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GAME THEORY AND COLLUSION:
OLIGOPOLY PROBLEM IN THE EUROPEAN UNION COMPETITION LAW

Master Thesis

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LIST OF ABBREVIATIONS[1]

Article 101 – Article 101 of the Treaty on the Functioning of the European Union;

Article 102 – Article 102 of the Treaty on the Functioning of the European Union;

CJ – the Court of Justice of the European Union (former name – the Court of Justice of the European Communities);

CNE – the cooperative Nash equilibrium;

Collusion – "collusion refers to combinations, conspiracies or agreements among sellers to raise or fix prices and to reduce output in order to increase profits. As distinct from the term cartel, collusion does not necessarily require a formal agreement, whether public or private, between members."[2]

Directive – Directive 2014/104/EU of the European Parliament and of the Council of 26 November 2014 on certain rules governing actions for damages under national law for infringements of the competition law provisions of the Member States and of the European Union. [2014] OJ, L 349;

EC – the European Commission;

EOI – an exchange of information;

EU courts – the Court of Justice and the Court of First Instance of the European Union;

EUMR - Council Regulation No 139/2004 of 20 January 2004 on the control of concentrations between undertakings. [2004] OJ, L 24;

GC – the General Court of the European Union (former name – the Court of First Instance of the European Communities);

Guidelines – Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings. [2004] OJ, C 031;

MS – The Member State (-s) of the European Union;

NNE – the non-cooperative Nash equilibrium;

Regulation – Council Regulation No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty. [2003] OJ, L 1;

SC – the suggested criterion proposed in this thesis for distinguishing concerted practices and conscious parallelism;

S-C-P – the Structure-Conduct-Performance paradigm (Harvard school).

System – Article 101 (concerted practices), Article 102 (collective dominance) and EUMR

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1 The abbreviations in the main text of this thesis will be sometimes intentionally not used in order to increase a reading comprehension.

2 Khemani, R. S., Shapiro, M. D. *OECD glossary of Industrial Organisation Economincs and Competition Law* [interactive]. OECD, 1993 [accessed 15-02-2015].<http://www.oecd.org/regreform/sectors/2376087.pdf>, p. 20.

together means the system of legal solutions under the EU competition law for solving parallelism (oligopoly) problem;

TFEU – the Treaty on the Functioning of the European Union. [2012] OJ, C326;

UKMIP – the UK Market Investigation Procedure.

MEANING OF GAME THEORY AND ITS BASIC CONCEPTS

Game theory – "Game theory is the name given to the methodology of using mathematical tools to model and analyze situations of interactive decision making. These are situations involving several decision makers (called *players*) with different goals, in which the decision of each affects the outcome for all the decision makers. This interactivity distinguishes game theory from standard decision theory, which involves a single decision maker, and it is its main focus. Game theory tries to predict the behavior of the players and sometimes also provides decision makers with suggestions regarding ways in which they can achieve their goals."[3]

Game – "A game is a mathematical model of a situation of interactive decision making, in which every decision maker (or player) strives to attain his "best possible" outcome, knowing that each of the other players is striving to do the same thing."[4]

Strategy – in game theory, strategy means an algorithm of actions, which is available to players. For instance, in the context of competition law the strategies could mean: to collude or not to collude; to enter the market or not; to increase the output or not, etc.

Solution – the concept that defines the ultimate outcome of a game. The solution concept should exhibit the properties of "expected" and "reasonable".[5] It means that the solution of the game should have these properties. Players could attain the expected outcome through reasonably choosing available strategies. There are various solution concepts, but the most important is the Nash equilibrium solution concept.

Nash equilibrium – "[…] a strategy vector at which no player has a profitable deviation".[6] The Nash equilibrium signifies the ultimate goal of a game because if players attain the Nash equilibrium, it means that they behaved in a rational way and have chosen rational strategies in a given set of circumstances.[7]

Folk theorem – the concept of infinitively repeated games that proves that provided players are sufficiently patient, the cooperation between undertakings could be Nash equilibrium.[8]

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[3] Maschler, S., Zamir, S., Solan, E. *Game Theory.* Cambridge: Cambridge University Press, 2013, p. xxiii.

[4] *Ibid., p.* 9.

[5] *Ibid., p.* 101.

[6] *Ibid., p.* 97.

[7] Other game theory concepts will be explained in the main part of this thesis where appropriate.

[8] Why this theorem is called "Folk theorem" has been explained by Maschler, S., Zamir, S., Solan, E.,

The relevance of game theory to competition law and in particular parallelism (oligopoly) problem, stems from the notion of "interdependence". In game theory, the interdependence is between players, whereas in oligopolies, the interdependence is between competitors. This observation enables the interdisciplinary research for which this thesis is primarily dedicated.

INTRODUCTION

The problematic and actuality of the master thesis. Legal problems that are related to competitors' collusive (parallel) behaviour in oligopolies constitute the problematic of this thesis. In scholarship it is so-called "*oligopoly problem*", "*unproven cartel gap*"[9] or "*parallelism problem*"[10]. The meaning and significance of oligopoly problem is that through tacit and collusive behaviour in the forms of concerted practices (Article 101) or abuse of collective dominance (Article 102) competitors could seriously harm effective competition[11], consumers and, in general, reduce welfare.[12] Oligopolies often are transparent markets. Therefore, in order to collude and attain higher (excessive) profits oligopolists should not necessarily enter into prohibited cartel agreements. Tacit and collusive behaviour is hard to detect and punish. This is why scholars regard the oligopoly problem as complex.[13] The main idea of this thesis is to attempt to solve oligopoly problem through novel and greatly unstudied game theory standpoint.

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supra note 3, p. 531: "The name of the Folk Theorem is borrowed from the analogous theorem [...] for infinitely repeated games, which was well known in the scientific community for many years, despite the fact that it was not formally published in any journal article, and hence it was called a "folk theorem"."

9 The terms "oligopoly problem" and "unproven cartel gap" are used by Hawk, B. E., Motta, G. A. Oligopolies and Collective Dominance: A solution in search of the problem. *Treviso Conference on Antitrust Between EC Law and National Law, Eighth Edition Fordham Law Legal Studies Research Paper* [interactive]. 2008, No 1301693: 59—104 [accessed 11-12-2014].<http://ssrn.com/abstract=1301693>, p. 59 and Petit, N. The Oligopoly Problem in EU Competition Law. *Research Handbook in European Competition Law, I. Liannos and D. Geradin eds, Edward Elgar, September 2013* [interactive]. 2012 [accessed 08-03-2015]. <http://ssrn.com/abstract=1999829>.

10 The term "parallelism problem" is used by Filippelli, M. *Collective Dominance and Collusion: Parallelism in EU and US Competition Law (New Horizons in Competition Law and Economics series).* Cheltenham: Edward Elgar Pub, 2013. Throughout this thesis, the terms "oligopoly problem" and "parallelism problem" will be used interchangeably. Furthermore, the terms "parallelism problematic" and "oligopoly problematic" in this thesis convey the meaning that oligopoly problem is complex. Therefore, it will be analysed in conjunction with closely related legal subjects: exchange of information, leniency, and imposition of fines.

11 Unlawful parallelism (collusion) infringes main goals of the EU competition law. The discussion of the main goals of the EU competition law could be find at: Moisejevas, R., Novosad, A. Some thoughts concerning the main goals of competition law. *Jurisprudencija* [interactive]. 2013, No 20(2), 627—642 [accessed 05-01-2015].<https://www3.mruni.eu/ojs/jurisprudence/issue/view/63>.

12 Petit, N., *op. cit.*, p. 13: "[…] tacit and express collusion yield similar adverse effects on consumer welfare. Both frustrate the various efficiencies ascribed to competitive markets – i.e., allocative (downward pressure on prices), productive (downward pressure on costs) and dynamic (upward pressure on investments) efficiency – and protected by the competition rules. This, in turn, entails that tacit collusion should a priori be addressed under the competition laws, like explicit collusion."

13 For instance, Whish, R., Bailey, D. *Competition Law* [interactive]. 7th edition. Oxford: Oxford University Press, 2012 [accessed 15-02-2014]. <http://oxcat.ouplaw.com/>. § 14.069: "[…] the 'problem' of oligopoly is a complex one, and the tools provided by Articles 101 and 102 and their domestic analogues are not always suitable for this purpose."

Hence, the essence of this thesis is to answer the question: *whether, how and to what extent game theory is capable to solve oligopoly (parallelism) problem under Articles 101, 102 of TFEU?*

At the outset, it is important to say a few words on what does collusive (parallel) behaviour means from legal and game theory point of views. From a legal standpoint, parallel behaviour could be broadly defined as the phenomenon of mutual interdependence between competitors that allows them to engage in tacit and collusive practices. Effective competition could be harmed through collusive behaviour in the forms of price parallelism[14]; output parallelism[15]; market partitioning[16], etc. The underlying reason for a collusive behaviour is apparent and selfish – to attain and sustain higher (excessive) profits than it would be possible to attain and sustain under normal competition.[17] Written, oral, and other agreements, as mentioned, are unnecessary for collusive practices because of market transparency. As a result, competitors only imitate a competition while collusive markets are not as competitive as could have been. It is obvious that collusion harms consumers' interests. Therefore, the protection of effective competition and consumers' interests is, indeed, at the heart of oligopoly problem. Historically concerted practices and abuse of collective dominance emerged as possible *ex post*[18] solutions to this problem, but presently *ex post* enforcement is regarded as not effective. It should be reminded that the main idea of this thesis is to apply game theory in order to solve parallelism problem in the EU competition law. Hence, at the outset it should be clarified that game theory expands the understanding of parallelism problem and allows seeing the phenomenon of interdependence between competitors from the different angle. Oligopolists are not just interdependent, they are also the players of strategic games, i.e. they adopt their own rational strategies in order to maximise profits. When rational strategies amount to tacit and collusive behaviour, the oligopoly problem occurs. What is rational to competitors is not necessarily good to effective competition and consumers, and *vice-versa*.[19] This tension of interests is an important aspect of parallelism problem. The combination of legal and game theory perspectives could be a key for solving parallelism problem. Hence, based on the main idea of this thesis, it

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[14] For instance, setting and maintenance of artificially high product prices.

[15] For instance, setting and maintenance of artificially low output.

[16] Market partitioning means the practice of undertakings to share markets artificially. Therefore, this type of parallelism reduces consumers' choice and increases oligopolists' sales.

[17] Hawk, B. E., Motta, G. A., *supra* note 9, p. 59 defines the oligopoly problem as: "[…] extent of sub-competitive performance (i.e. higher prices, lower output, lesser quality, etc.) a resulting from interdependence among rivals."

[18] The term "*ex post* parallelism" in the thesis will be used in order to denote competitors' parallel behaviour that could infringe Articles 101, 102, whereas "*ex ante* parallelism" will be used to denote competitors' parallel behaviour that is related to the examination of concentrations in accordance with EUMR.

[19] For instance, entering into cartel agreements could be a rational behaviour for competitors, whereas such behaviour apparently is illegal. The same could be said regarding collusive behaviour.

will be researched whether it is possible to attain novel and workable solutions to this problem through the interdisciplinary approach.

It was mentioned that oligopoly problem is a complex one. Therefore, non-exhaustive list of legal problems that are related to oligopoly problem is sufficient to justify the need and necessity of this interdisciplinary research. *Firstly*, and most importantly, collusion, as explained, harms effective competition and consumers. Welfare loss and other adverse consequences that are caused by parallel behaviour in oligopolies are comparable to the damage that is made by explicit cartels.[20] *Secondly*, there is no satisfactory solution in the EU competition law for distinguishing lawful an unlawful parallelism.[21] Also, it is unclear whether conscious parallelism that allows to maintain artificially high (excessive) profits should, indeed, be regarded as lawful and if so, why? That being the case, the absence of proper distinctive standard amounts to unpredictability and legal uncertainty. *Thirdly,* there are serious practical enforcement problems concerning concerted practices.[22] Extensive CJ's case law on concerted practices evidences that it is, indeed, very hard to prove collusion (concerted practices) without sufficient amount of direct evidences.[23] The improvement of these points is needed. *Fourthly*, scholars disagree on the question how to solve oligopoly problem.[24] This debate should be finally solved. *Fifthly*, the only

[20] Petit, N., *supra* note 9, p. 13.

[21] It is also important to stress that there are two types of parallelism: lawful and unlawful, meaning that unlawful parallelism infringes the EU competition law in a way of concerted practices or abuse of collective dominance, whereas lawful parallelism is not prohibited - so-called "conscious parallelism." It is extremely hard to distinguish soundly these two types of parallelism for the plain reason – presently in the EU case law there is no appropriate judicial standard that would separate these two types of parallelism. It is one reason why at the moment parallelism cases often end up in long disputes in the EU courts. In accordance to this thesis, since 1956 the CJ alone dealt with at least 11 cases on concerted practices. The most recent case is C-286/13, *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission* [2015] ECLI:EU:C:2015:184. The notion of "conscious parallelism" will be examined in the second chapter of this thesis.

[22] This problematic is examined in the part 2.1 of the thesis. It will be examined both practical and conceptual problems. For instance, the practical problems of how to prove unlawful parallelism and how to deal with undertakings behaviour to destroy evidences have been acknowledged by Whish, R., Bailey, D., *supra* note 13, § 3.078. Another problem is that there exist contradictory EU case law on concerted practices, i.e. in some cases parallelism have been regarded unlawful, in other cases lawful. The part 2.1 of this thesis will review some of CJ's decisions.

[23] For instance, the EC failed to prove concerted practices to the requisite legal standard in the following CJ's cases: C-29/83, *Compagnie Royale Asturienne des Mines SA and Rheinzink GmbH v Commission of the European Communities* [1984] ECR 1679 and Case C-89/85 (Joined Cases C-89/85, C-104/85, C-114/85, C-116/85, C-117/85, C-125/85, C-126/85, C-127/85, C-128/85, C-129/85), *Ahlström Osakeyhtiö and Others v Commission* [1993] ECR I-1307. The problems are less complicated in the subset of cases on concerted practices in the form of exchange of information, because it is not necessary to prove adverse "effects" that would impair the trade between the MS. On this point see: Case C-8/08, *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit* [2009] ECR I-4529 and very recent judgement: *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission*, *op. cit.*

[24] For instance, Filippelli, M., *supra* note 10, argues for the application of abuse of collective dominance to oligopoly problem, whereas Petit, N., *supra* note 9, criticize this approach. Neither of these scholars seriously considers the application of concerted practices as a proper solution to oligopoly problem. This third approach will be advanced in this thesis.

real instrument that presently solves oligopoly problem in the EU completion law is EUMR (*ex ante*), whereas scholars observe that Articles 101 and 102 in practice are not used at all.[25] This is a strong signal that the EU competition law is greatly ineffective in solving oligopoly problem at *ex post* stage. *Sixthly*, there is a gap and lack of scientific knowledge on game theory perspective to oligopoly problem in the EU competition law. Overall, a present state of the EU competition law signals that legal approach alone is incapable and insufficient to solve the complexities of oligopoly problem. Hence, one could and should use game theory as a substantive methodological instrument for the attainment of novel solutions to oligopoly problematic.[26]

The scientific novelty, originality and the level of examination of the problematic of the master thesis. Internationally available literature concerning parallelism problematic could be separated into two broad categories: legal and game theory. *From legal standpoint*, oligopoly (parallelism) problematic has been examined in most of textbooks and scholarship articles on the subject of the EU competition law: Whish, R., Bailey, D.[27], Rose, V.[28], Faull, J., Nikpay, A.[29], Švirinas, D.[30] to mention a few. The most recent, systematic and thorough book on the subject matter is written by Filippelli, M. (2013).[31] Obviously the EU legislation (both hard law and soft law), EU courts' practice, EC's cases will be also examined in this thesis. *From game theory standpoint*, there is an apparent lack of research. The benchmark and rather comprehensive work

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[25] Petit, N., *supra* note 9, p. 26, 57 respectively: "In essence, *ex post* remedies have been de jure or de facto disabled. The prohibition of anticompetitive coordination enshrined in Article 101 TFEU does not cover tacit collusion. Similarly, […] the notion of "collective dominance" […] has in practice never been enforced on an oligopolistic market"; "[…] the Commission's enforcement record against such practices [*authors note*, unlawful collusion] is close to inexistent. And absent a credible risk of enforcement proceedings in case of infringement, oligopolists have little incentives to comply with those legal principles"; Also see: Geradin, D., Lianos, I. (editors) *Handbook On European Competition Law. Substantive Aspects.* Cheltenham: Edward Elgar Pub, 2013, p. 313-314 who argues that predominant EU competition law paradigm with regards to parallelism is "merger-only enforcement paradigm", whereas *ex post* (Articles 101 and 102) enforcement remains embryonic; Furthermore, recent research in UK, as one of the most prominent jurisdictions in terms of competition law enforcement, showed that during the year 2001-2012 only 2 undertakings have been fined for the abuse of dominance (note that not necessarily for the abuse of collective dominance): Veljanovski, C. A Statistical Analysis of U.K. Antitrust Enforcement. *Journal of Competition Law & Economics* [interactive]. 2014, No 10(3): 711-738 [accessed 28-03-2015].<http://jcle.oxfordjournals.org/content/10/3/711.abstract>, p. 721, etc.

[26] Faull, J., Nikpay, A. *Faull and Nikpay: The EC Law of Competition* [interactive]. 2nd edition, Oxford: Oxford University Press, 2007 [accessed 10-03-2014].<http://oxcat.ouplaw.com/>, § 1.90: "[…] game theory has played a role in clarifying the main issues is that of collusion in oligopolistic markets."

[27] Whish, R., Bailey, D., *supra* note 13, Chapter 14: Horizontal agreements - oligopoly, tacit collusion and collective dominance.

[28] Bailey, D., Rose, V. *European Union Law of Competition* [interactive]. 7th edition, Oxford: Oxford University Press, 2013 [accessed 15-02-2014]. <http://oxcat.ouplaw.com/>. Chapter 2: Article 101(101): Agreements, Decisions and Concerted Practices.

[29] Faull, J., Nikpay, A., *op. cit.*, Chapter 7: Horizontal Co-operation Agreements, Information Exchange Agreements.

[30] Švirinas, D. The Assessment of Information Exchange Agreements Between Competitors from the Perspective of Competition Law of the EU and of the Republic of Lithuania. *Jurisprudencija* [interactive]. 2012 No 19 (1), 87—119 [accessed 05-01-2014].<http://www.mruni.eu/lt/mokslo_darbai/jurisprudencija/archyvas/?l=119509>.

[31] Filippelli, M., *supra* note 10.

on the subject matter is written by Phillips, L. (1995)[32], but it is 20 years old. More recent works of Filippelli, M. (2008)[33] and Petit, N. (2012)[34] could be distinguished.[35] In Lithuania, there is no published scientific work on the subject matter. Therefore, it seems that there is no recent and comprehensive scholarship on the topic. Notably, there are several focused researches on EUMR (2001)[36], leniency (2010)[37], exchange of information (1996)[38] that use game theory as the method of examination. In all the examined scientific works, the dominant way is to apply non-cooperative game theory, whereas cooperative game theory is not applied. The explanations of meaning and properties of game theory concepts in this thesis will extensively rely on comprehensive sources of game theory discipline.[39]

The scientific novelty and originality of this thesis deduce from the attempt to apply game theory insights systematically and in relation with the oligopoly problem in the EU competition law.[40] This area of interdisciplinary research, as indicated, is greatly unstudied. Therefore, this research is novel. Novel and original is not just research perspective, as such, but also the attempt to incorporate game theory concepts to workable legal solutions. For instance, original criterion on the question how to distinguish concerted practices from conscious parallelism will be suggested. Novel, interesting, and sometimes counter-intuitive conclusions will be attained on closely related topics: exchange of information, leniency, and imposition of fines. Thesis' part on the imposition of fines is fundamentally and conceptually unique[41] because

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[32] Philips, L. *Competition Policy: A Game-Theoretic Perspective*. Cambridge: Cambridge University Press, 1995.

