competitive practices. Among them, it is well known that cartels are considered the most serious infringement of competition law. Cartels aim to increase their prices and profits at the expense of the consumers' welfare by avoiding the risks of competition and reducing the uncertainty in the market.

In order to uncover cartels, screens can be a useful tool for competition authorities, using them to support opening an investigation or to filter industries prone to anticompetitive behaviour for further investigation. Screens can also help authorities to estimate the duration of the infringement, by identifying the starting point and the ending of the respective practice.

This paper reviews the main screens identified in the empirical literature and also used by competition authorities in order to uncover firms' behaviours which are more likely to be consistent with collusion than with competition.

**Keywords:** competition, cartel detection, empirical screens.

**Classification JEL:** L41, D43, C40.

### 1. Introduction

Over the last decades, many cartels were uncovered and prosecuted by competition authorities, both at European and national level. It is well-known that cartels are prohibited by Article 101 of the Treaty of Functioning of the European Union and, in Romania, by Article 5 of the Romanian Competition Law no. 21/1996. Cartels are *per se* illegal and should be seriously sanctioned since they are, by their nature, harmful to consumers.

As cartels are the most serious infringement of competition law with the highest impact on the consumer's welfare, the importance of cartel detection significantly increased in the last years and competition authorities approached it by multiple ways: the leniency policy, complaints, the use of external information, promoting reward programs, working with procurement officials and other regulatory and enforcement agencies and, lastly, using empirical economic analysis and screens.

The main tools used by national competition authorities and the European Commission for cartel detection is the leniency policy, complaints and external information. Even reactive methods are



successful in many jurisdictions, especially leniency, many competition authorities have begun to look for alternatives in order to search for cartel agreements and economic analysis has become extremely important in cartel cases.

Frequently, the analysis of market data can differentiate between a collusive environment and a competitive one. Nevertheless, a suspicious behaviour on a market detected using economic analysis does not amount to smoking gun evidence, but to one which requires an in-depth investigation. It is thus essential to carry on further research in order to establish an actual violation of competition law. Therefore, economic analysis can be considered a complementary tool to the traditional tools of detecting cartels, namely leniency, complaints and external information.

The rest of the paper is structured as follows: the following section provides a review of the cartel detection methods used by competition authorities, highlighting the importance of economic analysis, while the third section focuses on describing screens based on economic data that can flag markets prone to anticompetitive behaviour or markets where potential cartel behaviour already occurred. The fourth section presents the limitations of cartel screens and the last section concludes.

## 2. Methods of cartel detection

Generally, cartel detection methods can be divided in two categories: reactive methods and proactive methods. While reactive methods are based on information provided to competition authorities by third parties, proactive methods refer to the situations when the competition authority engages in the detection activity on its own initiative. An overview of the different methods of cartel detection is presented in Figure 1.

