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I. INTRODUCTION

These days, the fight against hard-core cartels is ranked high on the agenda of many competition authorities around the world. The recent efforts of, e.g., the European Commission, are not only reflected in policy reforms such as new fining guidelines and the introduction of leniency programs but have already materialized in the form of an improved cartel enforcement record.[2]

From an economic perspective, the fight against hard-core cartels is justified by the clearly negative welfare implications of such "agreements among competitors." In addition to allocative and productive inefficiencies, hard-core cartels typically also cause dynamic inefficiencies thereby harming customers and consumers in several dimensions.

This substantial harm caused by hard-core cartels—together with the absence of any benefit of such agreements—support the classification of hard-core cartels as "*per-se* violations" in most antitrust laws around the world. As a consequence, competition authorities have two key tasks: first, deter the formation of new cartels; and second, detect, verify, and prosecute existing infringements.

Against this background, this article focuses on answers to the following two key questions: (1) What are the general options competition authorities can use to detect cartels? and (2) What specific roles do screening tools that can proactively detect cartels play for competition authorities?

II. AN OVERVIEW OF CARTEL DETECTION METHODS[3]

It has long been recognized that competition authorities can make use of various methods to detect hard-core cartels.[4] Generally, these methods can be separated into reactive methods

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[2] *See* European Commission, *Cartel Statistics* (2011), *available at* http://ec.europa.eu/competition/cartels/statistics/statistics.pdf.

[3] This section largely follows K. Hüschelrath, *How Are Cartels Detected?, The Increasing Use of Proactive Methods to Establish Antitrust Infringements,* 1(6) J. EUR. COMPETITION LAW & PRACTICE, pp. 522-528 (2010).

[4] A hard-core cartel is typically defined as "… a group of firms who have agreed explicitly among themselves to coordinate their activities in order to raise market price – that is, they have entered into some form of price fixing agreement" (L. PEPALL, D. RICHARDS, & G. NORMAN, INDUSTRIAL ORGANIZATION: CONTEMPORARY THEORY AND PRACTICE, p. 345 (1999). The types of agreement that typically lead to such an increase in market price include not only price-fixing agreements in the literal sense but also bid-rigging, output restrictions and quotas, allocation of

and proactive methods. According to the International Competition Network ("ICN"),[5] important reactive methods are complaints (filed by competitors, customers, other agencies, or current or former employees of the respective companies), other external information (through either whistle-blowers or informants), and leniency applicants.

Complementary to these reactive methods, several proactive methods can be applied to detect cartels. The explicit use of economics, for instance, can play a role in the form of a study of collusion factors across industries, the conduct of market/industry studies, or the implementation of screening approaches as discussed below. Additionally, a competition authority can derive useful information on existing cartels by analyzing past cartel or other competition cases. Furthermore, the constant monitoring of industries through career tracking of industry managers, press, and internet monitoring, as well as regular contact with industry representatives, promises to increase the probability of detecting cartels.

In terms of the relative importance of reactive and proactive methods to detect cartels, evidence is rare. Following ICN,[6] complaints still play the dominant role; however, leniency applications are becoming more important. Although detailed statistics are unavailable, proactive methods generally seem to play a relatively small role compared to reactive methods. However, as shown in the following section, there are signs that proactive methods are increasingly being applied to further increase the probability of cartel detection.[7]

III. ADOPTION OF SCREENING TOOLS BY COMPETITION AUTHORITIES

Using screening tools is a particular proactive approach to detecting cartels. According to Harrington (2006),[8] "[*s*]*creening* refers to a process whereby industries are identified for which the existence of a cartel is likely." This likelihood serves as indicator whether a specific industry should receive further scrutiny. This first step of an investigation is followed by the *verification stage*, which aims at probabilistically distinguishing collusion from competition (e.g., through demand and cost controls). Finally, at the *prosecution stage*, sufficient evidence is collected to bring the respective case to court. In the remainder of this article, we largely follow Harrington's delineation and understand screening as a methodology for the identification of candidates (i.e., industries or markets) for further investigation. We divide existing screening tools into the following two subgroups:

- *Cross-industry tools* that aim at ranking several industries or branches by the likelihood of cartelization; and

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customers, suppliers, territories, and lines of commerce. When using the term "cartel" in the remainder of this article, we always refer to "hard-core cartels."