[33] Filippelli, M. *Collective Dominance in Competition Law.* PhD thesis. Lucca: IMT Institute for Advanced Studies, 2008. However, Filippelli, M. focuses on the abuse of collective dominance rather than on the concept of concerted practices.

[34] Petit, N., *supra* note 9.

[35] It should be noted that the indicated scholars, with the exception to Phillips, L., use game theory only marginally, not systematically, and not comprehensively.

[36] Europe Economics Study on Assessment Criteria for Distinguishing between Competitive and Dominant Oligopolies in Merger Control. *Report commissioned by Enterprise DG* [interactive]. 2001 (last review 2009) [accessed 01-03-2015].<http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_type=254&lang=en&item_id=2978>.

[37] Leslie, R. C. Antitrust Amnesty, Game Theory, and Cartel Stability. *Journal of Corporation Law* [interactive]. 2010, No 31: 453—488 [accessed 15-01-2015].<http://ssrn.com/abstract=924376>. This work is on the topic of U.S. leniency, but basics of approach *mutatis mutandis* could be applied to the topic of the EU leniency.

[38] Peeperkorn, L. Competition Policy Implications from Game Theory: an Evaluation of the Commission's Policy on Information Exchange. *Speech paper* [interactive]. 1996 [accessed 11-12-2014].<http://ec.europa.eu/competition/speeches/text/sp1996_057_en.html>.

[39] The idea to apply game theory to law thoroughly has been analysed by Baird, G. D., Gertner, H. R., Picker, C. R. *Game Theory and the Law.* Cambridge: Harvard University Press, 1998, but it has very little to offer to the problematic of this thesis. Very comprehensive book on game theory and its concepts could be found in the book of Maschler, S., Zamir, S., Solan, E., *supra* note 3.

[40] Especially novel is the attempt to use game theory as a tool to solve practical problems that are related to the concept of concerted practices under Article 101.

[41] In accordance to this thesis, at least in the EU, there is no available research on the application of cooperative game theory to the imposition of fines in parallelism cases. As said, few researchers - Filippelli, M., Philips, L., Petit, N. who are interested in oligopoly problematic apply only non-cooperative game theory branch, which is

the attempt will be to apply *cooperative* game theory in order to propose joint and several liability in parallelism cases under Articles 101, 102, and potentially beyond. Hence, the conclusions and suggestions of this thesis are authentic and original.

The significance of the master thesis. The thesis will advance the application of game theory to parallelism problematic concerning both theoretical and practical aspects in a manner comprehensible for legal scholars, students, and legal community as a whole. Substantial theoretical and practical results are expected to be achieved through proposed solution how to distinguish concerted practices from conscious parallelism under Article 101. Significant results are expected to be achieved in closely connected topics: exchange of information, leniency, and imposition of fines in parallelism cases. Several anticipated results could be mentioned: unorthodox game theory outlook on "leniency as punishment", is expected to facilitate attainment and validation of rather counter-intuitive propositions (predictions), including that presently the EU leniency regime could not be regarded as very effective with regards to revealing cartels, including unlawful collusion, as commonly contended; an entirely novel will be the attempt to apply cooperative game theory with regards to imposition of fines in unlawful parallelism cases. This novel idea is expected to allow to propose and justify the establishment of equal, joint and several liability in *ex post* collusions in duopolies under Article 101 and 102, and, arguably, beyond. In this way, the effectiveness and deterrence of infringements in the EU competition law would be reinforced. The overall contribution and value of this thesis is the expected advancement of interdisciplinary sophistication of the EU competition law concerning the phenomenon of parallelism in oligopolies. The results of this thesis *mutatis mutandis* could be applied in order to improve national competition laws. Thesis, to some extent, would fill the scholarship gap on the subject matter. The novel ideas and results that will be attained and explored in this thesis could be used for future researches.

The aim of the master thesis is to find out whether, how and to what extent game theory is capable to solve oligopoly (parallelism) problem under Articles 101, 102 of TFEU.

The objectives of the master thesis:

1. to identify why in oligopolies competitors' behave in a parallel manner; to critically assess the System, the notions of collective dominance and concerted practices in order to: (i) set and define the boundaries of game theory relevance to parallelism problematic; (ii) propose the idea that concerted practices, and not collective dominance, should be exclusively applied with regards to oligopoly problem (Chapter one);
2. to identify why concerted practices presently cannot satisfactorily solve oligopoly

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very different from cooperative game theory in many respects.

problem in order to: (i) identify whether and how game theory could advance the concept of concerted practices; (ii) to create a novel criterion with the use of game theory concepts for distinguishing concerted practices and conscious parallelism (Chapter two);

3. to critically assess legal subject that are closely related to oligopoly problem: exchange of information, leniency, and imposition of fines in parallelism cases in order to: (i) measure the extent to what game theory is relevant to solving oligopoly problem (ii) to propose game theory insights to these subjects with the aim to make the System more apt for solving oligopoly problem (Chapter two).

Methodology. The aim and objectives of this thesis will be attained by the use of the following methods:

1) *Systematic method*. The complexity of oligopoly problem necessitates systematic approach. The interrelations between various topics related to parallelism: e.g. a relation between Article 101 and 102; exchange of information; leniency and imposition of fines will be systematically examined.

2) *Analytical method.* It will be used in order to analyse the EU case law, doctrinal proposals, and the EU legislation. Analytical subdivision into two parts: *first*, where legal considerations predominate; *second*, where an emphasis will be on game theory perspective will be used throughout this thesis.

3) *Historical and comparative methods.* These methods will be used in order to indicate the evolution of legal measures for parallelism (oligopoly) problematic and in the comparative assessment of doctrinal proposals. Historical case law, especially on concerted practices, will be analysed.

4) *Interdisciplinary method.* Game theory, economic and legal standpoints (e.g. with regards to the concepts of Nash equilibrium, Folk theorem, Shapley value, Cournot duopoly, Grim trigger, Stick and Carrot strategies, etc.) will be combined.[42]

Data research, linguistic, philosophical, logic, and generalisation methods as fundamental research methods will be frequently used. To some extent, *a mathematical method* will be applied to illustrate general ideas of game theory with simple calculations.

The structure and structural logic of the master thesis. The structure of this thesis comprises of introduction, two chapters that are divided into sub-chapters, sections, and sub-sections respectively, also conclusions and recommendations.

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[42] It is important to clarify at the outset that game theory perspective in this thesis is used rather broadly, i.e. the term "game theory perspective" embraces not only formal application of game theory (
mathematical calculations or the formalisation of ideas through mathematical operators), but also informal application of game theory in the sense that the general ideas of game theory are applied with respect to the EU competition law.

Chapter one will identify the causality of oligopoly problem. This is necessary before proposing solutions to this problem. A reader will be familiarized with presently available legal solutions under the EU competition law in relation with oligopoly problem (System). Then, main scholarship attempts to improve the System will be examined. At the end of chapter one, it will become clear that oligopoly problem should be solved at *ex post* stage through the concept of concerted practices and not through the abuse of collective dominance. Hence, a reader will comprehend why the thesis in chapter two will focus on the concept of concerted practices and related legal subjects.

Chapter two is fundamental to this thesis. At the outset, the existence of parallelism problematic will be verified (sub-chapter 2.1). Then, in sub-chapter 2.2, non-cooperative game theory will be examined with the focus on concerted practices and related legal subjects. *Firstly*, in sub-section 2.2.1.1, it will be attempted to create a workable criterion for distinguishing lawful and unlawful parallelism (Suggested criterion). *Secondly*, in remaining sub-sections 2.2.1.2 – 2.2.1.4 this criterion will be deconstructed, verified, and clarified. An exchange of information (special case of oligopoly problem) and leniency (procedural instrument to reveal collusion) will be examined. Notably, chapter two will be completed by a novel examination of the imposition of fines by the use of cooperative game theory (section 2.2.2). *Finally*, acquired results will be provided in conclusions, whereas main proposals will be provided in recommendations.

Defended propositions of the master thesis

Collusion in oligopolies is caused by competitors' rational behaviour. Game theory could help solving this problem with the focus on the concept of concerted practices in novel ways:

1. The gap regarding presently non-existing criterion that delimits the concepts of concerted practices and conscious parallelism should be filled with the aid of the Nash equilibrium concept.
2. It should be recognized that competition authorities must assess the credibility of information as a principal element in each case that relates to information sharing between competitors.
3. It should be recognized that leniency at the moment cannot be regarded as a successful instrument for revealing collusions in oligopolies.
4. It should be recognized that imposition of equal, joint and several liability under Articles 101 and 102 for the infringements of collusive behaviour in duopolies and imposition of joint and several liability are the general solutions for solving oligopoly problem.

1. THE CAUSALITY OF OLIGOPOLY PROBLEM AND RELATED SYSTEM OF LEGAL SOLUTIONS IN THE EU COMPETITION LAW

1.1. The causality of oligopoly problem

Historically, three mainstream theories regarding the phenomenon of competitors' parallel behaviour in oligopolies could be distinguished: Structure-Conduct-Performance (Harvard School), Chicago School and game theory. In this sub-chapter, these theories will be illustrated in relation to the question: *what causes oligopolists to behave in a parallel (collusive) manner?* (*the question of causality*). Clear understanding of this preparatory, but very important question, is necessary for the effective thinking about possible solutions that could reduce detrimental effects that spring from collusion, such as artificially increased and maintained prices, restriction of competition, reduction of innovation, etc. It seems that the theories of S-C-P, Chicago School, and game theory provide different answers to the question of causality. These different answers will be explained each in turn.

With a bit of simplification, the S-C-P paradigm proposes that market structure defines competitors' conduct, whereas competitors' conduct defines their performance in a market. According to Whish, R., Bailey, D. economists under S-C-P paradigm have always contended that there is a causal relationship between industrial structure and competitors' performance in these markets.[43] Therefore, it could be understood that S-C-P paradigm answers the question of causality in a following way: oligopolistic market structure causes competitors' parallel behaviour that might adversely affect the effective competition.[44]

The Chicago School of thought emerged as an antithetical theory to the Harvard School. The Chicago School essentially criticizes S-C-P's proposition that market structure causes and defines competitors' performance. Consequently, under the Chicago School's approach market structure cannot be regarded as the primary and necessary cause of collusive behaviour in oligopolies.[45] An attainment of high (excessive) profits under the Chicago School outlook could be explained by other reasons than the market structure, i.e. oligopolists are undertakings that are

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[43] Whish, R., Bailey, D., *supra* note 13, § 1.024: "Economists have often suggested that there is some direct causal relationship between industrial structure, the conduct of firms on the market and the quality of their economic performance: this is often referred to as the 'structure- conduct- performance paradigm'." Also see: Faull, J., Nikpay, A., *supra* note 26, § 1.10: "In its simplest form it states that market structure determines companies' market behaviour which in turn determines market performance."

[44] Faull, J., Nikpay, A., *supra* note 26, § 1.10: "It is the structure that is responsible for the final market outcome."

[45] Posner, R. A. Oligopoly and the Antitrust Laws: A Suggested Approach. Stanford Law Review [interactive]., 1968, No 21: 1562—1606 [accessed 2015 01 18].<http://chicagounbound.uchicago.edu/journal_articles/1863/>, p. 1578 disagrees with this proposition, by saying that: "[…] tacit collusion or non-competitive pricing is not inherent in an oligopolistic market structure but, like conventional cartelizing, requires additional, voluntary behaviour by the seller."

simply more efficient.[46] After the closer look, it appears that Chicago School itself does not exactly offer the unique answer to the question of causality. It seems that the proposition that undertakings in oligopolies are more efficient is relevant to another question: *"why oligopolies form?",* rather than to the question of causality. This could be explained by noticing that Chicago School could be understood as antithetical theory to Harvard School, i.e. although being dependent theory, it is still influential.

Both Harvard School and Chicago School approaches have their limitation in their capacity to answer the question of causality. Most importantly, both theories do not fully appreciate the nature of competition, i.e. competition as a phenomenon being of the behavioural nature.[47] Therefore, these theories are insufficient to explain the causality of collusion. It seems that game theory is more relevant theory, since it directly examines a rational behaviour of players in a given set of circumstances. According to Van den Bergh, R. S-C-P, Chicago School, and game theory are all based on rationality assumption.[48] From this insight, it could be deduced that the primary cause that makes competitors behaving in a parallel manner is rationality itself.[49] Indeed, it is not precise to say that a market structure itself, as suggested by Harvard School, or efficiency, as suggested by Chicago School, cause oligopolists to behave in a parallel manner. It is true that in oligopolies, collusion is more likely rather than in very competitive markets with many undertakings, but it is not the end of the story. The oligopolistic market structure alone is not sufficient to guarantee that undertakings would act in a collusive manner. Otherwise, every oligopoly should be under close supervision. Obviously, such scenario is unrealistic and undesirable, especially because many markets are oligopolistic.[50] Therefore, it would amount to unreasonably deep market intervention. It is not that hard to substantiate that rationality is the true cause for a parallel behaviour. The argument from the contrary is a proper way to illustrate that the rationality, indeed, is the correct answer to the question of causality. Suppose that it is not rational to behave in a parallel manner, and then one could ask why undertaking would risk

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[46] Faull, J., Nikpay, A., *supra* note 26, § 1.14: "The Chicago School argued that the causal link is not between high concentration on the one hand and high profits on the other. Instead, they argued that the causality runs as follows: increased firm size leads to increased firm efficiency, which in turn leads to market concentration, and ultimately to possibly higher profits."

[47] Some scholars use the term "behavioural antitrust" to denote the approach to antitrust that deviates from the rationality assumption, i.e. "behavioural antitrust" tries to relax paradigmatic proposition that undertakings in markets behave strictly as utility maximising undertakings: Van den Bergh, R. Behavioural antitrust: not ready for the main stage. *Journal of Competition Law & Economics* [interactive]. 2013, No 9(1): 203—229 [accessed 01-04-2015].<http://jcle.oxfordjournals.org/content/early/2013/02/05/joclec.nhs042>.

[48] *Ibid., p.* 205: "[…] all mainstream economic approaches to competition (including those of Harvard School, the Chicago School, and the Post-Chicago game theoretical analyses) are based upon the rationality assumption."

[49] The rationality could be understood in many ways, but in this thesis, the rationality will be used to denote competitors' profit-maximising behaviour.

[50] Whish, R., Bailey, D., *supra* note 13, § 14.005: "In reality few markets are perfectly competitive and many are oligopolistic […]."

behaving in a way that possibly infringes Article 101 in a way of concerted practices; or Article 102 in a way of abuse of collective dominance. To some extent, irrational behaviour in reality could be ascribed to consumers and other natural persons due to so-called "bounded rationality", which means that people cannot always solve complex problems in the most efficient (rational) way.[51] It is simply less plausible or not plausible at all that large-scale undertakings operating in a common EU market would engage in irrational practices. There are many arguments to substantiate this proposition.[52] In conclusion, it is justified to say that rationality is the exact and adequate answer to the question of causality.

Obviously, the use of this insight that rationality is the primary cause of competitors' parallel behaviour in oligopolies is rather limited. It could be argued that it is self-evident. Nonetheless, it cannot be accepted as being self-evident, because whole and recent branch of behavioural economics argues against rationality assumption. Nonetheless, as uncovered by Van den Bergh, R. "Behavioural antitrust: not ready for the main stage". The limitations of the use of rationality as the true cause of parallelism could be overcome by using game theory. This contention will be examined throughout this thesis, especially in the second chapter. Suffice to say here, that game theory offers rather concrete answers to the question: "*what is rational in a given set of circumstances?"* To large extent, game theory incorporates mathematical reasoning, the use of matrixes, game trees, calculations, etc. In this way, the rationality assumption is reduced to rather rigorous and precise solutions. Nonetheless, this thesis is mainly dedicated to legal community, thus game theory will be used in combination with legal arguments. It means that game theory will be used more as a source of ideas rather than as a mathematical technique to derive concrete answers to concrete problems. Understood in this way, the revelation that rationality is the cause of competitors' parallel behaviour in oligopolies substantiates game theory's perspective to legal problems caused by collusive behaviour under Articles 101, 102.

In conclusion:

Neither Harvard School (S-C-P paradigm) nor Chicago School satisfactorily answers the question: "*what causes oligopolists to behave in a parallel (collusive) manner?*" This could be explained by the fact that these theories do not fully appreciate the importance of behavioural nature of the phenomenon of competition. The primary cause of parallelism in oligopolies is

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[51] Van den Bergh, R., *supra* note 47, p. 213, with the references therein: "Bounded rationality refers to the limited capacity of the human mind to formulate and solve complex problems."

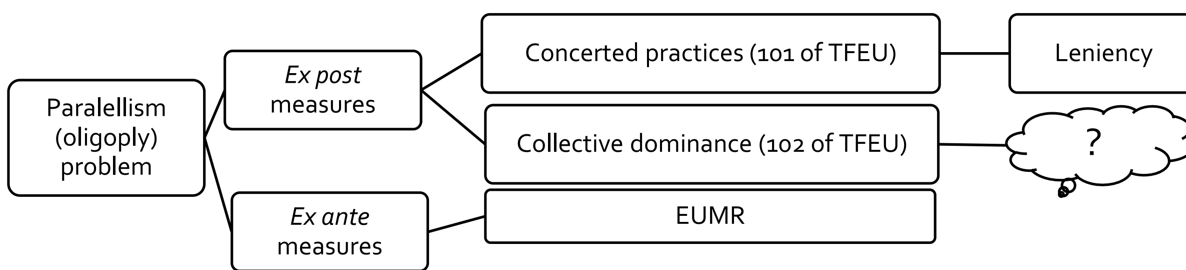
[52] Van den Bergh, R., *supra* note 47, *p.* 210-214: "There are reasons to doubt that problems of irrationality diagnosed in experiments with individuals […] manifest themselves in the same way within firms"; "Irrationalities at the firm level cannot be taken for granted and, even if they materialize, market forces may eliminate them over time"; "[…] firms are repeated players that learn from and correct their mistakes"; "[…[the scope of irrationality at the firm level is an unresolved puzzle"; "On the empirical side, evidence that individuals (consumers) act irrationally cannot simply be extrapolated to firms", etc.

rationality, i.e. the parallel behaviour is adopted because it is rational to behave in this way. Although this insight is rather general and thus of limited use, game theory seems to be capable to reduce the abstractness of rationality. Hence, the use of game theory is relevant and possibly effective perspective for solving oligopoly problematic under Articles 101, 102.

1.2. The system of legal solutions in the EU competition law for solving oligopoly problem

The understanding of insufficiencies of existing legal solutions under the EU competition law for oligopoly problem is necessary before examining concrete game theory solutions. Present three-fold System under the EU competition law for solving oligopoly problematic could be illustrated in a following scheme[53]:

The system of legal solutions that facilitates solving oligopoly problem. Table (1)



The System in terms of time works from *ex ante* to *ex post*. EUMR historically was the last measure (1989)[54]. However, in terms of practical importance for public enforcement, it is the dominant measure.[55] In particular, it prevents mergers and acquisitions that potentially might create favourable conditions for collusion (coordinating effects).[56] EUMR could partially be understood as the historical product of insufficiencies of *ex post* measures. Nonetheless, it also prevents strengthening of single dominance, which is outside the scope of parallelism problem.[57] Despite the dominance of EUMR in terms of practical use for solving oligopoly problem, the

[53] Note that leniency's functions are to facilitate enforcement under Article 101, whereas such a counterpart for Article 102 does not exist. It seems that it is the gap in enforcement system, if one accepts that exclusively Article 102 should solve parallelism problematic.

[54] Council Regulation of 21 December 1989 No 4064/89 on the control of concentrations between undertakings. [1989] OJ, L 395.