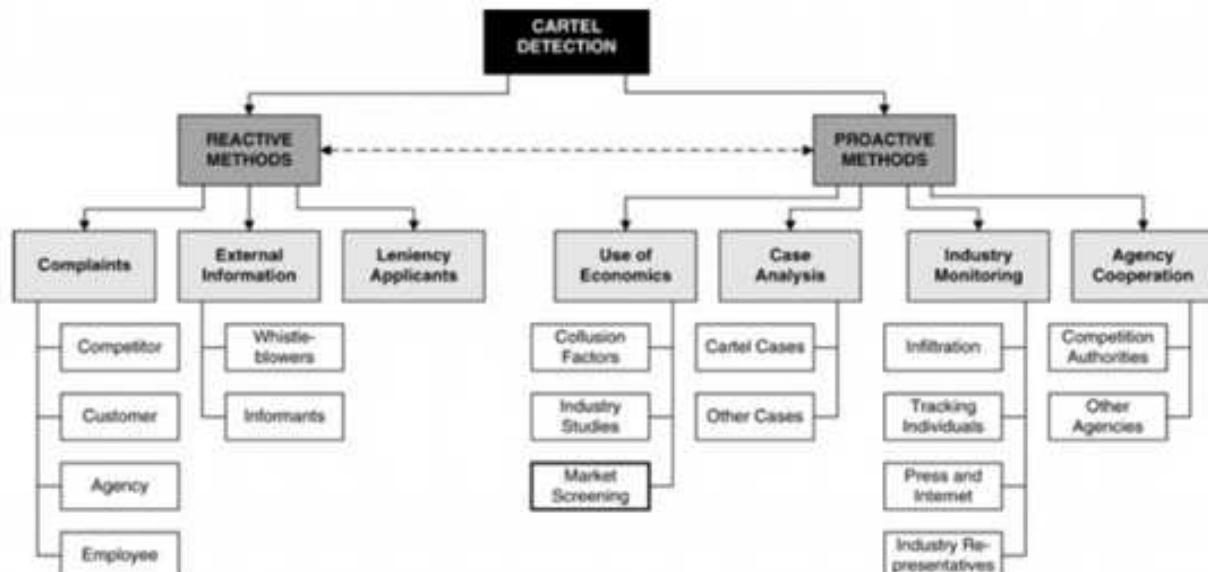


Figure 1. Methods of cartel detection

Source: Hüschelrath (2010).



As shown in Figure 1, reactive methods include leniency applications from cartel members, external information received from whistle-blowers or other informants and complaints which can be filed by competitors, customers, other agencies or current or former employees. On the contrary, proactive methods provide a variety of means for competition authorities to detect cartels. Cooperation with other competition authorities or other regulatory and enforcement agencies and the permanent supervision of some industries prone to collusion through infiltration or other means are among them. Furthermore, case analysis and other economic approaches such as industries studies and screening can significantly contribute and increase the detection of cartels.

Over the last years, economic analysis in general and screenings in particular have become increasingly important in cartel cases. Competition authorities and other agencies around the world have begun to use screens more and more to detect possible conspiracies and market manipulations.

Experience has shown that cartel screens helped overtime in uncovering hard-core cartels. One successful example where screens were implemented effectively is the case of the London Interbank Offered Rate (LIBOR). In 2008, the Wall Street Journal wrote an article regarding an alleged manipulation of the USD LIBOR by major international banks. Later in the same year, Abrantes-Metz et al. (2008) flagged the possibility of a LIBOR conspiracy and manipulation, through the application of a variety of screens showing that the rate volatility was very low over some periods compared with other similar rates and the banks' quotes were mostly uniform. In addition, the distribution of the second digits of the LIBOR over time was inconsistent with what is known as Benford's Law. These findings triggered subsequent investigations around the world which led to fines for several worldwide banks for manipulating the benchmark rate.

### 3. Economic analysis in cartel detection

In this section, a series of examples regarding the use of economic analysis in the activity of cartel detection is provided, especially regarding screens.

Cartel screens are classified in the literature in two different categories (Harrington, 2008): structural and behavioural. Structural screening aims to identify markets that are prone to cartel behaviour, while behavioural screening identifies a potential cartel behaviour that already occurred on a certain market. In order to ensure valuable results, structural and behavioural screening should be used in a complementary way: the first step is the structural screening which serves to identify markets and industries where it is more likely that a secret agreement occurs, so that competition authorities further proceed with behavioural screening of suspicious markets, which involves more data, resources and which usually has a higher degree of complexity.



### 3.1. Structural screens

The purpose of structural screening is to identify markets where anticompetitive behaviour is more likely to appear. In other words, there are markets whose conditions can lead to or facilitate anticompetitive behaviour and therefore deserve additional attention. Structural screens are based on a variety of market information such as number of firms, entry barriers, interaction between firms, demand volatility, market transparency etc., which can indicate markets where collusion is more likely to occur. Economic research has found that cartels are likely to occur in the presence of certain market conditions. These conditions may be structural, supply-related or demand-related (OECD, 2013). Among structural conditions, the small number of competitors, the high entry barriers, frequent interaction between firms and market transparency may facilitate collusion. Demand-related conditions include stable demand, low demand elasticity and buying power. Regarding the supply-related conditions, these ones may be represented by product homogeneity, limited innovation, cost symmetry, structural links, multi-market contacts, as well as frequent contractual relationships between competitors.