[5] ICN, *Anti-Cartel Enforcement Manual – Cartel Working Group – Subgroup 2: Enforcement Techniques* (2010), p. 7.

[6] *Id.* at 10

[7] Furthermore, at the Annual Conference of the International Competition Network in Istanbul in April 2010, representatives from the competition authorities in Hungary, Ireland, Japan, and Turkey presented their ideas to proactively detect hard-core cartels. *See* J. Sarai, *Pro-Active Cartel Detection: A Hungarian Example* (2010) Presentation, 9th Annual Conference of the International Competition Network, Istanbul; C. Galbreath, *Cartel Detection in Ireland* (2010) Presentation, 9th Annual Conference of the International Competition Network, Istanbul; K. Yabuki, *Proactive Cartel Detection from NGAs Viewpoint* (2010) Presentation, 9th Annual Conference of the International Competition Network, Istanbul; K. Ünlüsoy, *Proactive Cartel Detection in Turkey* (2010) Presentation, 9th Annual Conference of the International Competition Network, Istanbul.

[8] J. Harrington, *Behavioral Screening and the Detection of Cartels*, EUIRSCAS/EU Competition Working Paper, Florence (2006).

- *Market-based tools* that aim at identifying cartelization in a particular market.

In the following, we provide examples of the adoption of such screening tools by several competition authorities around the world. We base our assessments on the recent literature, authorities' web pages, and informal communication with representatives from several competition authorities.

A. Adoption Of Cross-Industry Screening Tools

Several countries have undertaken significant research in the area of cross-industry screening tools and partly also implemented such tools. In the following, we review the experiences of the Netherlands, the United Kingdom, and the United States.

1. The Netherlands

Until the introduction of a new competition law in 1998, the Netherlands was known as a "cartel paradise." Following a transition period from 1998 to 2004, cartels are now prohibited and prosecuted with the same standards as in most other European countries. The first serious screening attempts of the Dutch competition authority—the NMa—date back to 2006 when, on the one hand, this topic gained attention in both academia and practice and, on the other hand, initial positive experiences with the detection of a shrimp cartel suggested the significant detection potential of such tools.

In 2008, Buijs & Vermeulen[9] published an NMa working paper proposing a two-step screening methodology. The first step follows a top-down approach and ranks NACE-classified industries with respect to their risk of collusion. The risk is determined by nine structural indicators which are allocated to one of the following four groups: 1) concentration (measured as number of firms in an industry, the HHI, and the share of imports on the net turnover); 2) market dynamics (measured as average market growth, churn, survival ratio, and the share of R&D on gross value added); 3) price index in the Netherlands (in proportion to the weighted EU-15 mean); and 4) organization of the industry (measured by the number of trade associations in the analyzed industry). The indicators are then standardized, and then followed by the calculation of a risk of collusion through a predefined weighting scheme. In practice, the rank list is computed on a yearly basis and the 20 top-ranked sectors receive further scrutiny.[10] The second step of the methodology is industry-focused and basically employs behavioral screens on price, quantity, and market shares. This step also aims at using the Boone indicator to assess the dynamics of competition intensity.

Although this initial NMa approach is a full-fledged screening tool, its practical implementation revealed several key challenges. While the execution of the second stage was often foreclosed due to a lack of adequate data, the first stage faced several methodological weaknesses. First, top-down approaches are typically implemented by using industrial classifications; however, these classifications typically do not have much in common with antitrust markets (which focus on the substitutability of goods and services). Second, the

[9] M. Buijs & T. Vermeulen, *Detectie van Mededingingsbeperkend Gedrag. Onderzoeksrapport Economische Detectiemethoden*, NMa working papers (2008).

[10] This approach was also published to a broader audience in M. Buijs, *Economische Detectie Door de NMa*, ESB 94 (4566), (2009), p. 49, http://esbonline.sdu.nl/esb/images/493buijs_tcm445-523774.pdf.

outcomes of top-down approaches rely heavily on the chosen normalization and weighting scheme of the indicators.

Furthermore, as argued by van der Noll (2009),[11] the separation effect of the first stage might not be particularly good due to an aggregation leaving a significant number of cartels undetected [12] while, on the other hand, leading to fruitless investigations of industries. Furthermore, screening tools often struggle to differentiate between tacit collusion—which is typically not prohibited by competition laws—and overt collusion, thereby possibly leading to further fruitless investigations.