[55] Geradin, D., Lianos, I., *supra* note 25, p. 312-313: "There is empirical evidence in the case law that the EUMR enjoys a jurisdictional monopoly over tacit collusion […] In contrast, Article 102 TFEU was never applied to tacitly collusive oligopolies."

[56] It was early observed in U.S. that merger rules deal with market structure, whereas *ex post* measures deals with behaviour: Posner, R. A., *supra* note 45, p. 1593.

[57] Geradin, D., Lianos, I., *supra* note 25, p. 309-312. The substantive test for concentrations historically has changed from "creation and strengthening of dominant position" to "significantly impede effective competition." However, creation and strengthening of dominant position remains as particular instance of prohibited concentration.

enforcement power of EUMR, in terms of effectiveness, is limited. This limitation stems from *ex ante* nature itself, i.e. market conditions inherently are not static and might change in a way that would make collusion between oligopolists more likely at *ex post* stage.[58] Clearly, it is not possible to anticipate the future with perfect precision. It means that errors in public enforcement cannot be ruled out (type I, type II errors). Scholars observe that presently the EU competition enforcement is based on so-called "merger-only enforcement paradigm", whereas *ex post* public enforcement remains embryonic.[59] To conclude, it is logical and good that the System encompass both *ex ante* and *ex post* stages. Nonetheless, it is not sufficiently good and a lot could and should be done to improve the effectiveness of *ex post* legal measures. Thus, further analysis will be focused on *ex post* legal solutions.

The evolution of the System. Historical point of view enables better comprehension of the present state of the System. The proposition is that there was no System until 1992 (*Italian Flat Glass*[60] case). Historically, the EU competition law solely relied on Article 101, in particular, on the notion of "concerted practices" as principle measure dealing with the oligopoly problem.[61] The underlying reason was a dominant viewpoint that Article 101 deals with a reciprocal interaction between competitors, whereas Article 102 deals primarily with unilateral conduct. It was accepted viewpoint that Article 101, and not Article 102, is adequate for solving parallelism cases. Nonetheless, during the years the outlook has changed in conjunction with the evolution of "collective dominance", which principally enabled the application of Article 102 to parallelism. Third and last legal measure (EUMR) was adopted in 1989. It has completed and established, with subsequent case law, the System of legal measures for fighting parallelism.[62] This short sketch from a historical perspective will be used in the thesis in order to criticise some doctrinal proposals that argue for the amendments of the System. Further important aspect is to understand the evolution of the notion "collective dominance".

The notion of abuse of collective dominance, its significance in the System and erroneous idea to apply Article 102 to oligopoly problem. In this section, the idea to apply Article 102 to oligopoly problem will be presented and criticized. To begin with, the notion of collective dominance emerged from the interpretation of abuse of dominance by "more

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[58] For instance, suppose a situation where some undertakings left the market and in this way made market more concentrated. The collusion in such market is might be more likely than before.

[59] Geradin, D., Lianos, I., *supra* note 25, p. 313-314.

[60] Case T-68/89, *SIV and Others v Commission* [1992] ECR 1992 II-01403.

[61] Filippelli, M., *supra* note 10, p. 84-85.

[62] Until the adoption of the EUMR parallelism problem from *ex ante* perspective was not comprehensively approached, (the concentration issues have been tackled via Articles 101 and 102). Therefore, it has not constituted a system in a full sense.

undertakings" in accordance with Article 86 of the Rome Treaty.[63] The original function of the term "more undertakings" was to capture the abuses of dominance by corporate groups[64], which are often considered as single economic entities under the EU competition law.[65] The breakthrough was *Italian Flat glass* case in the sense that CFI, for the first time, held that the term collective dominance includes the dominance by individual undertakings outside the corporate groups' legal relationships.[66] This extension had at least two significant implications for the EU competition law with respect to parallelism cases. *Firstly*, and most importantly, it opened the gates for the application of Article 102 to parallelism cases. *Secondly*, it contributed to the extension if EUMR's scope to concentrations that have a potential to create market situations prone to collusion.[67] To conclude, *Italian Flat glass* case signifies a new era for the capacity to solve parallelism cases outside the scope of Article 101.

This evolution has several underlying reasons. Some scholars stressed that in order to constitute concerted practices proving the intent or so-called "mental consensus"[68] is too hard.[69] Based on this recognition, the EC and scholars began to discuss the need for alternative, better approach to oligopoly problem. The principal idea was to apply the concepts of "collective dominance" and "abuse" under Article 102, instead of using the concept of concerted practices, to oligopoly problem.[70] This idea implies that proving the abuse of collective dominance is easier than proving of mental consensus (concerted practices). In accordance to this thesis, these implications and ideas are erroneous and cannot be accepted.

Firstly, proposed reasoning incorrectly overemphasizes the significance of mental consensus significance in respect to concerted practices. The CJ's case law allows contending that mental consensus requirement is not so important as supposed by critics. For instance, in *T-Mobile* case the CJ argued that: "[…] the intention of the parties is not an essential factor in determining whether a concerted practice is restrictive […]"[71], similarly in *Dole Food Company*

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[63] Treaty establishing the European Economic Community. [1957].

[64] For instance, parent and subsidiaries legal relationships: Geradin, D., Lianos, I., *supra* note 25, p. 297-298.

[65] Filippelli, M., *supra* note 10, p. 75-77.

[66] Hawk, B. E., Motta, G. A., *supra* note 9, p. 81. Regarding this point also see: *SIV and Others v Commission, supra* note 60., § 366: "It follows that, even supposing that the circumstances of the present case lend themselves to application of the concept of 'collective dominant position' (in the sense of a position of dominance held by a number of independent undertakings), the Commission has not adduced the necessary proof. Hereby, one might see that Article 102 in principle is applicable, if Commission would have had sufficient evidence to show abuse.

[67] Also sometimes called "post-merger coordination": Filippelli, M., *supra* note 10, p. 96-97.

[68] Lorenz, M. *An Introduction to EU Competition Law.* Cambridge: Cambridge University Press, 2013, p. 86: "The concept of concerted practices requires a subjective element in a form of a common intention of the undertakings to lessen the cooperative pressure between them." This is the definition of "mental consensus."

[69] Filippelli, M., *supra* note 10, p. 85.

[70] *Ibid., p.* 80-91.

[71] *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, § 27.

case CJ again explained that: "[…] the parties' intention is not a necessary factor in determining whether a type of coordination between undertakings is restrictive […]"[72]. These cases illustrate that mental consensus is not a *sine qua non* for the determination of infringement in a form of concerted practices. One might argue that *T-Mobile* and *Dole Food Company* cases are later in time in comparison with the extension of abuse of collective dominance. However, this argument is immature because the CJ observed very early in its case law (1966)[73] that Article 101 could be infringed by object in a form of concerted practices. *Secondly*, the hardship of proving mental consensus under Article 101 might be remedied by appreciating game theory input to the understanding of rationality. Game theory as scientific discipline is based on the assumption of rationality. The meaning of rationality in competition law is that undertakings try to maximise their profit. If rationality assumption holds to every undertaking, then subjective mental consensus element seems to be redundant. If the EU courts and the EC would have been observant enough to appreciate the fact that both conscious parallelism and concerted practices stems from the same cause – rationality (see part 1.1 of this thesis), then mental consensus element from concerted practices might have been rescinded[74] rather early. Indeed, mental consensus bears no significant function for delimiting concerted practices from conscious parallelism because each commercial undertaking has the same objective – to maximise profit. Oligopolists could recognise the commonality of interests because of their interdependency in a market. Capacity and willingness to collude, as will be shown later, are especially likely if undertakings interact repeatedly. The advanced critique in relation with mental consensus element will be examined in other section of this thesis.[75]

Lastly, from historical and teleological points of views, the application of collective dominance to parallelism cases contradicts the initial legislative intent to preserve the application of Article 102 to the dominance of single economic entity or to the "group of companies".[76] It should be observed that the extension of application of Article 102 to several economic entities has been made not by the legislative, but by the judicial authorities. Naturally, the legitimacy of such extension is questionable.

Despite abovementioned arguments, the evolution of collective dominance, especially

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[72] *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21, § 118.

[73] Joined cases 56 and 58-64, *Établissements Consten S.à.R.L. and Grundig-Verkaufs-GmbH v Commission of the European Economic Community* [1966], p. 343.

[74] In accordance to this thesis, the mental consensus should be *rescinded* from the determination of concerted practices, even though CJ's case law, as shown, marginalizes the importance of subjective element of intent. This solution is stricter, than Filippelli, M. idea to *overcome* mental consensus by applying "abuse of collective dominance" to oligopoly problem, which for many reasons is immature.

[75] This thesis' suggestion significantly differs from Filippelli, M. solution, i.e. instead of overcoming mental consensus requirement by Article 102 (Filippelli, M. approach), this thesis suggest to overcome it by rescinding.

[76] Geradin, D., Lianos, I., *supra* note 25, p. 297-298.

with subsequent extension of EURM's scope to parallelism cases, remains significant. It is logical because if Article 102 prohibits an abuse of collective dominance, then the same should hold for EUMR. On this point, the question could be raised: whether two-fold system comprising of only Article 101 and EUMR, i.e. with the exclusion of Article 102, is better than the current System

Hypothesis: ***parallelism cases under the EU competition law should be dealt with two-fold system (Article 101 and EUMR), whereas the application of Article 102 (the abuse of collective dominance) to these cases should be excluded.***

The need for two-fold system. Such need is deduced from several reasons. *Firstly*, the practical difficulty to decide what to apply in parallelism cases: only Article 101, only Article 102, or both. *Secondly*, the duality of *ex post* measures (Article 101 and 102) for the same problem amounts to theoretical incoherence, redundancy and legal uncertainty. These issues will be revealed through the critical analysis of doctrinal proposals that attempt improving the System. The replacement of present System with two-fold system would obviously resolve these problems. The important task, if only Article 101 would be applicable to *ex post* oligopoly problem, would be to fill the gap because of inexistence of proper criterion for delimiting concerted practices and conscious parallelism. This thesis will attempt to provide the solution to this problem in the next chapter in order to increase the clarity and effectiveness of Article 101 concerning oligopoly problem. For now, the last step before the completion of this chapter is to review doctrinal proposals that aim to improve the System.

Critical assessment of doctrinal proposals that attempt to improve the System. First doctrinal proposal could be described as follows: oligopoly problem should be solved through EUMR and Article 102 (1st alternative). Second proposal could be described as follows: oligopoly problem should be solved through EUMR and, somewhat similar to UKMIP procedure (2nd alternative). Note that both alternatives incorporate *ex ante* and *ex post* enforcement stages and eliminate the application of Article 101 from the System.[77] This thesis attempts to critically assess both alternatives in order to defend antithetical and novel proposition that oligopoly problem at *ex post* enforcement level should be solved through the concept of concerted practices under Article 101.

Critical assessment of 1st alternative. This recent alternative is due to Filippelli, M., (2008, 2013).[78] It has several serious deficiencies. *First deficiency* derives from the fact that proving collective dominance is not sufficient in order to prove an infringement. The distinction

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[77] In accordance to this thesis, the elimination of Article 101 from the System is immature and unacceptable solution. Therefore, this thesis stands in a sharp contrast to these two doctrinal proposals.

[78] Filippelli, M., *supra* note 33, and Filippelli, M., *supra* note 10.

of existence of collective dominance and the existence of *abuse* of collective dominance is crucial. Fundamental and systematic problem of 1st alternative is that it asserts that pure interdependency (mere parallelism) of undertakings should be prohibited. This assertion is in apparent contradiction with the existing EU case law, i.e. it is a settled case law that undertakings have a right independently, intelligibly adapt to competitors' behaviour. Such behaviour does not constitute automatically anti-competitive collusion.[79] However, it could be said that the problem is semantic, but it is, indeed, substantial: if under Article 101 undertakings have the right to "adapt themselves intelligently"[80], then prohibition of such behaviour under Article 102 is paradoxical and contradictory; it distorts overall coherence of enforcement system under Articles 101 and 102. Clearly, the same behaviour cannot be regarded as rightful and unlawful at the same time. Moreover, the EU case law on Article 102 suggest that mere or pure parallelism is excluded from its scope.[81] In other words, the proponents of 1st alternative ignore that the phenomenon of parallelism is of two types: lawful parallelism and unlawful parallelism. The distinction between the two is a very important issue to which presently in the EU competition law there is no satisfactory answer. This question is central to oligopoly problem. However, it is not addressed by the 1st alternative. This problem will be examined and attempted to be solved later in this thesis.

Second deficiency could be derived from legal scholarship in conjunction with the EU case law. To understand the second deficiency one should ask what is a relation between Article 101 and Article 102 in the context of oligopoly problem. The following question is usually raised: *if one established the infringement of Article 101 (e.g. concerted practices), whether one could automatically infer that there is an abuse of collective dominance under Article 102?* Mere question of such type clearly implies that the application of Article 102 is incidental or supplementary, rather than principal issue concerning oligopoly problem. The reverse question in practice seems to be never raised. It signifies that Article 101 is somehow more relevant legal ground for initial analysis of parallelism cases, instead of Article 102. This assertion of the thesis is justified by the evolution of the System, case law, and legal doctrine. *Firstly*, short sketch of evolution of the System revealed that Article 101 has been regarded as primary legal ground to deal with oligopoly problem, whereas the concept of abuse of collective dominance gained its

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[79] For instance: Case C-40/73 *Coöperatieve Vereniging "Suiker Unie" UA and others v Commission of the European Communities* [1975] ECR 1663, § 174; *Wood pulp case, supra* note 23, § 71; C-7/95 P, *John Deere Ltd v Commission of the European Communities* [1998] ECR I-3111, § 87; Odudu, O. *The Boundaries of EC Competition Law: The Scope of Article 81* Oxford Scholarship Online, 2006, § 53, etc.

[80] *Sugar cartel case, supra* note 79, § 174.

[81] Geradin, D., Lianos, I., *supra* note 25, p. 298: "The blanket exclusion of tacit collusion from Article 102 was confirmed in subsequent cases."

significance only since 1992.[82] Thus, originally Article 101, and not Article 102, has been treated as legal solution solving oligopoly problem. *Secondly*, legal scholars identified that most cases related to collective dominance imply an infringement of Article 101. Therefore, Article 101 seems to be supreme, in terms of relevance, over the application of abuse of collective dominance under Article 102.[83] This line of reasoning confirms previously raised hypothesis: Article 102 should not be applied to parallelism cases. In order to verify the hypothesis more deeply, another supplementary hypothesis should be raised and verified:

Hypothesis: ***the extension of the abuse of collective dominance to cases that involve at least two economic entities is detrimental to the overall coherence of the System and legal certainty.***

To verify this hypothesis it is crucial to note that indicated deficiencies of abuse of collective dominance in terms of oligopoly problem have adverse effects to the EU competition law: the lack of coherence and legal certainty, which together amounts to practical application problems in parallelism cases. It was identified that the cause for these deficiencies is the duality of *ex post* enforcement measures. Thus, either Article 101 or 102 should be eliminated from the System. However, suppose that three-fold system remains. On this condition, it would becomes necessary to establish clear and unambiguous distinction between the concepts of abuse of collective dominance and concerted practices (coexistence). On the other hand, suppose the two-fold system. On this condition, the most prominent ground should be opted: either Article 101 or Article 102. In this scenario any deficiency of two-fold system, should and could be overcome by extensive judicial interpretation of either concept of concerted practices or abuse of collective dominance. Furthermore, game theory insights, as will be shown, could remedy some of parallelism problems. In any case, the relationship between Article 101 and 102 should, but is not, explained by the 1st alternative.[84]

Third observation is that the 1st alternative is based on the false assumption that proving of “mental consensus” (concerted practices) is harder than proving of an abuse of collective dominance. Suppose that the competitors adapt themselves intelligently to the market conditions. Suppose also that there is no infringement of Article 101. It is very unlikely that the abuse of

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[82] *SIV and Others v Commission, supra* note 60.

[83] Hawk, B. E., Motta, G. A., *supra* note 9, p. 79-84, the scholars noticed: “Most cases where collective dominance was found included clear evidence of an agreement or concerted practices within the meaning of Article 81 [presently Article 101].”

[84] In accordance to this thesis, it is not difficult to distinguish clearly Article 101 and 102 of TFEU if parallelism cases are being dealt only with Article 101, whereas the application of Article 102 is reserved to its original purpose, i.e. to tackle single dominance or collective dominance in terms of corporate groups. As a result, Article 102 would be restricted to cases of a single economic entity, whereas Article 101 to at least two single economic entities.

collective dominance would be proved in such case, because there is no element of collusion. Therefore, 1st alternative necessary fails at its main proposition that parallelism problem should be solved through Article 102, and not through Article 101, because of easier provability.[85] In summary, 1st alternative does not solve the problem of provability of unlawful parallelism. From a systematic point of view, EUMR at this point is much stronger legal device. Under EUMR, it is enough to show that concentration *might* create or strengthen collective dominance.[86] Nonetheless, as said, main limit of EUMR is that it cannot deal with *ex post* parallelism, which has not been anticipated *ex ante*.

In conclusion, the 1st alternative has many deficiencies and cannot be regarded as a solution to parallelism problem. Leniency programme then would be senseless with regard to parallelism because it is mainly restricted to Article 101. There is no such counterpart like leniency concerning Article 102. Ideally, the notion of abuse of collective dominance should be reserved to its initial purpose to solve the cases of abuse of group of companies', i.e. should be restricted by the concept of single economic entity. This reservation has the merit of clarity because in such way Articles 101 and 102 would be distinguished without ambiguities, i.e. Article 101 would deal with at least two independent economic entities, whereas Article 102 would deal only with the dominance of single economic entity. As a result, two previously raised hypotheses have been confirmed.

The critical assessment of 2nd alternative. This alternative is due to Hawk, B. E. and Motta, G. A. (2007).[87] These scholars advanced the idea of the enforcement system based on *ex ante* (EUMR) and *ex post* (UKMIP) devices. Scholars observed several relevant critical points towards 1st alternative: (i) case law under EUMR (e.g. *Airtours case*) cannot be automatically transposed to *ex post* application of the abuse of collective dominance under Article 102; (ii) an abuse of collective dominance is inappropriate legal device to address the "oligopoly gap" (parallelism problem). Since EUMR is rather effective and necessary to the System, this thesis will focus only on the critical assessment of the UKMIP procedure in order to verify that 2nd alternative also cannot be regarded as a proper solution for oligopoly problem.

The essence of UKMIP is that authorities might intervene any market in the absence of infringement. Authorities might apply remedies such as: rendering the information available to consumers; changing the terms of agreements between undertakings; obliging undertakings to

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[85] The idea to base *ex post* system on collective dominance is wrongheaded since, as mentioned, there is no relevant case law. On the contrary, Article 101 (concerted practices) has been applied quite extensively by the EU courts.

[86] It is not necessary for the EC to prove actual abuse because the mere likelihood of abuse is sufficient.

[87] Hawk, B. E., Motta, G. A., *supra* note 9.

divest a whole business, etc.[88] However in the absence of such procedure in the EU competition law, it would require a new legislative initiative. Further deficiency is that UKMIP's primary function is consumers' protection[89], rather than the protection of competition as such.[90]

Such short description of UKMIP is sufficient for the preceding purpose to illustrate that 2nd alternative cannot be regarded as a workable solution to parallelism. If one considers UKMIP as a proper solution solving oligopoly problem within the scope of the EU competition law, then it should be accompanied with greater explanations. It seems that Hawk, B. E. and Motta, G. A. do not seriously discuss the possibility to incorporate UKMIP procedure to the EU competition law. Successful national measures, as well as, incorporation of good practices, which proof to be efficient at a national level, nonetheless, could contribute to the public enforcement under the EU competition law as guidelines. However, if new legislative initiatives are required, then it is not a very practical solution.