An example of structural approach was developed in the United Kingdom. In a report prepared for the UK Office of Fair Trading, Grout & Sonderegger (2005) investigated the structural factors that facilitate the formation of cartels based on both theoretic literature and past evidence from EC and US cartel cases. Moreover, the authors used this analysis in order to predict, the probability of a cartel existence for a large number of sectors using econometric techniques, such as logit model, ordered logit model and OLS model. According to their study, the industries in the UK with high estimated probability of cartel detection, among others, are telecommunications, manufacture of motor vehicles, manufacture of basic chemicals, manufacture of cement, lime and plaster and activities of travel agencies and tour operators.

Another example of structural approach arises from the Netherlands Competition Authority. The authority developed in 2011 an instrument named the Competition Index whose aim is to detect industries that are prone to anticompetitive behaviour. According to Petit (2012), the proposed screening is based on nine economic indicators considered to suggest the probability of an anticompetitive behaviour, which can be divided into four categories: (i) the degree of organization: number of trade association; (ii) prices: prices in Netherlands versus in European Union; (iii) concentration: Herfindal Hirschman Index, number of firms and import rate and (iv) dynamics: market growth, churn rate, survival rate and research & development rate. The competition authority applied this analysis on the entire Dutch economy, which is divided into 500 industries.

In Romania, the Competition Council developed in 2013 a tool in order to measure the orientation of the industries in the national economy towards competition, indicating a degree of closeness to an ideal situation of competition. The Aggregate Index of Competitive Pressure relies on 20 primary indicators, divided in four categories of importance. Each of the 20 indicators are measured through a seven point scale, where the lower value of the scale indicates the less



favourable situation for competition and the highest value of the scale indicates the most favourable situation for competition. The main indicators included in the Aggregate Index by the Romanian Competition Authority are the following: lack of barriers to entry, number of active undertakings, concentration degree, innovation degree, transparency degree, the price elasticity, the product homogeneity, the existence and impact of business associations, the market share symmetry, the existence of structural connections between competitors. Several industries in the national economy have been assessed annually since 2013 by the competition authority. The Romanian industries most prone to anticompetitive behaviour are, according to the last Romanian Competition Council analysis in 2016, production and sale of cement, notary services, banking services associated with debit cards, production of natural gas and railway passenger transportation.

### **3.2. Behavioural screens**

In the literature, behavioural screening is defined as “the process of flagging unlawful behaviour through economic and statistical tests” (Abrantes-Metz, 2013, p. 2) or “a process whereby industries are identified for which the existence of a cartel is likely” (Harrington, 2006, p.2). Usually, detection screens are based on a theory of an alleged illegal behaviour and use market data such as prices, costs, margins, quantities or market shares, aiming to differentiate between a collusive environment and a competitive one.

Several behavioural screens were identified in the economic literature as able to search for collusive patterns, often called markers. Moreover, competition authorities have used screens as a tool for detecting collusion and in some cases screening efforts increased in the last years.

#### **3.2.1 Markers based on prices**

The first marker which can suggest the existence of a cartel behaviour is the price level. If a cartel is effective, it is likely to have an effect on prices. Therefore, a higher average price may be indicative of collusive behaviour, especially when the price increase does not appear to be explainable by an increased cost.