In 2011, a revised version of the screening methodology was presented to the public. The first step of the screening tool—which is now called the Competition Index ("CI")—is part of a broader Economic Empirical Detection Instrument ("EEDI").[13] This version clarified that the EEDI will serve as a complement for reactive detection methods such as leniency and whistle-blowing in order to maximize competition enforcement. The CI relies on the same type of indicators as the former approach; however, it aims to use more detailed data. Furthermore, the revised version tries to address several problems identified above, such as market definition and weighting issues. For example, in order to document the insensitivity of the CI to the weighting scheme, on the one hand, several different weightings were applied. On the other hand, the results of the CI were tested with detected cartels in other countries ("practical test"), which revealed a high overlap. Additionally, a statistical comparison of the CI with other measures of competition, such as the price-cost margin or the Boone indicator ("theoretical test") was conducted, resulting in signs of a weak but significant correlation.

2. United Kingdom

The U.K. Office of Fair Trading ("OFT") commissioned several projects to gain knowledge regarding the possible uses of economic analysis in competition law enforcement. Following a more general study[14] in 2004 on the derivation and use of possible indicators for the identification of market problems, Grout & Sonderegger [15] developed a detailed methodology which aimed to predict cartels by using a standard industrial classification. In contrast to Buijs & Vermeulen (2008), Grout & Sonderegger applied several econometric models in order to estimate the influence of market structural factors on the presence and frequency of detected cartels. Subsequently, they used the respective estimation results to predict the likelihood of a cartel presence in all industries. In particular, they identified telecommunications, manufacture of aircraft and spacecraft, and manufacture of grain mill products, starches, and starch products as industries especially prone to collusion.

A key problem of the methodology of Grout and Sonderegger is—as was true in the case of the NMa approach above—their reliance on industrial classifications. This problem becomes

[11] R. van der Noll & M. Visser, *De NMA als Economische Detective*, 5 MARKT & MEDEDINGING, (2009).

[12] The screen uses only data on the national level, while cartels in some industries may be regional or even local; for some industries data is missing.

[13] L. van Sinderen & L. Petit, *Detectie van Concurrentiegebrek in 2011*, ESB 96(4604), (2011), http://esbonline.sdu.nl/esb/images/118vansinderen_tcm445-595660.pdf

[14] NERA, *Empirical Indicators for Market Investigations*, London, (2004), http://www.oft.gov.uk/shared_oft/reports/comp_policy/oft749a.pdf.

[15] P. Grout & S. Sonderegger, *Predicting Cartels*, Economic Discussion Paper, Office of Fair Trading, London (2005).

apparent in the identification of the telecommunication industry, which cannot be considered a homogenous industry (e.g., given the differences in fixed and mobile telephony alone), nor does it have a particular history of or affinity for cartelization. Another problem of the approach is the implicit assumption that detected cartels behave similarly to undetected cartels. Commentators challenge this assumption as it could be the case that special industry factors lead to the detection of a cartel while, in other industries, circumstances favor the survival (or at least the non-disclosure) of a cartel ("endogeneity of cartel detection").

In the aftermath of these first investigations of the potential of screening approaches, the OFT summarized that the identification of sectors through screening tools was not a precise science and, thus, it was likely that a combination of approaches (including complaints of consumers, trade associations or other designated bodies, and, under some circumstances, also internal (economic) research) was needed to ensure a sustainable outcome. The decision to investigate a specific sector is now largely based on four criteria: impact of the intervention; strategic significance; resources; and risk.[16]

3. United States

The United States started implementing screening tools in the 1970s.[17] At that time, the Department of Justice ("DOJ") began to screen procurement auctions by a so-called "Identical Bid Unit" in order to detect (and deter) bidder collusion. However, after six years, the tool was discontinued as apparently the bidders had adapted their bidding behavior to the screen.