In conclusion:

So-called "embryonic use" of Articles 101 and 102 with respect to oligopoly problem signals that *ex post* enforcement system must be seriously reconsidered. Recent doctrinal proposals are not adequate for resolving *ex post* parallelism problematic. The extensive critique of this thesis revealed that the CJ erroneously extended the application of collective dominance from single economic entity to two or more economic entities. The idea to use the notion of the abuse of collective dominance instead of concerted practices concerning oligopoly problem cannot be accepted because it lacks ideas: (i) how to distinguish lawful and unlawful parallelism; (ii) did not satisfactory explain the relationship between concerted practices (Article 101) and the abuse of collective dominance (Article 102); (iii) did not resolve the problem of provability of unlawful parallelism. Consequently, 1st alternative, if opted, would amount to the lack of conceptual coherence and legal certainty in the system of *ex post* enforcement concerning oligopoly problem. Couple hypotheses, based on the idea that Article 101 is, somewhat, supreme, in terms of relevance, to *ex post* oligopoly problematic, whereas Article 102 should be reserved to cases of single economic entity, have been verified and confirmed.

The significance and meaning of obtained results is as follows: this sub-chapter demonstrated that legal reasoning alone is rather limited and insufficient to solve the

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[88] Whish, R., Bailey, D., *supra* note 13, p. 565 observe that: "[…] it would require an exceptional case for these draconian remedies to be used, but it is important to be aware of the fact that the possibility does exist."

[89] For instance, to prevent harm to consumers that could be made by undertakings in a way of increasing and sustaining artificially high prices.

[90] Consumer protection is very important, but far from being unique goal of competition law. Competition law have multiple goals: "[…] the integration of the Internal Market, the protection of consumers, protection of the competitors, freedom of competition and economic efficiency.": Moisejevas, R., Novosad, A., *supra* note 11, p. 628-632.

complexities of parallelism problematic. Thus, in the next chapter of this thesis, these limitations will be attempted to be overcome by the novel use of game theory.

2. GAME THEORY PERSPECTIVE TO OLIGOPOLY PROBLEM UNDER ARTICLE 101 OF TFEU

In the first chapter of this thesis, it was justified that Article 101 is the most relevant and appropriate legal ground solving oligopoly problem at *ex post* enforcement stage in the EU competition law. Thus, in-depth interdisciplinary analysis of oligopoly problematic with the focus on Article 101 will be the key interest of the second chapter of this thesis. In particular, it will focus on the concept of concerted practices and closely related legal subjects: exchange of information, leniency, and imposition of fines.[91] The logic of this chapter is based on dividing chapter in two broad parts: legal and game theory. This division is based on intensity to which game theory is used. In this chapter, the primary question of this thesis will be answered.[92] The subjects will be analysed with the emphasis on game theory perspective. At the outset, it should be clarified that in this chapter, the examination will abstract from Article's 101 application conditions: appreciable effect on competition and trade between MS, concepts of prevention, restriction, and distortion of competition, since these subjects are not directly related to the problematic of this thesis.[93]

The notion of concerted practices. Article 101(1) prohibits collusive, anti-competitive behaviour in a form of concerted practices. The primary function of concerted practices is to catch anti-competitive behaviour, which does not fall under the notions of "agreement" and "decisions of undertakings" under Article 101(1).[94] Thus, concerted practices could be conceived as supplementary concept. Nonetheless, the concept of concerted practices is very important, since it allows solving the hardest cases under Article 101 and its purpose seems to embrace the problem of collusion. To prove and catch tacit and collusive behaviour (concerted practices) is very hard due to evidentiary and provability problems. Legal and economic understanding is necessary for handling such cases, while in-depth assessment of indirect evidence and circumstances are crucial. Hence, interdisciplinary approach of this thesis is a proper starting point in a search for effective solutions.

Semantic clarification. Before defining the legal problematic of concerted practices, it

[91] Before going into particulars, it should be noted that systematic approach to parallelism problem necessitates to extend the analysis to surrounding or interrelated legal subjects: exchange of information, leniency and fines for infringements. Firstly, exchange of information is closely related to market transparency, which is very important in order to enable the undertakings to collude. Secondly, leniency is regarded as very successful instrument for revealing cartels, thus, naturally, it should be assessed whether this instrument could satisfactorily contribute to revealing collusion. Thirdly, imposition of fines is what deters undertakings from collusion.

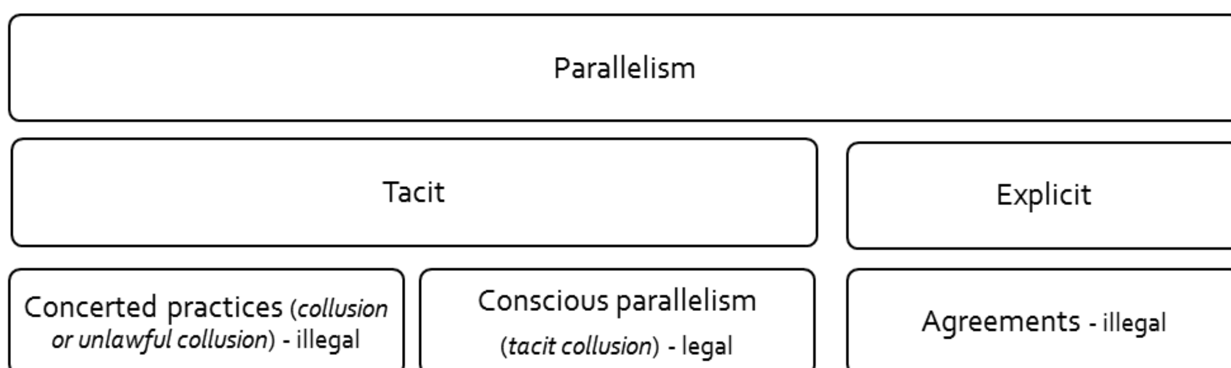
[92] To remind the main question of this thesis: whether, how and to what extent game theory is capable to solve oligopoly (parallelism) problem under Articles 101, 102 of TFEU?

[93] It is, indeed, necessary because of the limited scope of this thesis.

[94] Faull, J., Nikpay, A., *supra* note 26, § 3.103.

is important to clarify terminology because legal, economic and game theory scholars sometimes use terms with a bit different connotations. In this thesis, the "conscious parallelism" will be used as the synonym of "tacit collusion" and *vice-versa*.[95] Conscious parallelism must be distinguished from the notion of concerted practices (collusion; unlawful collusion) that is prohibited under Article 101. It was previously indicated that parallelism is of two types: lawful parallelism and unlawful parallelism. These terms are visually illustrated below:

Categories that are related to the concept of parallelism. Table (2)



2.1. Legal problems of concerted practices that are related to oligopoly problem

Legal problems of concerted practices that are related to oligopoly problem could be divided into two domains: application and conceptual (theoretical) problems. Such division is not strict and, to some extent, overlaps.[96] The need and necessity of research on concerted practices to someone might seem unjustified: one could ask whether it is indeed necessary to solve problems related to concerted practices and conscious parallelism, since under the CJ's case law the qualification between agreements and concerted practices could be imprecise.[97] This argument is immature. The need and necessity of research is not solely derived from the need of legal certainty. *Firstly*, scholars identify that collusion (concerted practices) is a boundary concept that defines the scope of Article 101(1).[98] Thus, if this concept is not clear and precise, then necessarily the scope of Article 101(1) itself is not clear. *Secondly*, the distinction must be drawn between simple and hard cases in the sense that simple cases are the ones where the existence of agreement cannot be excluded with certainty. Hard cases, on the opposite, are cases

[95] Khemani, R. S., Shapiro, M. D., *supra* note 2, p. 21-22.

[96] For instance, the principal conceptual problem is how to distinguish concerted practices from conscious parallelism, but it has practical significance as well.

[97] Bailey, D., Rose, V., *supra* note 1328, § 2.055. Also see Odudu, O., *supra* note 79, § 32. The CJ held: „In effect, while that provision distinguishes between 'concerted practices', 'agreements between undertakings' and 'decisions by associations of undertakings', the aim is to have the prohibitions of that article catch different forms of coordination and collusion between undertakings <…> Accordingly, in the present case, a precise characterisation of the nature of the cooperation at issue in the main proceedings is not liable to alter the legal analysis to be carried out under Article 81 EC."

[98] Odudu, O., *supra* note 79, Chapter 3: Collusion: Agreement and concerted practices, p. 2: "The concept of collusion plays a central role in drawing the boundary of Article 81 EC."

where no agreement has been clearly concluded among rivals. Thus, hard cases require precise and clear qualification of concerted practices. In hard cases the EC must specify and justify why concerted practices have been invoked. It is not possible to qualify behaviour as concerted practices if conscious parallelism defence could be substantiated and parallel behaviour could be explained by other reasons than collusion.[99] Obviously, it is impossible to apply neither concerted practices nor conscious parallelism, if these notions are not clear and precise. Therefore, the need and necessity of research exist. It will be firstly identified application problems and then conceptual problems related to concerted practices.

Application (practical) problems. According to Whish, R. there is at least 2 problems related to concerted practices: application difficulties and a lack of incriminating evidence that are caused by undertakings' behaviour destroying evidence.[100] These two aspects are inter-related. In particular, the lack of evidence makes the application of concerted practices difficult. Same problem by other scholars is also referred as "unproven cartel gap", which means that some cartels escape competition law enforcement because of the failure to prove it to a requisite legal standard.[101] To conclude, one of the underlying problems of concerted practices is the problem how to prove it.

It seems natural that concerted practices are harder to prove than infringements by agreement or decisions of associations, because evidences in these cases usually are non-written and non-formalised. Circumstantial evidences, tacit or explicit behaviour, the analysis of surrounding legal and economic context, these are the primary sources proving an infringement in the absence of written evidences. Supplementary nature of concerted practices does not diminish its importance. Quite the opposite – the concept of concerted practices *inter alia* to some extent embraces the phenomenon of sophisticated, strategic behaviour of competitors (parallelism). Therefore, it is very important concept to the EU competition law enforcement. It should be reminded that from an economic point of view, the adverse effects, and welfare loss in the cases of concerted practices might be the same as in explicit cartel.[102]

The fact that undertakings are likely to destroy incriminating evidence by its nature is a behavioural problem. It could be explained by rationality because less evidence means the lower

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[99] This proposition will be defended in the part of this chapter that relates to the concept of conscious parallelism.

[100] Whish, R., Bailey, D., *supra* note 13, § 3.078.

[101] Hawk, B. E., Motta, G. A., *supra* note 9, p. 71. Also on this point: Posner, R. A., *supra* note 45, p. 1578-1587.

[102] Petit, N., *supra* note 9, p. 13: "[…] tacit and express collusion yield similar adverse effects on consumer welfare. Both frustrate the various efficiencies ascribed to competitive markets – i.e., allocative (downward pressure on prices), productive (downward pressure on costs) and dynamic (upward pressure on investments) efficiency – and protected by the competition rules. This, in turn, entails that tacit collusion should a priori be addressed under the competition laws, like explicit collusion." Also: Khemani, R. S., Shapiro, M. D., *supra* note 2, p. 20: "it should be noted that the economic effects of collusion and a cartel are the same and often the terms are used somewhat interchangeably."

risk of being fined for an infringement. However, some scholars would disagree with this proposition because retention of evidences could be valuable for future leniency applications.[103] In any case, the problem of destroying evidences is acknowledged by the EC and the EU legislation. The issue is closely related to the investigatory powers conferred under the Regulation to the EC.[104] For instance, the EC might conduct sector inquiries or inquiries with respect to particular type of agreements, as well as to request or require relevant information, to conduct interviews with legal or natural persons, to conduct inspection with broad range of rights, such as to enter or seal premises, to examine records, etc.[105] These investigatory rights are credible because the EC could impose fines in accordance with Articles 23, 24 of Regulation, respectively. The EC, however, cannot apply structural remedies in the absence of infringement, such as to oblige divesting the business or to impose more lenient structural remedies, such as amending the contracts, etc.[106]

The credibility of fines is real and is evidenced by the EC's case law. For instance, in *E.ON*[107] case the fine of outstanding amount – 38 million euros has been imposed for breaking the seals. More recently, General Court in *Energetický a průmyslový and EP Investment Advisors v Commission*[108] case upheld the imposed fine of 2.5 million euros for undertaking's failure to block the email account and divert incoming emails. Hence, these examples signal that procedural infringements will be treated seriously by the EU authorities. The EC's investigatory powers and effectiveness might be analysed separately. Therefore, this short analysis suffices for preceding purposes. The conclusion is that practical problem of concealment or destroying of evidences is acknowledged and strictly fined by the EC.

***Conceptual (theoretical) problems*.** The most important conceptual problem is the difficulty to separate concerted practices (unlawful collusion) from conscious parallelism (tacit collusion). It is hard to delimit these concepts because both concepts signify mutual interdependency of undertakings. Hence, the difference between the two could be a matter of intensity of cooperation, which highly depends on the facts of s particular case, rather than depends on certain conceptual dissimilarity. The problem to separate these concepts is

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[103] In scholarship, there exists antithetical position based on leniency benefits in the case of retention of evidences: Feuerstein, S. Collusion in Industrial Economics - A Survey. *Journal of Industry, Competition and Trade* [interactive]. 2005, 5(3): 163–198 [accessed 10-01-2015].<http://link.springer.com/article/10.1007%2Fs10842-005-4868-5>, p. 191: "*Leniency programs can also contribute to solving the puzzle why firms keep so much hard evidence on cartels instead of destroying it immediately after communication* […]."

[104] Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty. [2002] OJ, L 001.

[105] *Ibid.,* Chapter IV "Powers of Investigation of Regulation."

[106] *Ibid.,* Article 7.

[107] C-89/11 P, *E.ON Energie AG v European Commission* [2012] ECLI:EU:C:2012:738.

[108] T-272/12, *Energetický a průmyslový and EP Investment Advisors v Commission* [2014] ECLI:EU:T:2014:995.

particularly important in oligopolies, which are often rather transparent markets and that creates favourable environment for collusion and subsequent adverse effects on effective competition and consumers' interests. Without clear separation between concerted practices and conscious parallelism, as said, the scope Article 101 remains ambiguous. This is why clear and precise legal standard for delimiting these concepts is necessary.

Presently in the EU competition law the primary difference between concerted practices and conscious parallelism is that concerted practices entails at least some degree of cooperation (at least mental, tacit cooperation), whereas conscious parallelism seems to denote only independent (non-cooperative) behaviour. To remind, the CJ observed in *ICI v Commission*[109] judgement that every competitor is free to change product prices, take into account competitors' behaviour, and act accordingly, but do so in a non-cooperative way.[110] In particular, undertakings have a "[…] right to adapt themselves intelligently to the existing and anticipated conduct of their competitors."[111] Therefore, it is quite unclear how to separate these concepts and that constitutes a gap.

Special problem - antithetical CJ's jurisprudence on concerted practices. The concept of concerted practices should be understood in the light of CJ jurisprudence as the authority that provides final explanations of the EU competition law, including on the concept of concerted practices and conscious parallelism. The most significant the CJ case law with a focus on principles relevant for the subsequent application of game theory perspective was selectively chosen.[112]

ICI v. Commission (1972).[113] This case is also known as *Dyestuff* case and it is significant because for the first time CJ dealt expressly with the existence of concerted practices for the first time. The dispute was related to advance announcements of dyestuff prices, which made the market artificially transparent and, consequently, allowed to fix prices in different markets.[114] Concerted practices have been upheld. The longstanding definition of concerted practices has been established.[115] The decision is important because CJ clarified that concerted practices are practical *cooperation* that substitutes the risk of competition and it could be inferred

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[109] Case C-48/69, *Imperial Chemical Industries Ltd. v Commission of the European Communities* [1972] ECR 619.

[110] *Ibid.*, § 118.

[111] *Sugar cartel case, supra* note 79, § 174.

[112] Most textbooks partially analyse the case law on concerted practices. However, without the focus on the aspects that are related to game theory.

[113] *Imperial Chemical Industries Ltd. v Commission of the European Communities, op. cit*.

[114] The prices have been increased 3 times (1964, 1965, and 1967) in different MS almost on the same day.

[115] *Imperial Chemical Industries Ltd. v Commission of the European Communities, op cit.*, § 64. The definition of concerted practices will be analysed later to retain the coherence of this thesis.

from competitors' *behaviour*.[116] Significant restriction of this concept is that *parallel behaviour* itself does not mean concerted practices, even though it might be strong evidence.[117] Finally, cases of concerted practices imply an *economic overall analysis*: the nature of product, the size, and number of undertakings, market volume, etc.[118]

Legal significance of this case is related to apparent signal to undertakings that the concept of concerted practices is a workable device to fight unlawful parallelism: simultaneous price increases and advance announcements will not be tolerated. Beyond legal significance, focused points bridge game theory and competition law in the sense that game theory, likewise competition law: analyse strategic behaviour of undertakings; to some extent implies economic analysis in order to provide the most rational strategies; practical cooperation might be the best response – solution to particular game. To conclude, the inconspicuous origins of game theory perspective to competition law could be traced in *ICI v. Commission* case in the sense that the CJ implicitly used general ideas relevant to both game theory and competition law.

Sugar cartel (1975).[119] This case is about the delivery of sugar from Belgium to the Netherlands. Belgian sugar manufacturer channelled sugar only to certain Netherlands manufacturers and concerted in a way of market sharing. Such practices were obviously beneficial to the Netherlands manufactures as they acquired the control over imported sugar. The export from Belgium to other manufacturers, i.e. to manufacturers that have not concerted, in the Netherlands has been immaterial. Such practices safeguarded the Netherlands producers because Belgian sugar was cheaper. The CJ upheld concerted practices in the form of market sharing. The main evidences were written. Significance of this case lies in strengthening and forming the core of the test for adjudicating cases of concerted practices. In conjunction with the *Dyestuff* case, according to scholars, the *Sugar cartel* case allows to deduce 4 conditions for the establishment of concerted practices: 1) *mental consensus*; 2) *a direct and indirect contact between parties*; 3) *the substitution of competition by cooperation*; 4) *a causal link between the mental consensus and the concerted practices*.[120] In these two cases, concerted practices have been upheld. However, two antithetical CJ's cases will be presented in order to show how contrasting the case law on concerted practices really is.

Cram and Rheinzink v. Commission (1984).[121] The case is about concerted practices in a

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[116] *Imperial Chemical Industries Ltd. v Commission of the European Communities, supra* note 109, § 65.
[117] *Ibid.,* § 64.
[118] *Ibid.,* § 68.
[119] *Sugar cartel case, supra* note 79.
[120] Lorenz, M., *supra* note 68, p. 86.
[121] *Compagnie Royale Asturienne des Mines SA and Rheinzink GmbH v Commission of the European Communities, supra* note 23.

form of preventing parallel imports of rolled zinc. The price of rolled zinc in Germany was higher than elsewhere. Therefore, export from cheaper jurisdictions to Germany was profitable. Two German suppliers of rolled zinc exported it to one Belgian producer for re-exportation to Egypt. However, the Belgian producer, instead of exporting zinc to Egypt, re-exported it back to Germany. After noticing such practices, the German producers, almost at the same day, ceased the deliveries of zinc to the Belgian producer. Nonetheless, concerted practices have not been upheld. The reason was that the cessation of deliveries successfully has been explained by financial relations between the Belgian producer and one of the German producers, i.e. the Belgian producer sometimes was late in payments. Furthermore, it acquired all zinc, which has been agreed, and there is no obligation to extend the contractual relationships.

Another aspect was that three German suppliers concluded the cooperation agreement: in a case of shortage of zinc, suppliers undertake to supply each other. This obligation was beyond the *force majeure* cases, i.e. it was very broad arrangement. The CJ held that such obligation is so wide and so vague in order to restrict the competition.[122] This case is significant in two respects: *firstly*, it shows that in practice it is possible to successfully use the defence of alternative explanation (conscious parallelism); *secondly*, as follows from the previous case law, the prohibited contact between undertakings is not absolute, since cooperation agreements between competitors themselves are not necessary illegal.