Various methods are available in order to quantify the effect of the cartel on prices. A method widely used among economists is to compare prices during the cartel period with prices outside this period or to compare prices in the cartelized market with prices on a different but similar geographic market. Comparison with other products can be done as well, as long as the products belong to a similar market and are not under investigation. However, in these cases, it is assumed that nothing but the cartel affected price, this assumption being a restrictive one. In order to solve this problem, the “differences-in-differences” method may be implemented. This methodology consists of comparing two groups of individuals: the “treatment group” and the “control group” with the purpose of comparing the price evolution of the products affected by the cartel, defined as the “treatment group” during and outside the alleged cartel period with the price evolution of similar products not affected by the anti-competitive behaviour in question, namely the “control group”. The hypothesis of this methodology is that the price evolution of products belonging to the “control



group" over time coincides with the price evolution of the products belonging to the "treatment group" in the absence of coordination. In other words, it is assumed that all the factors that affect the "treatment group" similarly affect the "control group". Thus, it is computed the difference of the "treatment group" prices during and outside the cartel period and the difference of the "control group" prices for the two periods, followed by a difference of those differences. The importance of this analysis lies in its ability to better control the effect of factors that can influence the price over time (the effect of eventual cost changes, demand, macroeconomic conditions, market characteristics) while eliminating them. Alongside comparator-based methods, the "but for" price can be estimated using a regression analysis. In this case, the econometric model should be set up so to consider the most significant factors determining supply and demand conditions.

In order to show the effect of a cartel on prices, Figure 2 illustrates the lysine prices during the global lysine cartel of 1992-1995 for the United States and European Union, along with lysine cost for the same period.

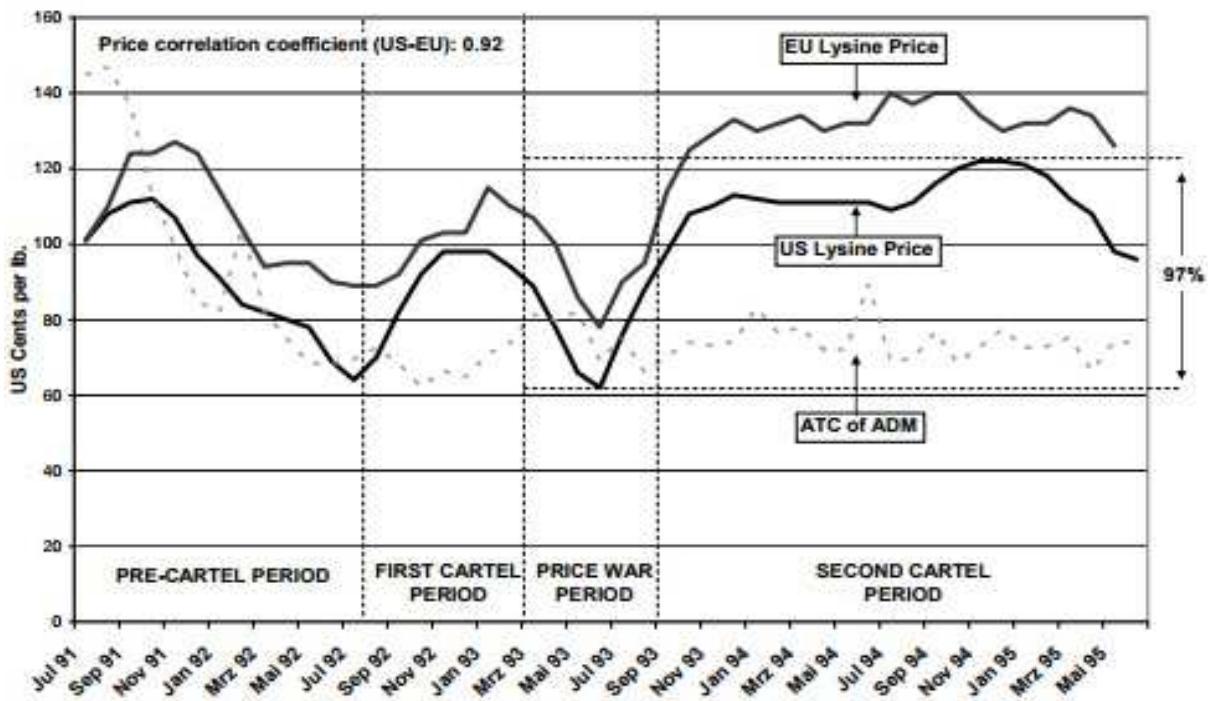


Fig 2. Average monthly lysine prices in the United States and the European Union between July 1991 and June 1995, along with lysine cost

Source: Connor (2002).