In 1998, to detect competition problems, the Federal Trade Commission ("FTC") started a broader screening project focusing especially on price movements over the business cycle. It was thought that, e.g., the existence of cartel agreements would increase prices coming out of a business cycle trough. In particular, the screen aimed at identifying industries that experienced price increases during periods where output was stable and the industry was still in recession. Using various data sources such as production price indices of the Bureau of Labor Statistics, the screen flagged about 600 suspicious industries, 25 of which were selected for further investigations. But a benign explanation for the observed market outcome was found for all but three of these industries.[18] These negative experiences may have led the FTC to abandon the use of cross-industry screening tools. However, screening in particular markets is still considered as a helpful complement, as shown in the next section.

B. Adoption Of Market-Based Screening Tools

Several countries have undertaken significant research in the area of market-based screening tools and partly also implemented such tools. In the following, we review the experiences of the United States, Italy and Austria, the European Union and Mexico.

1. United States

In 2002, the FTC adopted a monitoring program to detect abnormal price movements for gasoline. By tracking retail prices in 360 cities across the United States and wholesale prices in 20 major urban areas, the FTC wanted to "identify possible anticompetitive activities and

[16] For the priorization framework of the OFT, *see* http://www.oft.gov.uk/shared_oft/about_oft/oft953.pdf

[17] R. Abrantes-Metz & P. Bajari, *Screens for Conspiracies and Their Multiple Applications*, 24 ANTITRUST, pp. 66-71 (2009).

[18] Van Sinderen & Petit, *supra* note 13.

determine whether a law enforcement investigation would be warranted."[19] However, all observed abnormalities so far can be explained by non-collusive events such as pipeline breakages or the malfunctioning of refineries.

2. Italy and Austria

Italy and Austria both conducted empirical research with particular variance screens following the seminal paper by Abrantes-Metz et al. (2006).[20] Their approach was built on the observation that prices are more rigid under collusion than under competition. Cartel firms try to avoid frequent negotiations on pricing as these would increase the danger of the cartel being detected.[21] Hence, the variance screen flags a market where the variance of prices has become lower than expected as more likely to be collusive.

Esposito & Ferrero (2006)[22] used two Italian cartel cases to test whether a variance screen would have detected the respective cartels. For the gasoline-retailing cartel, they conducted an EU-wide comparison of national price data and concluded that Italy was at the bottom of the list in both price level and variance. However, they noted that this could have been due to a higher tax share and higher distribution costs in Italy. The authors also analyzed prices of hygienic products sold in pharmacies by comparing them to the same products sold in supermarkets. Again, prices in pharmacies were higher on average and fluctuate less. The authors restrained their results by pointing out that menu costs and data aggregation could also explain their findings.

Sharma & Kaltenbrunner (2008)[23] of the Austrian Competition Authority analyzed gasoline retail prices in an EU-15 comparison. They pointed out that the results of a variance screen depend on the applied method (variance of price changes versus variation coefficient) and the type of prices chosen (gross versus net prices). Applying all possible combinations they partly received contradictory findings such as, e.g., for Finland, which showed a low variation when using the variation coefficient and showed a high variation when using the variance of price changes. They therefore concluded that further assistance from academics was needed before such methods could be successfully applied to Austrian gasoline markets. The authority remains interested in further applications of the approach as, e.g., reflected in the organization of a workshop on variance screening in 2010.[24]

3. European Union

In 2006, DG Competition of the European Commission ("EC") started to develop a framework to strengthen the economic analysis in cartel cases. Quantitative and qualitative analysis should give guidance as to where to perform dawn-raids and justification for the related

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[19] *See* http://www.ftc.gov/ftc/oilgas/gas_price.htm

[20] R. Abrantes-Metz, L. Froeb, J. Geweke, & C. Taylor, *A Variance Screen for Collusion*, 24 INT'L J. INDUSTRIAL ORG 24, 467-486, (2006).

[21] For a more formal reasoning, *see* S. Athey, K. Bagwell, & C. Sanchirico, *Collusion and Price Rigidity*, REV. ECON. STUDIES 71, 317-349, (2004) or J. Harrington & J. Chen, *Cartel Pricing Dynamics with Cost Variability and Endogenous Buyer Detection*, 24 INT'L J. INDUSTRIAL ORG, 1185-1212, (2006).

[22] F. Esposito & M. Ferrero, *Variance Screens for Detecting Collusion: An Application to Two Cartel Cases in Italy*, Working Paper, Rome, (2006).