Wood pulp case (1993).[123] This case is about concerted practices between forty-three producers[124] of bleached sulphate pulp in a way of price fixing and exchange of information, etc. Some of producers announced future prices in the form of quarterly announcements in press between the years 1975-1981. Two expert opinions were submitted in the proceedings (1990, 1991), *inter alia*, with the question whether in the absence of alleged concerted practices, the price structure would be unified or differential. The CJ held that future price announcements itself is not an infringement.[125] The court also examined alternative explanation for parallel conduct. It was concluded that historically alleged price announcements came into existence due to the requests of purchasers because sulphate pulp is main element in the cost structure of paper manufacturing. Moreover, market itself was very transparent. Nonetheless, the Commission *inter alia*, argued that price were not an equilibrium price, which would have been a case in the absence of concerted practices. The CJ, with the aid of two expert reports, rebutted this argument and concluded that pricing could be properly explained by oligopolistic tendencies and not by

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[122] *Compagnie Royale Asturienne des Mines SA and Rheinzink GmbH v Commission of the European Communities, supra* note 23.

[123] *Wood pulp case, supra* note 23.

[124] U.S., Canadian, Swedish, Finnish producers.

[125] *Wood pulp case, supra* note 23, § 65.

necessarily by concerted practices. Therefore, parallel conduct has not been regarded as concerted practices.

The significance of this case lies in several factors. *Firstly*, CJ showed willingness to rely on experts. *Secondly*, parallelism in transparent markets, if it could be explained by oligopolistic tendencies, could be considered lawful. *Thirdly*, it is good example illustrating practical problems of proving concerted practices. Particularly, with respect to game theory, this case has been analysed by Philips, L. (1995).[126]

Obviously, there are more cases on concerted practices. For instance, in *T-Mobile*[127] case concerted practices has been established in a way of exchange of information. Notably, the *T-Mobile* case and explanations therein have been reinforced by the most recent CJ's judgement on concerted practices in a form of exchange on information in *Dole Food Company*[128] case. This very recent judgement signifies that the topic of exchange of information is actual and important.[129]

Legal definition of concerted practices. Orthodox definition of concerted practices has been defined by the CJ in the *Sugar cartel* case: "[…] form of *coordination between undertakings*, which, without having been taken to the stage where an agreement properly so-called has been concluded, *knowingly substitutes for the risks of competition*, practical cooperation between them which leads to conditions of competition which do not correspond to the normal conditions of the market."[130] Concerted practices are the forms of practical cooperation between undertakings that lead to artificial conditions of a market. Undertakings must be aware of such coordination (mental consensus). Notably, the concept of concerted practices is defined through broad terms, assumingly, in order to catch more illegal practices by reserving high margin of appreciation for the EC and the EU courts. It seems that it is done at the expense of precision and legal certainty. This notification is in line with supplementary and boundary function of concerted practices as explained previously.

Several critical points must be noted. *Firstly*, the definition of concerted practices has subjective element "knowingly substitutes". Obviously, proving subjective criterion in most cases is harder than to prove objective criterion due to lack of sufficient incriminating evidences. *Secondly*, the element of "normal condition of the market" implies economic analysis. In other

[126] Philips, L., *supra* note 32, p. 131-136.

[127] *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23,

[128] *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21.

[129] The topic of exchange of information to the extent that is related to oligopoly problem will be examined separate section of this thesis.

[130] *Sugar cartel case, supra* note 79, § 26.

words, one line of arguments in such cases shall consider proving that practical cooperation makes market conditions artificial. It was said that the CJ relied on two expert reports in *Wood pulp* case. Nonetheless, in accordance with *T-Mobile*[131] and *Dole Food Company*[132] cases, concerted practices could be applied regardless adverse "effects" to the competition. In *T-Mobile,* the CJ held that single exchange of information could constitute the infringement of Article 101(1) by object.[133] Despite that, an economic analysis is still important for the determination of fines.[134] In any case, competition law cases widely rely on economic concepts, such as single economic entity, market, supply, demand, costs, market transparency, to mention a few. *Finally*, concerted practices must be understood in the light of so-called "safe-harbours" or defences, even though the definition of concerted practices itself does not directly reflect them. The dialectic and tension between concerted practices and conscious parallelism should be explained.

Tension between concerted practices and conscious parallelism. Concerted practices cannot be established if it is possible to explain competitors' parallel behaviour by any other convincing explanation other than anti-competitive collusion (conscious parallelism). This defence is well established in the CJ case law. For instance, the CJ relied on this criterion implicitly in the *ICI vs. Commission*[135] case and explicitly in the *Wood pulp* case: "[…] it must be noted that parallel conduct cannot be regarded as furnishing proof of concertation unless concertation constitutes the only plausible explanation for such conduct."[136] In practice, if the EC has a sufficiently strong case, the competitors shall demonstrate appropriate business justification in order to avoid fines. The significance of this defence lies in two implications: parallel conduct as such is acknowledged as legal; concerted practices and conscious parallelism are separate notions that could be delimited. This is the reason why there exist a need and necessity to create the proper standard of distinction. The critical assessment of the CJ's explanation of conscious parallelism allows deducing several observations.

Firstly, the conscious parallelism is defined only negatively. It might encompass almost

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[131] *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, § 36, 39. CJ held: "[…] in order to find that a concerted practice has an anti-competitive object, there does not need to be a direct link between that practice and consumer prices."

[132] *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21.

[133] *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, § 60. CJ held: "[…] a single meeting between competitors may constitute a sufficient basis on which to implement the anti-competitive object which the participating undertakings aim to achieve."

[134] For instance, in accordance with Article 23(3) of Regulation in fixing the amount of the fine, regard shall be had both to the gravity and to the duration of the infringement. It could be argued that if there is no anti-competitive effect, then there is no serious gravity, thus, there is legal basis to impose comparably lower fine, than in cases where anti-competitive effects are substantial.

[135] *Imperial Chemical Industries Ltd. v Commission of the European Communities, supra* note 109, § 113.

[136] *Wood pulp case, supra* note 23, § 71.

anything. The EC should prove that parallelism or imitative behaviour could be explained only by concerted practices, whereas undertakings should give at least one compelling explanation why it is not the case. In other words, undertakings should substantiate a reasonable doubt. It relates, as correctly noted by Philips, L., to legal principle *in dubio pro reo*[137], which is also recognised in the EU case law.[138] It would be great to reconsider appropriate business justification in a positive manner. It would increase precision and facilitate practice in the way of narrowing the object of proof in parallelism cases.

Secondly, arguably, there is no underlying theory for delimiting lawful and unlawful parallelism. A present state could be described as a case-by-case approach. It is insufficient because it does not facilitate understanding how in principle to distinguish concerted practices and conscious parallelism. Recalling that there are two rather antithetical lines of cases of CJ, legal certainty necessitates to backup predominant case-by-case approach by theoretical underpinning. The practical merit of delimiting these concepts is that the EC's would be able to justify its decisions more substantially and arguably, as a consequence, that would reduce the number of appeals to the EU courts. On the other hand, the CJ provide some aspects, which should be taken into consideration during the assessment of concerted practices and conscious parallelism: the nature of the product, number and the size of the competitors, market size.[139] However, since the outcome of the case depends on the overall assessment, the comparable importance of these criteria might fluctuate. At the end, it amounts to the lack of legal certainty. Therefore, present CJ's explanations for delimiting conscious parallelism and concerted practices could be understood more like soft guidelines, rather than the hard and effective rules for the substantive legal analysis.

For the purpose of exhaustiveness, it is also necessary to mention some specific defences for the exchange of strategic information, i.e. so-called "public distancing".[140] The exchange of strategic information is a form of concerted practices and it infringes Article 101(1) by object.[141] Concerted practices cannot be established if undertaking expressly distances from

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[137] Philips, L., *supra* note 32, p. 148.

[138] Case T-406/08, *Industries chimiques du fluor (ICF) v European Commission* [2013] ECLI:EU:T:2013:322, § 67 also *Compagnie Royale Asturienne des Mines SA and Rheinzink GmbH v Commission of the European Communities, supra* note 23, § 18, where CJ held that suspicious cessation of delivery could be explained by explained by financial relations between respective undertakings.

[139] For instance: *Imperial Chemical Industries Ltd. v Commission of the European Communities, supra* note 109, § 66; *Sugar cartel case, supra* note 79, § 26; C-172/80, *Gerhard Züchner v Bayerische Vereinsbank AG* [1981] ECR 2021, § 14; *Wood pulp case, supra* note 23, § 72; *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, § 33, etc.

[140] Article 101(3) of TFEU or "*de minimis*" grounds will be excluded from analysis intentionally, as they are in nature more general grounds to avoid fines, than the specific defence (see below), thus is outside the scope of current analysis.

[141] For instance: *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsauto-*

the exchange of information. Scholars distinguish two ways of distancing: by expressly dissociating from the use of information or by informing competent authorities[142]. The subject matter of exchange of information will be examined later. In addition, outside the scope of this thesis are *de minimis* defence and defence under Article 101(3).[143]

In conclusion:

Antithetical CJ's case law and the absence of substantial and effective criterion for delimiting concerted practices and conscious parallelism signifies the incompleteness and the gap under Article 101. This gap forms the part of existing practical and conceptual problems that are related to the concept of concerted practices. The analysis revealed that both concerted practices and its main defence – conscious parallelism, are vaguely defined. In conjunction with the present case-by-case approach in parallelism cases, it means the lack of legal certainty. Game theory and the EU competition law seem to have common denominators.[144]

2.2. Game theory perspective on concerted practices and related subjects

This sub-chapter is subdivided into two sub-sections. In the first sub-section, *non-cooperative* game theory and its concepts will be applied with respect to oligopoly problematic. Then, in the second sub-section, *cooperative* game theory and its concepts will be applied with respect to the imposition of fines in parallelism cases.

2.2.1. Non-cooperative game theory perspective with regards to concerted practices and related legal subjects

The idea that game theory and oligopoly problem are related enables new research perspective. The application of game theory in this sub-section will be focused on the creation of a workable solution for the delimitation of concerted practices and conscious parallelism. The solution is anticipated to be of prescriptive nature. The underlying idea behind this research effort is to advance the use of game theory in the EU competition law analysis in general, and in particular, to some extent solve conceptual and practical problems of concerted practices. If it proves to be successful, the higher degree of legal certainty will be ensured. The following

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riteit, supra note 23; *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21.

[142] Ghezzi, F., Maggiolino, M. EU Concerted Practices & US Concerted Actions: Beyond William H. Page's Proposal. *Bocconi Legal Studies Research Paper No 2302535* [interactive]. 2010: 1—30 [accessed 01-02-2015].<http://ssrn.com/abstract=2302535 >, p. 13.

[143] Recently, both *de minimis* and Article 101(3) of TFEU problematic thoroughly has been analysed by Puksas, A. *Reikšmingos įtakos konkurencijai ir prekybai sąlyga.* PhD thesis. Social sciences (law). Vilnius: Mykolas Romeris University, 2014.

[144] For instance, the use of economic analysis and the use of notions - "practical cooperation", "behaviour", "intelligently adapt", "normal conditions of the market."

hypothesis will be verified in this sub-chapter:

Hypothesis: ***concerted practices and conscious parallelism could be properly distinguished by creating a criterion that incorporates a solution(s) from game theory.***

Game theory as concerns oligopoly problem in the EU competition law is highly unstudied. This thesis will attempt to fill this gap, but it should be mentioned that Phillips, L. has already suggested the solution for delimiting concerted practices and conscious parallelism with the use of *non-cooperative Nash equilibrium*[145] (NNE) in every sub-game of *repeated* market game that is worth to consider. The Phillips, L. use of non-cooperative Nash equilibrium means that in order to justify parallel behaviour, undertakings must prove that there is no cooperation among them. There should also be no punishment mechanism.[146] Obviously, if there is a punishment mechanism between competitors, the one could infer that collusion is the case as long as the main purpose of a punishment mechanism is to stabilise collusion. Therefore, the existence of a punishment mechanism implies the existence of collusion. On the opposite, if there is no punishment mechanism and everyone acts independently, then collusion is not a case. In accordance to this thesis, NNE, in conjunction with the existence of a punishment mechanism as a core criterion for distinguishing concerted practices from conscious parallelism, is good, but not a sufficient, solution. Therefore, in this section of the thesis it will be examined whether better solution could be derived.

Cooperative Nash equilibrium (CNE) vs. non-cooperative Nash equilibrium (NNE). Before justifying the novel solution of this thesis, it is essential to clarify the distinction between cooperative (CNE) and non-cooperative (NNE) Nash equilibrium. CNE refers to a situation where players choose a strategy to cooperate (collude), rather than to non-cooperate (purely compete). Both types of equilibrium might coexist in the same *non-cooperative game*. Importantly, non-cooperative games do not strictly exclude cooperation. For instance, non-cooperative game theory, *inter alia*, deals with the *self-enforcing* cooperation.[147] Thus, CNE in non-cooperative games is possible and attainable. Clearly, if the attainment of NNE is demonstrated, then, from legal a point of view, there should not be any competition concerns because NNE signifies effective competition. Despite that, more subtle and harder cases are

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[145] Philips, L., *supra* note 32, p. 5: “This equilibrium is defined under the assumption that each firm behaves as “competitively” as possible in the sense that it maximises its own profit individually, yet without ignoring competitors’ actions.”

[146] *Ibid., p.* 124-125.

[147] Self-enforcing cooperation is cooperation, which does not need external force in order to be enforced. For instance, as classical example, the external force is state, which ensures that the contracts will be enforced. In the context of EU competition law, importantly, cartel agreements are unenforceable and void *ab initio* under Article 101(2). Thus, self-enforcing cooperation is of particular importance to the EU competition law, because the cooperation among competitors might be self-enforceable without illegal cartel agreement, or even tacit.

related with the attainment of CNE.[148] In these cases, it is not immediately apparent that there is no collusion. In such cases, it is necessary to evaluate the specifics of particular case and take into consideration various parameters.[149] These parameters to some extent will be analysed later. Nonetheless, it is very important to have a proper core standard that would be capable to distinguish in what cases CNE should be treated as lawful and in what cases prohibited. It is also important to justify the following proposition before suggesting the criterion for delimiting concerted practices and conscious parallelism.

Proposition: ***even though competitors have attained <u>cooperative</u> Nash equilibrium (CNE) in infinitively repeated market game, it does not necessary evidence the existence of concerted practices.***

It is important to note that this proposition goes beyond Phillip's, L. proposal, as described previously, in the sense that not only attained non-cooperative Nash equilibrium (NNE), but also cooperative Nash equilibrium (CNE) could signify lawful (conscious) parallelism, rather than collusion (concerted practices).

This proposition is of general validity. One could argue and ask why the EU competition law in principle should not prohibit all types of parallelism that allows undertakings to attain supra-competitive profits that are signified by the attainment of CNE. Several arguments would suffice in order to justify the validity of the proposition. *Firstly*, the proposition is justified by the consideration of rationality. The idea is that competitors cannot be held liable in cases where cooperation could be achieved because of rational behaviour, provided it has been achieved without unlawful contact between the colluding undertakings.[150] A parallel behaviour could be a natural phenomenon in transparent and tight oligopolies with high entry barriers, stable demand and cost structure. This idea is indeed captured and legalised through the concept of conscious parallelism. As shown, parallelism not necessary leads to the infringement of Article 101. Besides that, conscious parallelism has roots in competitors' recognition of their strategic interdependence. As shown, the EU case law on concerted practices grants the right for competitors to behave rationally and adapt intelligently to a market situation or rivals behaviour. Hence, the consideration of rationality seems to be recognised and, to some extent, respected in the EU competition law. Nonetheless, a present state is not satisfactory in two respects: i) very little guidance is given to what extent intelligent or conscious parallelism should be allowed; ii) what is theoretical underpinning of allowing conscious parallelism at all and why indeed it must

[148] To understand what does it means to attain CNE, it should be clarified and simplified that the attainment of CNE could refer to the attainment of *supra*-competitive profits (e.g. monopoly profits).

[149] For instance, market transparency, the number of competitors that are active in the market, symmetry between competitors in various respects, etc. For the indicative list see Annex I of this thesis.

[150] For example, without illegal exchange of sensitive information, without hiding collusion in the contracts, etc.

be allowed? *Secondly*, market inefficiency shall be considered. Markets might be inefficient without any fault on the side of competitors.[151] For instance, in *Wood pulp* the EC argued that the equilibrium price must have been lower in the absence of concerted practices. However, the CJ rejected such argument by saying that the price level could be explained by oligopolistic market tendencies.[152] This might be interpreted as a suggestion that in oligopolies prices could be at a higher level than in other markets. Therefore, it is very close to saying that CNE, in terms of prices, is legal in oligopolies if these markets are transparent. *Thirdly*, conscious parallelism itself has many limitations of external nature – such as the threat of potential entrants, the instability of demand, etc., and of internal nature – such as non-symmetric internal growth, technological innovation, incentives to cheat or deviate from parallelism, etc. These constraints often might be enough to leverage the need of intervention by the EU competition law and authorities.[153]

The proposition, however, has certain caveats and limits. *Firstly*, the proposition itself in no case could be interpreted as legalisation of cartels or concerted practices. The proposition is based on the statement "not necessarily". This implies that CNE might, but not necessarily is, lawful.[154] Indeed, in majority of cases it is hard for competitors to attain CNE without cartel agreement or collusion. Judgements by the EC and the EU courts in every case that relates to parallelism are based on careful analysis of non-exhaustive list of circumstances (the overall assessment). Thus, various special circumstances such as market transparency, the number of competitors, etc. should be assessed in order to infer concerted practices. *Secondly*, the proposition itself does not say in what cases CNE should be regarded as legal. Therefore, it is necessary to go beyond the proposition and introduce some precise elements that could potentially define and precise lawful parallelism. This limitation will be overcome later. *Thirdly*, the proposition is limited to *infinitively repeated games*, i.e. games where the end of the game is unknown and competitors interact with each other numerous times. This limitation stems from the idea that in *one shot games*, or *finitely repeated games*, for instance, in prisoner's dilemma game; the method of backward induction proves that cooperation is unlikely and irrational.[155]

[151] Suffice to say that creation of a new product might lead to creation of a new market and, at least for a certain time, to monopoly.

[152] *Wood pulp case, supra* note 23, § 126.

[153] Posner, R. A., *supra* note 45, p. 1591: "There are […] quite good reasons why even in the absence of legal penalty an oligopolist might decide not to restrict output: inability to predict rival's reactions and fear that they would cheat."

[154] For instance, cooperative Nash equilibrium might be reached in express or tacit cartels, which due to obvious reasons cannot be allowed.

[155] It is necessary to assume that the particular finite stage of the game exists, from which the backward induction could begin: Maschler, S., Zamir, S., Solan, E., *supra* note 3, p. 258: "Without this assumption, the process of backward induction, cannot begin […]." However, the game itself should not necessary be the finite game. This

Despite these caveats, the practical and theoretical merits of proposition are evident: (i) the proposition goes beyond guiding scholar in the field – Phillips, L. proposal; (ii) the proposition does not contradict present EU courts' practice; (iii) the proposition incorporates the concept of Nash equilibrium into the field of the EU competition law. Theory on concerted practices and conscious parallelism in such way is reinforced; (iv) the concept of CNE makes the analysis of parallelism more precise. Game theory perspective to the EU competition law in literature is not unequivocally appreciated. Critical thoughts to game theory perspective as concerns oligopoly problem should be revised.