Another marker indicating collusion is represented by prices that are strongly correlated across firms. Even though firms may charge the same price in a competitive environment as well, greater



suspicions may appear when uniformity applies also in closely related neighbouring markets. For instance, in an industrial and medical gases cartel in the Netherlands prosecuted by the European Commission, the cartel members agreed not only a common price for gas but also transportation costs and a common rate for renting a gas cylinder.

Abrupt changes in price that cannot be explained by demand or cost evolution also may raise suspicions regarding possible cartel behaviour. Green and Porter (1984) consider that periodic sharp price drops might indicate collusion, based on the assumption that sharp drops followed by sharply rises might reflect the instability of a cartel agreement.

### 3.2.2 Markers based on variance

A lower price variance may also indicate collusion. Low price variability and insensitivity to cost generally appear in the presence of a cartel for a number of reasons. For example, frequent price changes are costly and would make deviations from the agreement harder to detect.

There is evidence that variance screen could help competition authorities in their efforts to detect cartels. This approach of testing for lower volatility is conducted in Abrantes-Metz et al. (2006). In this paper, authors assess the price evolution over time around the collapse of a bid rigging cartel prosecuted by the Antitrust Division of the US Department of Justice in the sale of frozen seafood to military installations and find that following the cartel period the mean price decreased by 16% while the standard deviation of price increased by 263%. As shown in Figure 3, the frozen perch prices significantly decreased when the competition authority triggered the investigation and, thereafter, the price begin to change in the same way as the cost, having a greater volatility. A similar approach is taken in Esposito and Ferrero (2006) where a variance screen was applied on two Italian cartel cases from two different sectors, namely the motor fuel market and the personal care and baby food products market. In both cases, the authors reach the conclusion that the price variance screen would successfully have detected these two cartels before the competition authority's findings. Bolotova, Connor and Miller (2008) use ARCH and GARCH models in order to assess the impact of two cartels on prices and variance in the pre, post and cartel periods. Authors find that lysine price increased by more than 25 cents per pound and its variance decreased during the cartel period relative to non-cartel periods and, regarding the citric acid, its price increased by approximately 9 cents per pound compared to the pre-cartel and post-cartel periods, but found increased variance in the price of citric acid during the cartel period.

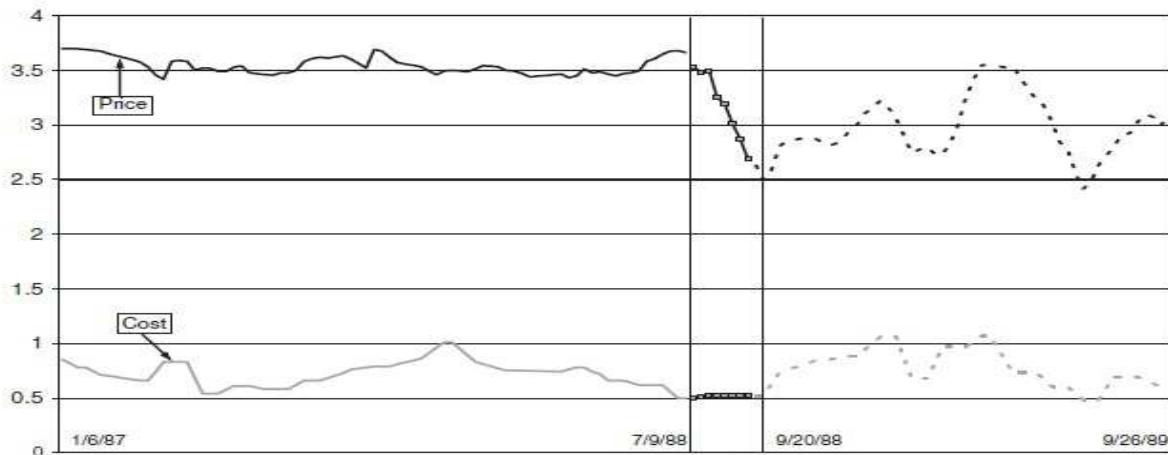


Fig. 3. Frozen perch prices and cost: Jan. 6, 1987- Sept. 26, 1989

Source: Abrantes-Metz et al. (2006).