[23] S. Sharma & R. Kaltenbrunner, *Untersuchung spezifischer Problemstellungen der Märkte für Mineralöl-produkte*, 1. ZWISCHENBERICHT, (July 2008).

[24] *See* http://www.bwb.gv.at/Aktuell/Archiv2010/Seiten/variance_screen_18102010.aspx

opportunity costs. An outline of the resulting framework sketched in the following was later published in Friederiszick & Maier-Rigaud (2008).[25] In contrast to the cross-industry approaches of the NMa or the OFT, the EC approach prefers a "bottom-up" methodology which is divided into two steps, screening and verification.

The screening step is triggered by an exterior event, such as consumer complaints or other suspicions. In the beginning, a preliminary antitrust market definition and a reference period have to be chosen, followed by the calculation and aggregation of 14 indicators concerning price movements, industry transparency, concentration, and entry barriers. If the resulting industry scores are found to be beyond a certain threshold, the second step, the so-called "critical event analysis," is conducted. This verification step aims to distinguish collusion from competition by puzzling out the relation between changes in the market structure (such as decline of demand or supply, entry of foreign companies, and drastic innovation) and changes in the behavior and performance of the incumbents (such as price movements, structural breaks in the price-cost-ratio, and declines in volatility in prices and market shares).

The EC approach is very ambitious from an economics point of view, incorporating the most recent academic literature on this topic. Even though one might consider it as an idealistic best-practice approach, its substantial data needs and the demand of expertise might foreclose its regular application in practice.

4. Mexico

Estrada & Vazquez (2010) [26] of the Mexican Competition Authority ("CFC") analyzed public procurement auctions of generic drugs in Mexico. Building on the results of Abrantes-Metz et al. (2006) and Bolotova et al. (2008), [27] they applied screens on prices and market shares and identified many drugs where lowest bids tended to be identical across auctions regardless of winner, location, or contract volume. Market shares were found to quickly converge over time. Additionally, bids dropped and the above pattern disappeared after aggressive entry or procurement consolidation occurred. Their study triggered a formal investigation of the CFC, which indeed identified the presence of illegal bid-rigging in 2010.

IV. CONCLUSION

Cross-industry and market-based screening tools generally use economic data to both indicate markets likely to be cartelized and identify cartel patterns in specific markets. In this article, we have reviewed the experiences of a selection of competition authorities in the adoption of such tools for the detection of cartels. Although the first implementations took place several years ago, detection successes of, particularly, cross-industry screening tools are still rare. This makes their implementation a less attractive investment for competition authorities, especially given their recent detection successes through the application of leniency programs.

However, the more focused market-based screening tools appear to be more promising and are increasingly used by competition authorities. In order to further increase the significance

[25] H. Friederiszick & F. Maier-Rigaud, *Triggering Inspections Ex Officio: Moving Beyond a Passive EU Cartel Policy*, 4 J. COMPETITION LAW & ECON., 89–113, (2008).

[26] E. Estrada & S. Vazquez, *Bid Rigging in Public Procurement of Generic Drugs in Mexico*, Federal Competition Commission, Mexico, (2010).

[27] Y. Bolotova, J. Connor, & D. Miller, *The Impact of Collusion on Price Behavior: Empirical Results From Two Recent Cases*, 26 INT'L J. INDUSTRIAL ORG., 1290-1307, (2008).

of such tools, it appears necessary to provide assistance to competition authorities on how to use the respective tools. Furthermore, more cooperation between researchers and competition authorities has the potential to produce substantial gains on both sides as, on the one hand, researchers are able to work with market-based data sets and, on the other hand, authority officials can improve their knowledge on how to apply the respective tools for their purposes. The recent detection of an alleged Libor conspiracy and manipulation indicates the potential of such cooperation.[28]

A further boost in the significance of screening tools can be reached through their adoption by firms as part of their efforts to ensure compliance with competition laws. Given the richness of firm data, screening tools can promote in-house detection and deterrence of cartels—benefiting the respective firm through the avoidance of heavy fines or damages and benefiting the consumers through a reduction in the number of harmful cartels.

[28] *See*, e.g., R. Abrantes-Metz, M. Kraten, A. Metz, & G. Seow, *Libor Manipulation?*, J. BANKING & FINANCE (forthcoming, 2011).