The opposition to game theory solutions as regards concerted practices. At the deeper level, game theory perspective to parallelism relates to the debate between two conflicting policy approaches: pro-interventionist and anti-interventionist.[156] The thesis is not dedicated to solving this debate. However, to some extent, it is necessary to focus on main arguments asserted by pro-interventionists that criticize the reinforcement of defences derived from game theory concerning concerted practices. Main arguments are the following: "flawed moral justifications", "overstated remedial difficulties".[157]

Firstly, as for flawed moral justifications, critics suppose that since competition authorities deal with rational competitors' behaviour in inefficient markets, the appeal to rationality (conscious parallelism) is not valid. It is supposed that in every competition case authorities deal with rational behaviour in inefficient markets. Therefore, in no case rationality could be a ground to "fabricate new antitrust immunity doctrines"[158]. It is contended that every rational behaviour implies active and, to some extent, purposive behaviour that facilitates cooperation. This is why "no fault" approach, as suggested by game theory, cannot be accepted.

This line of arguments is not plausible. It completely ignores present EU case law – it is well established that conscious parallelism is a proper justification of parallelism.[159] Therefore, it is not the case of "fabrication" of new antitrust immunity doctrines as supposed. Moreover, the critique is too exaggerated. Suppose that the critique is correct, then logical conclusion would follow that competitors shall act irrationally in order to make market efficient or, failing to do so, they would risk facing intervention and fines that would be imposed by competition authorities.

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limitation will be clarified in the part of the thesis related to infinitively repeated games.

[156] In the sense that pro-interventionists argue for state intervention to inefficient markets (for example, through competition law and its prohibitions), whereas anti-interventionists argue against state intervention.

[157] These arguments are due to: Petit, N., *supra* note 9, p. 18-20.

[158] *Ibid., p.* 19.

[159] For instance, *Imperial Chemical Industries Ltd. v Commission of the European Communities*, *supra* note 109, § 113 and *Wood pulp* case, *supra* note 23, § 71.

Essentially, the critique introduces general obligation to act irrationality in oligopolies.[160] Famous U.S. scholar Turner D. F. advanced a viewpoint that workable remedies that might possibly sustain irrational behaviour do not exist.[161]

Secondly, Turner's point is criticised on the supposition that *ad hoc* behavioural and structural remedies are sufficient to oblige oligopolists to act in accordance with a competition law. This critique, again, is not plausible. At the outset, the critique ignores the fact that empirically it is hardly possible to estimate correctly the scope and frequency of parallelism phenomenon. Many markets are oligopolistic and it is obvious that in these market undertakings are interdependent and behave strategically. Suffice to remind that the EC and the EU courts dealt with many cases on concerted practices.[162] Despite that, the number of unrevealed concerted practices obviously is not known. To emphasize, even explicit cartels could last for decades unnoticed. For example, in industrial bags sector, the EC held that some undertakings have been in the cartel over 20 years.[163] Therefore, one could have a rational doubt whether the EU competition law are very effective in terms of revealing concerted practices, not to mention proving of it. Moreover, Philips, L. explained so-called "indistinguishability theorem", which supposes that sometimes authorities cannot correctly assess the cases of concerted practices due to informational disadvantage *vis-à-vis* undertakings.[164] In sum, it is hardly true that *ad hoc* or structural remedies can overcome Turner's point.

Finally, from a policy point of view, the legal nature of Articles' 101 and 102 is prohibitive, not regulative.[165] The principal aim of these articles is to prohibit and deter anti-competitive practices. Thus, the EU competition law in the context of oligopoly problem should not contradict competitors' freedom to behave rationally and independently, even it implies a certain degree of tolerable cooperation. In conclusion, the described critique is insufficient to rebut this section's proposition of the thesis.

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[160] Some scholars criticise observe and criticize such irrational obligation: Whish, R., Bailey, D., *supra* note 13, p. 566: "[…] it would be absurd to forbid firms from behaving in a parallel manner if this is a rational response to the structure of the market […] it would be strange indeed if competition law were to mandate that firms should behave irrationally, by not acting in parallel, in order to avoid being found to have infringed competition law."

[161] Turner, D. F. The Definition of Agreement under the Sherman Act: Conscious Parallelism and Refusals to Deal. *Harvard Law Review* [interactive]. 2010, 75(4): 655—706 [accessed 02-03-2015].<http://www.jstor.org/stable/1338567>, p. 669: "But such an injunction [prohibiting a price fixing], read literally, appears to demand such irrational behaviour that full compliance would be virtually impossible."

[162] It was said previously that in accordance to this thesis since 1956 the CJ alone dealt with at least 11 cases on concerted practices. The most recent one is *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21.

[163] Case COMP/38354, *Industrial bags* [2005] OJ, L 282, p. 41–46.

[164] Philips, L. (editor) *Applied industrial economics.* Cambridge: Cambridge University Press, 1998, p. 273: "[…] informational disadvantage – which I think is very real […] can make the collusive outcome of the game indistin-guishable from the non-collusive one."

[165] Whish, R., Bailey, D., *supra* note 13, p. 566: "Competition authorities should not be price regulators; they should be guardians of competitive process."

S-C-P as the alternative to game theory solutions concerning concerted practices. Some scholars argue that game-theoretic models of oligopoly are indeterminate and too technical to be capable to help competition law.[166] It is contended that game theory does not provide much insight to policy makers on the problem of conscious parallelism.[167] Thus, S-C-P paradigm[168] is regarded as a better perspective to oligopoly problem than game theory. U.S scholar Dibadij, R. advances this viewpoint.[169] His main propositions will be critically examined.

First proposition related to "conduct" is that the conduct of competitors: price wars and various facilitating practices are the indicators of collusion. Stress is put on anti-competitive intent of competitors. Such proposition is not plausible. *Firstly*, the existence of price wars is insufficient in order to infer collusion because CNE, as discussed previously, could signify lawful (conscious) parallelism. *Secondly*, the intent requirement should be eliminated from the concept of concerted practices. Suffice to remind here that infringements by object are not based on the assessment of intent. *Second proposition* related to "structure" is that the phenomenon of collusion springs from the oligopolistic market structure.[170] This proposition forms the core of S-C-P paradigm and, to some extent, is accepted by game theorists. It is quite clear that parallelism is mainly the problem in oligopolies. Nonetheless, there are empirical evidences that the oligopolistic market structure itself is not necessary or sufficient cause of collusion. For instance, in *Dyestuff* case it was 17 undertakings charged with concerted practices[171], whereas in *Wood pulp* case it was 43 undertakings[172] *Third proposition* related to "performance", according to the Dibadj, R., is the most underutilized. "Performance" is the most important variable in the legal assessment of collusion. The main idea is that abnormally high profits indicate collusion. Stress is put on the effect of a conduct, rather than on the intent of competitors. Furthermore, prices, output, costs, and demand should be assessed in these cases. *Finally*, it is contended that emphasizing "performance" rather than "conduct" phase, lawful and unlawful parallelism might

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[166] Dibadj, R. Conscious Parallelism Revisited. San Diego Law Review [interactive]. 2010, 3(47): 590—636 [accessed 12-11-2014].<http://ssrn.com/abstract=1124969>, p. 609-611.

[167] *Ibid*.

[168] To remind, in the first chapter of this thesis it was argued that S-C-P does not correctly address the question of causality of oligopoly problem.

[169] Dibadj, R., *op. cit*. Since both U.S. and EU competition laws are concerned with parallelism phenomenon, the same could be applied as regards the EU competition law: Ghezzi, F., Maggiolino, M., *supra* note 142, p. 2: "[…] the current EU and US experiences are not very different one from the other."

[170] It was already argued in the first chapter of this thesis that oligopoly structure is not a cause for oligopoly problem. Nonetheless, in must be admitted that to large extent parallelism is a problem of oligopolistic markets, even though there is no causal relationship between the two.

[171] *Imperial Chemical Industries Ltd. v Commission of the European Communities, supra* note 109, § 7. Overall, undertakings were in separate member states and were not in oligopoly. However, considering separately, national markets were oligopolistic, see § 78.

[172] *Wood pulp case, supra* note 23, § 3.

be disentangled.[173]

It seems that although S-C-P is helpful, but it is not a panacea for parallelism problematic. It is easy to understand that there might be many indicators of collusion (e.g. oligopolistic structure or abnormally high profits). However, the S-C-P perspective itself is not sufficient to solve oligopoly problem because supra-competitive profits or oligopolistic market structure alone does not guarantee the existence of collusion. The insufficiency of S-C-P is illustrated by rather paradoxical incorporation of NNE concept in the explanation that price wars indicate collusion, i.e. S-C-P in this case itself relies on game theory. S-C-P, with the emphasis on "structure" and "performance", rather than competitors' intent, could be useful in facilitating game theory perspective to oligopoly problematic. Game theory ideas such as NE in comparison to S-C-P suggestions are more advantageous because of their general validity *vis-à-vis* incoherent and insufficient indications of collusion that are offered by S-C-P. In conclusion, the theory on delimitation of lawful and unlawful parallelism should be based on game theory, while S-C-P could precise and solidify it.[174]

2.2.1.1. Novel criterion for delimiting lawful and unlawful parallelism

Analytically there are two ways to improve the concept of concerted practices: *first*, to improve the notion of concerted practices directly, i.e. to refine the notion itself; *second*, to improve the antithetical notion of conscious parallelism, i.e. to strengthen a proper understanding of "what are not concerted practices". Such methodological approach is used in the CJ practice as well.[175] It is simple to understand why it is so: if someone could appreciate what are not concerted practices, then one can understand that all remaining logically is concerted practices. This thesis will try to focus to the middle of these approaches. However, it seems that the indirect approach to concerted practices will be more relevant in further analysis.[176] Visually, the placement of the problem is shown below:

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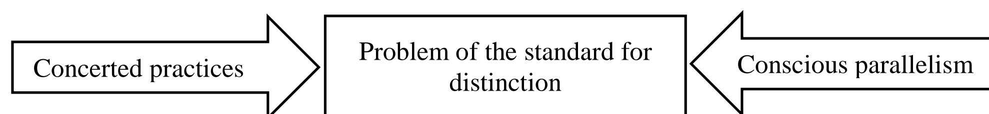
[173] Dibadj, R., *supra* note 166, p. 612-630.

[174] Dibadj, R., *supra* note 166, p. 624. Dibadj, R. himself agrees that conduct-structure-performance is not capable to be "grand theory" of parallelism: "The best economic work on conscious parallelism thus reflects careful, often unglamorous, econometric study-not grand theory."

[175] By a way of analogy, this method for clarification of notions could be observed in CJ case law with respect to notions "consumer" and "trader": C-59/12, *BKK Mobil Oil Körperschaft des öffentlichen Rechts vs. Zentrale zur Bekämpfung unlauteren Wettbewerbs eV* [2013] ECLI:EU:C:2013:634, § 33: "[…] the meaning and scope of the concept of 'trader' which is used in that directive must be determined in relation to the related but diametrically opposed concept of 'consumer' […]."

[176] Note that previously it was criticized the negative definition of conscious parallelism. However, it should be clarified that here is no contradiction in the thesis position, since in this thesis it will be tried to advance the notion of conscious parallelism positively with the use of game theory.

The problem how to delimit concerted practices and conscious parallelism. Table (3)



Throughout this chapter it will be verified whether the novel solution of this thesis, provided below, for properly distinguishing concerted practices from conscious parallelism with the incorporation of NE concept in the EU competition law could be adopted. The solution is as follows:

Suggested criterion (SC)*: if cooperative or non-cooperative Nash equilibrium could be justified without direct or indirect contact between undertakings, taking into consideration: (i) market transparency, (ii) market concentration, and (iii) other relevant circumstances, concerted practices under Article 101 cannot be constituted.*

Two ideas underlie SC: *first*, the incorporation of game theory solution concept of NE with the intention to delineate concerted practices from conscious parallelism; *second*, flexibility, and open-endedness of SC. Due to overall consistency the second idea will be explained first.

SC is assumed being open-ended in the sense, that it might evolve alongside the evolution of game theory or economic understanding of parallelism. The concept of NE is a cornerstone of SC. However, NE alone is insufficient to delineate concerted practices from conscious parallelism. This is the primary reason why additional sub-criteria are necessary, such as: absence of contact between competitors, market transparency, and market concentration. These elements should be understood as pre-requirements of collusion.[177] Theoretical origins of market concentration stems from S-C-P, whereas market transparency is widely accepted to be the pre-requisite of collusion.[178] Therefore, these two elements form the stable part of SC.[179] The idea of open-endedness is enshrined in SC's expression of "other relevant circumstances". It signifies not only the need for overall assessment in every case, but also practical possibility, through case law, to incorporate additional elements in SC, i.e. to make SC more precise, on condition that new elements prove to be confirmed as necessary precondition of collusion in the disciplines of game theory and economics. In such way, SC could ideally evolve up to the point where theoretically, all relevant sub-criteria would be established in SC and therefore SC would be completed. Critics might say that the idea of open-endedness is too naive or unrealistic.

[177] In particular: sufficient information is necessary for both legal and illegal parallelism, whereas the increase of number of competitors increases the likelihood of parallelism as number of competitors increases, the likelihood of collusion.

[178] For instance: *Imperial Chemical Industries Ltd. v Commission of the European Communities, supra* note 109, § 102-103; *Wood pulp case, supra* note 23, § 105, 109, 126; *John Deere Ltd v Commission of the European Communities, supra* note 79, § 67, etc.

[179] Feuerstein, S., *supra* note 103, p. 192. Adverse effect of market transparency is recognised as "clear result."

However, in accordance to this thesis it would be too immature. The idea of this thesis is based on the observation that in a scholarship, there is generally no consensus and complete understanding what set of causes allows inferring collusion.[180] Suppose furthermore, that critics contend that SC does not have any practical significance because overall assessment should be performed in every case. The conviction of this thesis is that SC is much better than just the simple observation of overall assessment. SC has a merit in recognising and differentiating between settled and unsettled indications of collusion that presently are too ambiguous to be directly incorporated in SC. It should also be separately analysed in what set of cases SC could be applied.

Infringements by object and effect. It should be clarified that SC embraces both infringements of Article 101 by object and effect. As for infringements by object, one could verify this statement by considering two CJ's cases: *T-Mobile* and *Dole Food Company*.[181] Presently most cases that infringe Article 101 by object in the context of oligopoly problem are related to an exchange of information. Thus, SC would catch these practices since it prohibits "direct or indirect contact between undertakings". It should also be clarified that SC still holds if it would be necessary to prove mental consensus requirement in order to prove concerted practices. It is easy to see that mental consensus are implied in the category of "contact", which is part of SC.[182] Indeed, it is hard to conceive that in the absence of the direct or indirect contact between undertakings, the EC could prove concerted practices. In conclusion, SC is valid independently from previous considerations on mental consensus.

Cases when NNE would not be attained. One might consider the role of non-cooperative Nash equilibrium (NNE) in SC. It should be reminded that NNE signifies non-cooperative behaviour that means competitive behaviour. Thus, competitors could prove NNE and that would suffice in order to justify the non-imposition of fines on them because there would be no infringement. That would also mean that NNE could be used in cases that are more straightforward where undertakings could justify non-cooperative behaviour. Thus, it seems that NNE function is limited to comparably easy cases.

Cases when NNE and CNE would not be attained. Suppose another case where neither CNE nor NNE has been attained. Such case would be indeed outside of the scope of SC due to

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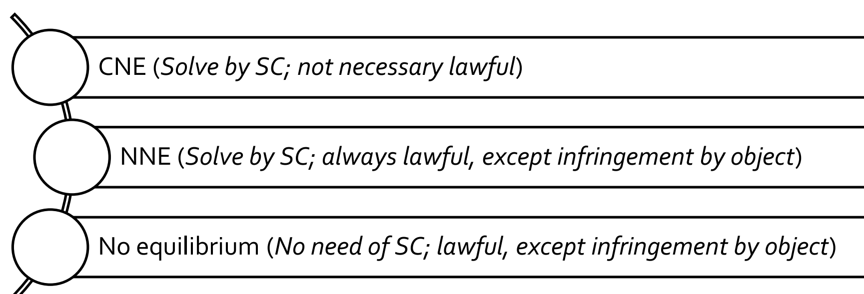
[180] For that regard, see sub-chapter 1.1. The indicative list of circumstances that could facilitate collusion is provided in the Annex I of this thesis.

[181] *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21. Especially good example is *T-Mobile* case where the CJ considered that single contact between undertakings in conjunction with the exchange of information amounted to the infringement of Article 101 by object.

[182] Whish, R., Bailey, D., *supra* note 13, § 3.082: "[…] the consensus need not be achieved verbally, and can come about by direct or indirect contact between the parties."

obvious reasons. If equilibrium has not been reached, then there is no adverse effect to competition. On the other hand, the infringement by object under Article 101 could still be the case. Authorities then could satisfactorily deal with the situation in accordance with existing case law on exchange of information. In sum, all possible cases in terms of attainment of CNE or NNE under SC are visually showed in the illustration below[183]:

The visualisation of cases where SC could be applied. Table (4)



In conclusion, the primary area of application of SC is hard cases, where CNE (e.g. supra-competitive profits) has been attained. The construction of SC relies on previously verified proposition, i.e. that CNE not necessarily signifies collusion. It means that SC is valid to the extent of validity of that proposition.

Nash equilibrium (NE) – the cornerstone concept of Suggested criterion (SC). NE is the cornerstone concept of SC for several reasons.[184] *Firstly*, the existence of NE in any market game is guaranteed.[185] However, the caveat is that the attainment of NE is not guaranteed. In most markets, competitors interact infinitely many times without prior knowledge when the interaction would end.[186] The existence of CNE could be proved by the so-called "*Folk theorem*" (if players are sufficiently patient).[187] Hence, since the existence of NE is guaranteed, NE could be regarded as general benchmark criterion. There are several caveats and inherent limitations of the use of NE in SC: (i) SC does not say anything on how to find it; (ii) game theory could not predict with certainty which equilibrium would be reached (if reached at all); (iii) the calculation of concrete equilibrium could be very hard and it requires large amount of information.

[183] Note that the illustration is abstracted from the infringements by object, which could satisfactorily be dealt outside the scope of SC, as previously said.

[184] Scholars have recognized the merit of Nash equilibrium. For instance: Philips, L., *supra* note 32, p. 10-11: „[…] it should be clear that antitrust authorities, lawyers, judges and experts cannot continue to ignore the concept of a Nash equilibrium (which is at least as much a theoretical possibility as the equality of price and marginal costs), though I know that much work remains to be done on practical questions."

[185] Maschler, S., Zamir, S., Solan, E., *supra* note 3, p. 151: "Every game in strategic form G, with a finite number of players and in which every player has a finite number of pure strategies, has an equilibrium in mixed strategies" (for finite games). So-called Folk theorem also proves that in infinitively repeated games Nash equilibrium also exists provided players discount the future sufficiently little: Fudenberg, D., Maskin, E. The Folk Theorem in Repeated Games with Discounting or with Incomplete Information. *Econometrica.* 1986, 54(3): 533-554, p. 537.

[186] The word "interaction" is here used to denote various practices such as setting the prices, deciding on the output, responding to the changes of the demand and competitors' behaviour, responding to technological changes, etc.

[187] Fudenberg, D., Maskin, E., *op. cit*.

Therefore, from practical point of view, it would be, indeed, necessary to use game theory experts or economists to do the calculus, since judges are primarily legal experts and not economists; there could also be infinitely many CNE. Despite these limitations, the importance of CNE for the assessment of parallelism cases is retained if one appreciates the fact that the EC or the EU courts under SC would not be able to infer automatically concerted practices in cases where CNE have been attained. The *Wood pulp* case could illustrate that the incorporation of CNE in SC is not trivial or impractical. As said previously, the EC in *Wood pulp* relied on the argument that the price level were above non-cooperative equilibrium level (i.e. the EC implied the existence of CNE). However, the CJ rejected such argument by saying that oligopolistic tendencies, market transparency, and other circumstances justify pricing above NNE. Hence, in the *Wood pulp* case the EC would have been instructed by SC to make more in-depth analysis of the case, instead of simply relying on the idea that the prices in the market were too high, i.e. above NNE.[188]

Secondly, NE signifies the essence of a strategic interdependence of competitors and rationality. By definition, if NE has been attained, then no one would want to deviate unilaterally.[189] In other words, it is the peak of rational competition in a given case. Since, as said, the obligation to behave irrationally is not workable, the legalisation of NE, to some extent, is inevitable. The rationality consideration is a basis for the critical assessment of mental consensus requirement under the concept of concerted practices.