### 3.2.3 Markers based on market-share

Market shares highly stable over time also serve to identify collusion. Stable market shares may result from agreements to share geographic markets or customers. Moreover, cartel members may agree to freeze market shares at their pre-cartel levels, resulting in stable market share for the future period. There are several examples of previous uncovered cartels where market shares were frozen at the pre-cartel level, including the cartel for copper plumbing tubes, the cartel for organic peroxides cartel and the cartel for vitamins A and E and folic acid.

### 3.2.4 Markers for bid rigging conspiracies

As public procurement accounts, on average, for 15% of the global GDP and is generally awarded through competitive bidding procedures, a number of empirical studies have analysed collusive behaviour in public procurement. Likewise, competition authorities pay close attention to this sector and are increasingly involved in detection efforts and also in advocacy in order to augment awareness of bid rigging risks.

Empirical literature and competition authorities have identified overtime several screens to assess markets and identify behaviour that may indicate collusion in public procurement. Naturally, in a tender process, firms should act independently and their bids should properly reflect their costs in the competitive market. Hence, a useful tool for competition authorities is looking for improbable events in bid auctions, such as identical bids, high correlation between bids or unexpected and significant differences between winning and losing bids.

To the same effect, OECD issued fighting bid rigging guidelines providing a list of collusive markers that may be used in order to detect big rigging cartels. According to OECD (2009), there are



signs and patterns that can indicate the possibility of a bid rigging, such as when the same firm is often the lowest bidder, when some suppliers unexpectedly withdraw from bidding, when certain firms always submit bids without winning once, when the winning bidder repeatedly subcontracts work to unsuccessful bidders or when the winner does not accept the contract and is later found to be a subcontractor. As for the same document, there are also price patterns that can help uncover collusion. Identical pricing, sudden elimination of anticipated discounts, increases in price that cannot be explained by cost increases, large differences between the price of the winning bid and other bids or large differences between two bids of the same supplier for two similar contracts are among the behaviour patterns that might suggest that firms are coordinating their behaviour in bid auctions.

#### 4. Limitations of cartel screens

In the following, limitations of empirical screens are discussed. It is important to bear in mind that the effective implementation of a cartel screening depends to the extent to which the screening is properly developed and applied.

First, the quality of data sets is fundamental in cartel screening. Poor quality data cannot lead to a successful detection activity. For this reason, access and quality of data should be taken into consideration when deciding whether to implement such actions.

Second, cartels are difficult to detect because they can take many forms and the industries may significantly differ one from another. There is no “one size fits all” model for cartel detection. The empirical model should always be tailored according to the alleged form of the cartel, whether it is price fixing, market allocation, bid rigging etc. Moreover, economists should consider all relevant variables and specifications for the case at hand when designing an econometric model.

Finally, screens may lead to both false negatives and false positives. In other words, they may fail to detect cartels or may incorrectly identify some markets or behaviours that are not anticompetitive. Hence, it is clear that evidence resulting from economic screening is not sufficient to prove guilt, requiring an in-depth investigation in order to establish an actual violation of competition law. Nevertheless, an empirical screening which indicates collusion on a certain market is typically enough for a competition authority to trigger an investigation.

#### 5. Conclusions

An effective anti-cartel enforcement policy should represent a priority for competition authorities around the world. The leniency, the use of complaints and external information, working with procurement officials or rewarding whistle-blowers are effective methods used in cartel detection, but competition authorities should become more proactive and aggressive in their cartel detection in order to deter cartel formation.

The use of screens to flag possible cartel behaviour is a beneficial tool, supporting competition authorities in opening an investigation or in filtering industries prone to anticompetitive behaviour for further investigation.



Although leniency policy is very efficient in detecting cartels, proactive methods are necessary especially in order to uncover cartels whose members have no reason to apply for leniency. In addition, small economies still have limited experience with leniency programs. By developing and implementing proactive economic methods of cartel detection, the cartel activity may be less tempting for undertakings. Moreover, proactive methods may produce positive externalities to the reactive methods, improving their efficiency.

Even screening for cartels may be difficult and have some limitations; further research shall be made in order to become a powerful tool for competition authorities and to play a higher role in competition enforcement.

## 6. References

- [1] R.M. Abrantes-Metz. Roundtable on Ex Officio Cartel Investigations and the use of screens to detect cartels. October 21, 2013. Available at SSRN: <https://ssrn.com/abstract=2343465>.
- [2] R.M. Abrantes-Metz and P. Bajari. Screens for conspiracies and their multiple applications. In Antitrust, 24 (1), 2009, pp. 66-71.
- [3] R.M. Abrantes-Metz, M. Kraten, M. Albert & G. Seow. LIBOR Manipulation?.Working Paper 2008, available at [http://papers.ssrn.com/sol3/cf\\_dev/AbsByAuth.cfm?per\\_id=339863](http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=339863).
- [4] R.M. Abrantes-Metz, L.M. Froeb, J. Geweke and C.T. Taylor. A Variance Screen for Collusion. In International Journal of Industrial Organization, 2006, Volume 24, pp. 467- 486.
- [5] Y. Bolotova, J. M. Connor and D. J. Miller. The Impact of Collusion on Price Behavior: Empirical Results from Two Recent Cases. In International Journal of Industrial Organization, 2008, 26, pp. 1290-1307.
- [6] J. Connor. Global Cartel Redux: The Amino Acid Lysine Antitrust Litigation (1996). Working Paper. 2002.Purdue University, West Lafayette.
- [7] F. Esposito, M. Ferrero. Variance screens for detecting collusion: an application to two cartel cases in Italy. Italian Competition Authority, Working Paper, 2006.
- [8] E.J. Green and R.H. Porter. Non Cooperative Collusion under Imperfect Price Information. In Econometrica, Vol 52, 1, January 1984.
- [9] P.A. Grout and S. Sonderegger. Predicting Cartels. Office of Fair Trading, Economic discussion paper 773, 2005.
- [10] J.E. Harrington. Detecting Cartels. In Handbook of Antitrust Economics, P. Buccirossi Editor, 2008.
- [11] J.E. Harrington. Behavioral screening and the detection of cartels. In European Competition Law Annual 2006. Enforcement of Prohibition of Cartels, Hart Publishing, 2006.
- [12] K. Hüschelrath. How Are Cartels Detected? The Increasing Use of Proactive Methods to Establish Antitrust Infringements. In Journal of European Competition Law & Practice, 2010, Vol. 1, No. 6.
- [13] R. Paun and P. Prisecaru. An Economic Instrument to Evaluate the (Pro) Competitive Nature of Industries: The Aggregate Index of Competitive Pressure. Romanian Competition Journal, December 2013.
- [14] L. Petit. The Economic Detection Instruments of the Netherlands Competition Authority: The Competition



(online) = ISSN 2285 – 3642  
ISSN-L = 2285 – 3642  
*Journal of Economic Development, Environment and People*  
Volume 6, Issue 3, 2017

URL: <http://jedep.spiruharet.ro>  
e-mail: [office\\_jedep@spiruharet.ro](mailto:office_jedep@spiruharet.ro)

Index. NMaWorking Papers, January 2012.

[15] Romanian Competition Council. Competition developments in key sectors. Bucharest, 2016.

[16] OECD. Ex officio cartel investigations and the use of screens to detect cartels. 2013, available online at <http://www.oecd.org/daf/competition/exofficio-cartel-investigation-2013.pdf>.

[17] OECD. Guidelines for fighting big rigging in public procurement.2009.