Proposition: ***mental consensus element should be eliminated from the notion of concerted practices under Article 101*.**[190]

The proposition above could be verified in the following way. Suppose that rationality assumes profit maximising objective. In this case, each rational undertaking has the same objective. It should be considered whether it does mean that sufficient *mental consensus* exists. It seems that it would be too abstract, thus insufficient to prove mental consensus to the requisite legal standard. Nonetheless, the intent requirement must be rescinded since it is too artificial to assume that undertakings might have as objective *per se* to infringe competition law or its objectives.[191] Competition law could be seen as the obstruction for the undertakings to obtain

[188] This has been recognised and criticizes by Philips, L., *supra* note 32, p. 119: "It is therefore unfortunate that the European Commission uses price parallelism as a proof of tacit collusion, as in the 'Wood Pulp' decision […]."

[189] For instance, by setting lower prices or increasing the scope of production, etc.

[190] Not all scholars would agree such statement. For instance: Filippelli, M., *supra* note 33, p. 12: "[…] consciousness is indefectible component of coordination, because oligopolists are at least aware of their conduct and of result they intend to rationalize." This proposition fails to recognize that both conscious parallelism and concerted practices are "conscious." Therefore, it cannot be substantive element in terms of distinguishing between the two.

[191] The opposition to the proposition could be based for instance on Lithuanian case law. One might argue that it is not important the subjective intent of the parties: the Supreme Administrative Court of the Republic of Lithuania

higher profits. Thus, everyone has the same objective to maximise profits and no one want to infringe competition law and get a fine. Hence, it seems that mental consensus requirement is more or less empty and artificial.[192] From a philosophical stance, one could even ask how legal entities could have intent at all.[193] Indeed, natural persons could have intent because they are rational beings, but legal entities could be understood as legal fictions.[194] Dominant way to solve this matter is the derivation of legal entity's intent from natural person's intent. In accordance to this thesis, it is not the satisfactory solution. *Firstly*, suppose that undertaking's decision makers change often, thus one should admit that intent is unstable. *Secondly*, suppose that large undertakings have several decision makers, thus the multiplicity of natural persons' intents exist. What is the criterion to choose the proper intent in such case? *Thirdly*, corporate decisions might be invalidated on many grounds, including on the ground of *ultra vires*. One might wonder whether the intent that originates from *ultra vires* behaviour could and should be the intent that is important as regards concerted practices. These and many other not straightforward questions could be raised because of mental consensus requirement in the notion of concerted practices. Another relevant idea is the succession of rights, which is applicable if rights and obligations are transferred to legal successor.[195] Indeed, supposing that intent originates from natural persons, then it seems logical to introduce personal or even criminal liability under the EU competition law. It would directly tackle the subject from which the intent arises.[196] Scholars that advance S-C-P approach criticizes mental consensus requirement as well.[197] Moreover, to some extent, existing case law allows to consider the dismissal of mental consensus requirement, by a way of analogy to a "motive requirement", which *expressis verbis* has been excluded in CJ's *Zuchner vs. Bayerische*[198] case. Mental consensus requirement in concerted practices, in accordance to

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26 March 2008 decision in administrative case *BĮ UAB "Interlatas" et al. v. The Competition Council of the Republic of Lithuania* (case No A-444-1433-11) explained that the subjective, conscious intent does not have any significance as regards concerted practices; the intent should be objective and based on economic context.

[192] Essentially, one could opine that there is no principle difference in terms of intent between the cases of communication, such as: "if you increase the price, I will increase it too" and the case of tacit increase of prices, which, in terms of effect, is the same. In substance, in both cases the idea to increase prices springs from a rationale to maximize profit.

[193] The problem of intent of legal persons is especially important in criminal law. For instance, see: Colvin, E. Corporate personality and criminal liability. *Criminal Law Forum* [interactive]. 1995, 6(1): 1— 44 [accessed 01-03-2015].<link.springer.com/article/10.1007/BF01095717>.

[194] Orts, E. W. *Business persons: a legal theory of the firm.* Oxford: Oxford University Press, 2013, p. 9: "Debates about whether business firms are simply "legal fictions" created by the state or "real entities" that exist independently as institutions trace at least to classical Roman times."

[195] The example of succession of rights, including liability for infringement: *Compagnie Royale Asturienne des Mines SA and Rheinzink GmbH v Commission of the European Communities, supra* note 23, § 9.

[196] It is a case in USA: Feuerstein, S., *supra* note 103, p. 190. In the EU competition law presently, there is no personal liability of natural persons.

[197] Dibadj, R., *supra* note 166, p. 612-615.

[198] *Gerhard Züchner v Bayerische Vereinsbank AG, supra* note 139, § 17.

this thesis, mislead even academy.[199] It should be emphasised that the reasoning above is limited to the considerations of oligopoly problem and concerted practices. The same reasoning cannot be applied to the notion of "agreement" under Article 101. So-called "meeting of the minds" has deep roots in contract law and the EU competition law should not become the platform for the harmonisation of national contract law. In conclusion, if mental consensus requirement would be rescinded from concerted practices, the distinction between concerted practices and agreements under Article 101 would be reinforced. The final remark is that NE is a proper substitute for the mental consensus – the concept is general, objective, and theoretically justified. Hence, the proposition of this section has been verified.

The use of NE should not be overstated. NE concerning SC has serious limitation: an abstract existence of NE is not sufficient to prove that it is actually the case. Thus, the problem of provability of concerted practices, even without mental consensus requirement, remains unresolved. However, SC still is useful because it narrows down the object of proof in parallelism cases. The EC would be required to prove that the only way to attain CNE was collusion. On the opposite side, the undertakings would be required to prove alternatively: (i) equilibrium has not been attained; (ii) NNE has been attained; (iii) CNE has been attained in a manner compatible with SC. To conclude, SC appears to be practically workable in terms of shaping the boundaries and clarifying the object of proof in parallelism cases.

Suggested criterion's structural elements: direct and indirect contact; market transparency; market concentration. Direct and indirect contact, market transparency as structural elements of SC should be analysed in conjunction because both are related to the topic of information sharing. Suffice to say here that direct and indirect contact thereof should be understood in terms of communication: written, oral or any other form of communication between competitors under SC would be prohibited. On the other hand, "indirect contact" does not extend to rational responses[200] that are attributable to natural market transparency. The primary problem with information sharing between undertakings is that the information could serve two opposing functions: consumers and competitors could use the information at the same time. In the absence of the public information, collusion would be less likely, but the rational decision-making by consumers would be paralysed as well. The CJ's recognise market transparency as an important factor in the overall assessment of parallelism.[201]

[199] The whole idea of applying Article 102 to oligopoly problem is predicated on assumption that due to mental consensus requirement in concerted practices, the best way to fight parallelism is under "objective" abuse of collective dominance, rather than concerted practices. Suppose that mental consensus is no longer requisite of concerted practices, then all project to apply Article 102 to parallelism problem collapses.

[200] For instance, increase and decrease of prices or output, etc.

[201] For instance: *Imperial Chemical Industries Ltd. v Commission of the European Communities, supra* note 109, §

As for SC's element of market concentration, it is important to remind that the parallelism essentially is the problem of oligopolistic markets. There is no precise numerical answer when market should be regarded as oligopoly and when not. Game theory is capable to suggest certain insights. The famous result is due to game-theoretician, a Nobel Prize winner in economics Selten, R. (1973)[202]: *"four are few and six are many*". In principle, Selten's model contends that in oligopolies with 4 members it is rational to collude, whereas with at least 6 members, it is irrational, and with 5 members, it depends. Selten's model abstracts from any restrictions of competition law and assumes perfect information. However, from empirical point of view parallelism might be a case in market with greater number of competitors.[203] Furthermore, like market transparency, market concentration has been also observed as important factor to overall assessment by the CJ.[204] In the assessment of horizontal mergers, the EC recognised that coordination between few undertakings is more likely.[205] The observation of strategic variables such as prices or output of production is much easier when there are few competitors; thus, the element of market concentration, to some extent, is connected with the SC's element of market transparency.

SC, as noted previously, left some place for the consideration of case related circumstances. This is needed because of the complexity of parallelism cases, i.e. hard and fast rule would not be adequate solution. It should be reminded that the determination of NE and the assessment of "other related circumstances" might require an expert analysis. For instance, in at least two parallelism cases: the *Dyestuff* and *Wood pulp* cases expert reports were scrutinized by the CJ.[206] However, the actual use of expert reports is rare.[207] In accordance to this thesis, expert

102-103; *Wood pulp case, supra* note 23, § 105, 109, 126; *John Deere Ltd v Commission of the European Communities, supra* note 79, § 67, etc.

[202] Selten, R. A simple model of imperfect competition, where 4 are few and 6 are many. *International Journal of Game Theory* [interactive]. 1973, No 2(1):141-201 [accessed 10-12-2014].<http://link.springer.com/article/10.1007%2FBF01737566>.Also see: Philips, L., *supra* note 32, p. 23-38.

[203] Recall *Wood pulp* and *Dyestuff* cases: 43 and 17 undertakings have been accused of infringement.

[204] For instance: *Sugar cartel case, supra* note 79, § 174; *Wood pulp case, supra* note 23, § 71; *John Deere Ltd v Commission of the European Communities, supra* note 79, § 87; Odudu, O., *supra* note 79, § 52-53, 61, etc.

[205] Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings. [2004] OJ, C 031, § 45.

[206] *Imperial Chemical Industries Ltd. v Commission of the European Communities, supra* note 109, § 79; *Wood pulp case, supra* note 23, § 31-32.

[207] Geradin, D., Lianos, I. (editors) *Handbook On European Competition Law. Enforcement and Procedure*. Cheltenham: *Edward Elgar*, 2013, p. 70-71: "It should be remembered that the possibility of engaging a court-appointed expert has rarely been used by the European courts" [with the references therein]. The right of the CJ to appoint an expert is established in the Rules of Procedure of the Court of Justice. [2012] OJ, L 265, Article 70. Notably, the EC has internal Economic Advisory Group on Competition Policy (EAGCP) which with the Chief Competition Economist: "[…] provides independent guidance on methodological issues of economics and econometrics in the application of EU competition rules.": The European Commission's official website, *The Chief Competition Economist* [accessed 28-03-2015].<http://ec.europa.eu/dgs/competition/economist/role_en.html>. Interestingly, the department of the Chief Competition Economist works from 2003. In year 2005, the office comprised of 10 specialists, all with Ph.D. in industrial organisation, which is highly related discipline to the

reports should be used more often, the cost of such practice, in comparison with high fines and potential damage to consumers in parallelism cases, seems to be immaterial. So far, the analysis did not consider the importance of repeated interaction between competitors. Because parallel behaviour presupposes repeated interactions, the game theory of infinitely repeated games should be analysed.

Infinitely repeated games with regard to concerted practices. Infinitely repeated games could be generally described as simple or one-shot games repeated many times.[208] It is important that the end of game is unknown to participants because so-called "backward induction" method for finding Nash equilibrium (NE) strategy profiles cannot be used.[209] This is the fundamental difference between finite and infinite games. Nonetheless, NE exists in both type of games. It should be noted that it is not exactly precise to understand infinitely repeated games as simple repetition of the stage (one-shot) game. Baird, G. D., Gertner, H. R., Picker, C. R. observed: "[…] mere repetition of strategic interaction does nothing to allow cooperative pricing."[210] The key insight is to understand that repetition without definite end of the game could qualitatively change the optimal strategies of participants of the game. Suppose that one-shot market games are based on prisoner's dilemma, thus cooperation in such case is unlikely.[211] On the other hand, if undertakings are uncertain about the end of the game, then collusion could be a dominant strategy.[212] All cartel agreements and cases of concerted practices are empirical expressions of this idea. In conclusion, infinitely repeated games are very relevant to oligopoly problematic.

Furthermore, one of the most important concepts in the infinitely repeated games is *Folk theorem* because it proves that in infinitely repeated prisoner's dilemma games, there exists at least one NE strategy, which is more beneficial than static (one-shot) NE strategy that is

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discipline of game theory: Röller, H. L., Buigues, A. P. The Office of the Chief Competition Economist at the European Commission [interactive]. May 2005, [accessed 02-02-2015].<http://ec.europa.eu/dgs/competition/economist/role_en.html>.

[208] Main concepts of repeated games could be found at very recent game theory textbook written by Maschler, S., Zamir, S., Solan, E., *supra* note 3, In particular, chapters 13 and 14 are relevant.

[209] It is necessary to assume that the particular finite stage of the game exists, from which the backward induction could begin: Maschler, S., Zamir, S., Solan, E., *supra* note 3, p. 258: "Without this assumption, the process of backward induction, cannot begin […]." However, the game itself should not necessary be the finite game.

[210] Baird, G. D., Gertner, H. R., Picker, C. R., *supra* note 39, p.167.

[211] The fine example of one-shot market game that is based on prisoner's dilemma is single public procurement of unique big project (e.g. building a nuclear power plant in Lithuania). In this case all bidders would like to win the project, thus the cooperation between them is unlikely.

[212] So-called "bid rigging" could be understood as particular type of this problem. The definition of bid rigging is provided in Khemani, R. S., Shapiro, M. D., *supra* note 2, p. 16: "Bid rigging is a particular form of collusive price-fixing behaviour by which firms coordinate their bids on procurement or project contracts […] Bid rigging is one of the most widely prosecuted forms of collusion." For instance, if the undertakings compete infinitively many times, e.g., undertakings participate in same type of public procurements numerous times for building nuclear power plants in Lithuania, Latvia, Estonia, France and in other EU counties, and then the collusion could possibly be dominant strategy. The recent CJ's example of bid rigging is C-557/12, *Kone AG and Others v ÖBB-Infrastruktur AG* [2014] ECLI:EU:C:2014:1317.

non-cooperate. Close nexus between *Folk theorem*, infinitely repeated games, SC and oligopoly problematic exist: *Folk theorem* proves that in infinitely repeated games cooperative Nash equilibrium (CNE), as used in SC, exist and undertakings through parallel behaviour could possibly attain it. Therefore, *Folk theorem* appears as theoretical justification of the incorporation of CNE concept in SC. *Folk theorem* is primarily existential theorem, i.e. it proves the existence of particular set of equilibriums, which are above, in terms of payoffs, static (one-shot) NE. The generic problem is that this set might indeed have several equilibriums. Therefore, it is necessary examine whether it would have any implication to the EU competition law enforcement, if SC would be employed in practice.

The problem of multiplicity of equilibriums in infinitely repeated games and its effect on SC concerning concerted practices. Scholars observe the problem of multiplicity of equilibriums in infinitely repeated games. For instance, Faudenberg, D. and 2014 Nobel Prize laureate in economics Tirole, J. observed: "[…] repetition can allow "cooperation" to be an equilibrium, but it does not eliminate the "uncooperative" static equilibria, and indeed can create new equilibria which are worse for all players than if the game had been played only once."[213] It means that some equilibrium strategies could be more beneficial than the others in repeated games. The abovementioned problem is general to game theory because, obviously, unique solutions are inherently more apt for prediction, than solutions with multiple equilibriums. The multiplicity of NEs means that it is hard to predict with certainty which equilibrium would be, should be, and actually is played. The *Folk theorem* does not solve this problem. In the context of parallelism problematic within the scope of Article 101, the multiplicity of equilibriums means that both non-cooperative and cooperative strategies could be equally rational. At first sight, it seems that it call into question the basic idea behind SC, i.e. to satisfactorily distinguish concerted practices and conscious parallelism. Nonetheless, the multiplicity of NEs does not have serious implication for the SC and its potential workability, provided it would be used in practice. This statement could be verified by considering that presently concerted practices must be the only rational explanation of parallel behaviour; otherwise, parallel behaviour could be regarded as conscious parallelism.[214] Thus, if both CNE and NNE are equally plausible, concerted practices cannot be established. Hence, with respect to competition law, the multiplicity of equilibriums is not genuine problem, even though it is serious problem in game theory. It seems that from a legal point of view more important question is whether particular

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[213] Fudenberg, D., Tirole, J. *Handbook of Industrial Organization. Chapter 5. Noncooperative game theory for industrial organization: An introduction and overview* [interactive]. Elsevier, 1989 [accessed 10-12-2015] .<http://www.sciencedirect.com/science/article/pii/S1573448X89010083>, p. 278.

[214] For example: *Wood pulp case, supra* note 23, § 71.

equilibrium has been attained with or without collusion.

A fine illustration of the multiplicity of equilibriums is Cournot duopoly game. Suppose two undertakings compete with respect to quantities of production. They should get the profit (π_c), which is above profits in perfect competition (π_p), but below profits of monopolistic setting (π_m), i.e. $\pi_p < \pi_c < \pi_m$. Thus, non-cooperative Nash equilibrium (NNE) in Cournot game does not bring monopoly profits. In other words, it is not Pareto optimal outcome. It is easy to conceive that competitors might have an incentive to collude in a way to gain, at best, monopoly profits (so-called "joint maximisation of profits") and therefore end up in cooperative Nash equilibrium, (CNE). The prohibition to collude is obvious legal obstruction for the attainment of higher profits than π_c. Monopoly profits could be possibly gained by entering into a cartel agreement, but it has serious limitations: *first*, cartel agreement cannot be enforced judicially; *second*, competition authorities could rather easily trace and punish cartel behaviour if there are direct evidences of cartel agreement. Thus, the conclusion of agreement is more risky, than behaving in a way concerted practices where the defence of conscious parallelism could be invoked, and, furthermore, the hardship of proving concerted practices would be on the side of competition authority. If competitors appreciate this, it is likely that they would rather concerted practices, which is more sophisticated way to collude, rather than conclude anticompetitive agreement.

At this point, it should be mentioned that if SC would be employed in practice, it would mean that the EC should argue that undertakings must have behaved non-cooperatively because it reflects normal competition under static (one-shot) NE or, alternatively, that CNE, without collusion, could not have been attained. On the opposite side, undertakings should argue that static (one-shot) NE has been attained, or, alternatively that CNE has been attained lawfully and could be explained by mutual interdependence in the oligopolistic market. It should be reminded that to prove the attainment of CNE is insufficient in order to decide on the legality of parallelism because explicit cartel agreement could match CNE as well. If CNE has been proved by the EC, undertakings should provide convincing explanation, backed-up with evidences, and argue that *self-enforcing* CNE was the case, i.e. CNE has been attained without unlawful contact between the undertakings, as required under SC.

It appears that in order to verify the appropriateness of SC for its practical application, it is crucial to consider whether it is possible to cooperate tacitly without direct or indirect contact, i.e. in compliance with independent behaviour principle established by CJ[215] It will be argued in

[215] The definition of concerted practices implies requirement of independent behaviour. The principle of independent behaviour is well established in CJ's case law, for instance, in C-199/92 P, *Hüls AG v Commission of the European Communities* [1999] ECR I-4287, § 159 the CJ held: "The criteria of coordination and

the sub-chapter of exchange of information that it is possible. Suffice here to say that this possibility depends on the following criteria: *first*, cooperation for undertakings must be more profitable than deviation (individual rationality); *second*, deviation should be punishable with credible punishment;[216] *third*, the market should be sufficiently transparent; *fourth*, there should be not many competitors in the market.[217] In conclusion, the analysis of this section verified that the multiplicity of NE in infinitely repeated games is not fatal as concerns SC's practical applicability. The analysis now is turned back to its primary aim: the justification of inclusion of CNE into SC.

Folk theorem as justification of CNE's inclusion into SC. The inclusion of CNE into SC would be impossible if CNE's existence cannot be guaranteed. Thanks to *Folk theorem*, CNE is proved to exist in any infinitely repeated game, provided players are sufficiently patient. Therefore, it is necessary to understand the basics of *Folk theorem*.

Folk theorem, as noted previously, is a solution concept of infinitely repeated games, which allows determining the existence of NE. This theorem proves that in principle cooperation could be equilibrium strategy in infinitely repeated games. The game of prisoner's dilemma is of no exception. For instance, in the previous illustration of Cournot duopoly game, CNE would be attainable as well.[218] There are many forms of Folk theorem. Selectively, it will be analysed the "discounted Folk theorem"[219] because it is the most relevant for the aim of this thesis. The word "discounted" reflects the general idea that players value future payoffs less than "today's" payoffs. Therefore, the *discounted Folk theorem* allows to model real market situations better than Folk theorems without discount factor. Formally, the *discounted Folk theorem* is defined as follows:

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cooperation must be understood in the light of the concept inherent in the provisions of the Treaty relating to competition, according to which each economic operator must determine independently the policy which he intends to adopt on the market.*"* The principle of independent behaviour also has been emphasized in other cases: *Sugar cartel case, supra* note 79, § 173; *Gerhard Züchner v Bayerische Vereinsbank AG, supra* note 139, § 13; *Wood pulp case, supra* note 23, § 63; *John Deere Ltd v Commission of the European Communities, supra* note 79; Odudu, O., *supra* note 79, § 62; C-209/07, *Competition Authority v Beef Industry Development Society Ltd and Barry Brothers (Carrigmore) Meats Ltd.* [2008] I-8637, § 34, *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, § 32.

[216] The punishment herein shall be understood as playing the worst static Nash equilibrium strategies.

[217] Essentially these ideas, as mentioned is recognised in *ex ante* merger cases in the EC's guidelines: *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings*, *supra* note 205, § 41.

[218] Philips, L., *supra* note 32, p. 99: "[…] In Friedman's repeated game, the vector of collusive quantities <…> of the one-period game turned out to be sustainable as a Nash equilibrium of the overall non-cooperative game. These quantities can be joint profit-maximising ones […]. This is the basic intuition behind the different versions of the "Folk theorem.""

[219] Fudenberg, D., Maskin, E., *supra* note 185, p. 534.

The formal definition of the Folk Theorem. Table (5)

$for\ any\ (v_1, \dots, v_n) \in V^*, if\ players$ $discount\ the\ future\ sufficiently\ little, there\ exist\ a$ $Nash\ equilibrium\ of\ the\ infinitely\ repeated\ game\ where, for\ all\ i,$ $player\ i's\ average\ payoff\ is\ v_1\ (Folk\ theorem)$[220]

Firstly, to understand *Folk theorem*, one should be aware of so-called minimax value (reservation value). The minimax value is the minimum payoff the player is guaranteed to receive, provided he acts rationally (best responds) to the other players' punishing behaviour, i.e. other players try to punish the first player as hard as possible (minimax him). *Secondly*, one must also understand the distinction between the types of payoffs in the definition. Suppose that V denotes the set of aggregate minimax values of all agents in the game. For instance, in a Cournot duopoly game, a Cournot output is minimax value. Suppose that V^* represents the set of all agents' average payoffs higher than V. In a Cournot duopoly game, for instance, the output tends to the point of joint profit maximisation. Thus, $V^* > V$, i.e. V^* Pareto dominates V. In this way, the intuition that for undertakings' collusion in the market could be more profitable than pure competition is captured. *Finally*, notation v_n represent n agent's average payoff, which is higher than $n's$ payoff would be if he would play NNE. The set of payoffs $(v_1, \dots, v_n)$ correspond to agents' so-called *individually rational strategies*, i.e. strategies that give to the particular agent at least as much as his minimax value.

The proof of *Folk theorem* could be found in many game theory textbooks. The particular version above is taken from Fundenberg D., Maskin E. (1986).[221] The proof that every repeated game has NE solution with higher than minimax values, provided players are sufficiently patient, is significant. *Folk theorem* applies notwithstanding how many players there are in the game. Thus, the incorporation of CNE concept into SC is possible as a general solution.

Discount factor. The primary insight in *Folk theorem* above is a discount factor, which, by convention, is identified as δ. In game theory, discount factor could have several important functions. *Firstly*, discount factor captures the idea that competitors value future profits less than today's profits. *Secondly*, it indicates players' level of patience. Players assumingly are more patient if they know that they would interact with each other for a long time. The discount factor should be sufficient to make collusion sustainable. The sustainability of collusion will be

[220] Fudenberg, D., Maskin, E., *supra* note 185, p. 537.
[221] *Ibid.*

analysed in the next sub-section.

For now, suppose that all competitors have a discount factor between $0 < \delta < 1$. Consider two extremes: if $\delta = 0$, it is equal to say that there is no patience; therefore, cooperation is impossible, as everyone has an incentive to play NNE strategy (i.e. everyone would choose to non-cooperate). If $\delta = 1$, it means that agents are perfectly patient, i.e. they do not discount future. Hence, in the last case the idea of discounting makes no sense. Notice that discount factor could be equal to 1 only in the first round of the game.[222] More formally, in a first period $t_1$which denote the part of total history of the game $t_1 \in \sum_{t1}^{\infty} t_n$. Payoffs in the first period are today's payoffs; therefore, the discount factor does not apply.

In conclusion:

In this sub-section, non-cooperative game theory perspective allowed to construct the criterion for distinguishing concerted practices from conscious parallelism (Suggested criterion). In this way, theory on concerted practices and conscious parallelism became more complete. The need and gap of such standard in the EU competition law by SC, if used in practice, could be remedied.

Several conclusions have been attained. *Firstly*, the hypothesis that concerted practices and conscious parallelism could be properly delimited by the use and incorporation of game theory solutions (e.g. *Nash equilibrium (directly), Folk theorem (indirectly)*) has been proved. *Secondly*, proposition *even though undertakings have reached cooperative Nash equilibrium (CNE) in infinitely repeated market games, it does not necessary evidence concerted practices*, has been justified. *Thirdly*, the conjunction of legal and game theory arguments justified the elimination of mental consensus element from the notion of concerted practices. Constructive critique provided in this sub-section suggests the substitution of mental consensus element by more objective concept of Nash equilibrium. *Fourthly*, *Folk theorem*, to some extent, theoretically explains why in practice undertakings risk to enter into collusion in order to maximise their profits. *Fifthly, Folk theorem* justifies inclusion of CNE into SC.

Several limitations of game theory perspective concerning concerted practices have been recognised. *Firstly*, the predictive power of game theory is limited. Infinitely repeated games have many equilibriums, it is not obvious which, if at all, would be attained. This limit stems the absence of the unique solution for infinitely repeated games. If one supposes practical application of SC, it seems that it would be more beneficial for undertakings, rather than the EC because any plausible doubt regarding the dispute of which equilibrium and in what way it has

[222] More formally, in a first period t_1 which is part of total history of the game denoted by: $t_1 \in \sum_{t1}^{\infty} t_n$. Payoffs in the first period are today's payoffs, thus discount factor does not apply.

been attained, would mean that the EC did not manage to prove concerted practices to the requisite legal standard. *Secondly*, pure application of game theory with respect to parallelism is not sufficient for the distinction of parallel behaviour in terms of its legality. Inevitably, constructed SC incorporates several structural elements: the absence of contact between undertakings, market transparency, market concentration and, if necessary, non-exhaustive list of other circumstances, i.e. to some extent SC incorporates already existing, but not systematized, ideas in the EU case law and doctrine in order to make SC workable.

2.2.1.2. Fundamental problem for colluders: how to sustain and enforce collusion

Cooperation or collusion between undertakings must have the properties of *sustainability* and *enforceability*; otherwise, it is unlikely that cooperation is a rational strategy for oligopolists. The need to examine the properties of sustainability and enforceability of cooperation is necessary, because if cooperation cannot be sustained or enforced, then there is no need to examine oligopoly problem because it is unlikely that this problem would occur. Hence, the subject of this section is essential for coherent and systematic examination of legal problems that stem from parallelism in oligopolies.

The sustainability of cooperation. Every cartel, especially tacit one, faces the sustainability problem.[223] The problem might be succinctly stated as follows: *how one undertaking, which cooperates could be certain that the other undertaking would not cheat?*[224] The topic of the sustainability of cooperation will be analysed to the extent, which is necessary in order to justify SC. The analysis is divided in two parts: *firstly*, the necessary conditions for cooperation, which comprises of a sufficiently high discount factor and the assessment of cooperative payoffs versus non-cooperative payoffs; *secondly*, the enforcement of cooperative behaviour.

Discount factor (δ) must be "sufficiently" high. It mainly depends on three elements. *Firstly*, on the amount of gains received from defection. The more particular competitor could gain from deviating, the higher δ shall be. *Secondly*, on the difference between the payoffs of CNE and NNE. The higher the difference, the larger δ shall be. *Thirdly*, on the probability that a

[223] The EC based on T-342/99, *Airtours plc v Commission of the European Communities* [2002] II-2585 judgement in its guidelines: *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings*, *supra* note 205, § 41 recognised three conditions for sustainability of coordination: (i) capacity to monitor to a sufficient degree adherence to cooperation; (ii) existence of effective deterrence mechanism in case of deviation; (iii) existence and influence of countervailing factors (e.g. buyers' power, threat of entry, etc.). It is a proof that game theory insights are recognised by the EC and EU courts in *ex ante* stage as regards collective dominance.

[224] This is large and interesting topic. The thesis obviously will not cover all peculiarities on the subject. Nonetheless, it is clear that in practice the sustainability of cooperation depends on many criteria which are not necessary susceptible for an easy analysis. For instance, how to measure trust between competitors?

game will continue in a next period. The higher the likelihood that the game will continue, the lower δ is sufficient. These elements are rather abstract and, indeed, themselves depend on other variables. For instance: on market transparency, on market concentration, on trust between competitors, on capacities of undertakings, etc.[225] A caveat here is that colluders must know each other's discount factors, otherwise they cannot be certain that the rival would not deviate. Therefore, it seems that the element of sufficient information and market transparency is of essential importance in the context of SC.

*Cooperative payoffs must be higher than non-cooperative payoffs***.** This requirement is a *condition sine qua non* and presupposes the multiplicity of NEs. It must be for the interest of each player to choose CNE rather than NNE equilibrium. The mere existence of NE, which Pareto dominates another NE is not sufficient to guarantee cooperation between rivals. Credible punishments and sufficient information for monitoring deviations are necessary. Hence, the subject of enforcement of cooperation and sufficient information are crucial.

Suppose circumstances have changed and sustainability of cooperation has been lost. Then reasonable competitor would likely choose cheating, rather than sticking to unreasonable collusion.[226] Many factors could influence this situation. For instance, demand shocks, technological innovation, market share changes, legislative changes, etc. Therefore, the application of infinitely repeated games is quite limited, especially when modelling dynamic markets. Collusion in sectors susceptible for intensive technological progress, research, and development could be less likely prone to collusion, since innovation could make the sustainability of cooperation impossible.[227] The enforcement of cooperation is pre-requisite for its sustainability; therefore, it should be examined as well.

The enforcement of cooperative behaviour. Any cooperation faces the problem of enforcement. From legal standpoint, it is clear that cartel agreements cannot be legally enforced. Article 101(2) establishes: "Any agreements or decisions prohibited pursuant to this Article shall be automatically void.*"* This rule has important implications to game theory considerations on cooperation. Suppose the legalisation of cartels. In such case, deviation from cooperation would be interpreted as a breach of a contract. Subsequently, deviator would be punished for a breach by imposing relevant remedy in judicial or arbitration proceedings. However, since legal enforcement of cartels is not possible, undertakings face a problem how to sustain cooperation by other mechanisms. The ideal is to do so in a compatible way with the legal requirements. In

[225] It seems that δ to some extent depends on the list of criteria indicated in Annex I of this thesis.

[226] This idea is, indeed, central to leniency mechanism. Leniency will be analysed in other section of this thesis.

[227] For instance: *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings*, *supra* note 205, § 45.

scholarship the notion of *self-enforcing cartels* emerged[228], meaning that cartel (including concerted practices) could be enforceable despite the fact that from legal standpoint these agreements or practices cannot be enforced. By a way of analogy, the derivation of the idea of the *self-enforcing conscious parallelism* emerges. There are two necessary conditions for "self-enforcement": *first*, deviation must be detectable (cf. market transparency); *second*, the punishment must be credible.

Detectable deviations. Effective enforcement mechanism of collusion must be based on capacity to detect deviations. For that purpose, capacity to acquire relevant information about rivals' behaviour is important. Suppose that one of the colluders did not have any post-collusive information about its rivals, and then obviously he is in no position to detect whether his rivals cooperated or deviated. Therefore, cooperation in such setting is unlikely. Mere capacity to acquire information is, nonetheless, not sufficient. A lot depends on the quantity and quality of information. For instance, if colluding undertakings cannot acquire sufficient amount of reliable information, the problems of so-called „false positives" or "false negatives" might be the case. It is easy to conceive that colluders from acquired information in such cases might wrongfully conclude that their rivals deviated from initial cooperation, but the true cause could have been, for instance, a shock in demand. To summarise, an effective enforcement mechanism, with implied requirement of capacity to monitor potential deviations, is closely related with capacity to obtain sufficient amount of reliable information about rivals' post-collusive behaviour. Not surprisingly, Article 101 prohibits the exchange of information by object.[229]

Credible punishments. Second requirement for cooperation to be plausible is the existence of credible punishments. The threat of punishment is credible only if it is economically beneficial for the punisher to punish. It being the case, suppose that punishment is compatible with NNE. The derivation of such punishment is possible from the previously examined multiplicity of NE in infinitely repeated games. Logically, if CNE strategies exist, then NNE strategies also exist. If punishment is compatible with NNE, then such punishment could be understood as the shift from CNE to NNE (e.g. grim trigger strategy). It is easy to verify that NNE punishment is credible. It derives from NE concept itself, i.e. any strategy compatible with NE requirement is rational (i.e. best response). To illustrate this point, suppose that in Cournot competition, competitors attained CNE, but one or some undertakings suddenly deviated. In such case, credible punishment strategy for a punisher would be to set the output of production at the

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[228] For instance: Ayres, I. How Cartels Punish: A Structural Theory of Self-Enforcing Collusion. *Yale law school Faculty Scholarship Series* [interactive]. 1987, Paper 1549: 295—323 [accessed 10-11-2014].<http://digitalcommons.law.yale.edu/fss_papers/1549/>,

[229] For example: *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23,

level of Cournot output, instead of setting collusive output.

Another way to solve the credibility of punishment is to incentivize punishment. To illustrate the point, it should be reminded that one of the premises of cooperation is that it must be beneficial for colluders. On this supposition, it is possible to conceive that the existence and sustainability of collusion itself could be interpreted as a reward.[230] This should hold because in the absence of any credible punishment mechanism, collusion as such is unlikely. Therefore, inherently if cooperation is beneficial, then it is for the interest of undertakings to punish for the sake of sustention of cooperation. It means that any colluder, provided he is still interested to retain cooperation, should punish deviations, otherwise, collusion would become unsustainable and not all possible benefits from the cooperation would be attained. If this logic is correct, then an undertaking, which thinks about deviation, should not expect to be allowed to cheat without subsequent punishment. As a result, the cooperation is sustained. Suppose to the contrary that the punisher does not or cannot punish deviator. Deviator might then consider that punishment is not credible and subsequently deviate again. Non-punishment is conceivable, for instance, in cases where punisher does not have enough capacity to produce more (e.g. in Cournot competition). It is interesting to observe that non-punishment could causes repeated deviations; since repeated deviation inflicts loss to other undertaking that sticks to cooperation, it is rational instead of cooperating to choose punishment; otherwise, repeated deviation is likely. Such reasoning aims to show that the possibility of repeated deviation, indeed, could be understood as a threat or punishment from the perspective of undertaking that abides to initial collusion. Therefore, abiding undertaking in this way is incentivized to punish in order to pre-empt repeated deviations. This reasoning, to some extent, reminds the idea from criminal law that "inevitability of punishment" effectively deters crimes.

It is important to consider why deviation from collusion in principle could be beneficial. One theoretical reason could be deduced from the observation that market games are based on a prisoner's dilemma.[231] This means that cheating is beneficial provided other party cooperates.[232]

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[230] EC recognised somewhat similar idea: *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings*, *supra* note 205, footnote 70: "The expectation that coordination may break down for a certain period of time, if a deviation is identified as such, may in itself constitute a sufficient deterrent mechanism."

[231] To emphasize on importance of prisoner's dilemma, and since in USA antitrust law the same problem of conscious parallelism exist, the USA Supreme Court decision is relevant (*Northern Pacific Railway Co. v. United States* [1958]. , 356 U.S. 351, 354): "The Sherman Act was designed to be a comprehensive charter of economic liberty aimed at preserving free and unfettered competition as the rule of trade. It rests on the premise that the unrestrained interaction of competitive forces will yield the best allocation of our economic resources, the lowest prices, the highest quality, and the greatest material progress, while at the same time providing an environment conductive to the preservation of our democratic political and social institutions." Indeed, it is plausible to interpret existence of such free and self-regulatory competition because of the fact that market games are games of prisoner's dilemma, where fierce competition ideally shall prevail due to dominance of the strategy non-

On first sight, it seems to suggest that cooperation in market games is more an exception than a rule. Indeed, it is rarely easy to reach CNE because of various internal and external constrains.[233] However, repeated behaviour is the key element that allows sustaining cooperation in a long run. It was previously discussed that *Folk theorem* proves that cooperation, in principle, could be more beneficial than non-cooperation in repeated prisoner's dilemma. To summarise, the credibility of punishment is main element, which guarantees that all colluders would have an incentive to stick to collusion.

Game theory offers many punishment strategies, which competitors could chose in infinitely repeated games in order to sustain collusion. The focus will be on two rather simple strategy profiles: the "Grim trigger" and the "Stick and Carrot".

Grim trigger strategy. This strategy means that upon observed deviation, deviator will be punished forever (more precisely, until the end of the game). The phase of punishment starts at the next period after deviation. In other words, deviation triggers an infinitive punishment:

1) $Cooperate\ if\ everyone\ cooperates, otherwise,$
2) $Deviate\ forever.$

This strategy is strict in the sense that it suggests an infinitive punishment upon single deviation. Primary limitation of this strategy is that return to cooperative path is not possible, since, by definition, punishment phase lasts until the end of a game. The underlying intuition here is that deviation imposes severe and irreparable loss of trust between colluding undertakings. This strategy reflects the early stage of evolution of game theory. More sophisticated strategies that allow milder strategies, i.e. strategies based on finite punishments and subsequent reversion to cooperative path, evolved only later. Nonetheless, it is worth to note that the strictness of Grim trigger strategy, on the other hand, makes it very strong strategy in the sense that single deviation is enough to destroy collusion without subsequent possibility to reverse back to cooperative path. In this sense, the Grim trigger appears to be stronger strategy than strategies based on finite punishments.

Based on Grim trigger strategy, the credibility of enforcement of cooperative behaviour could formally be described as follows:

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cooperate.

[232] For instance, in price parallelism: if one undertaking sticks to agreed high prices, the other could cheat and decrease prices and as a consequence to win a substantial amount of sales).

[233] For the list of factors that affects a capacity to collude see Annex I of this thesis.

Formula how to calculate whether deviation is profitable. Table[234] (6)

$$\overline{v_i} - v_i \le \delta(\frac{v_i}{1-\delta} - \frac{v_i}{1-\delta}),$$

Simplified formula how to calculate whether deviation is profitable. Table[235] (7)

$$\overline{v_i} - v_i \le \delta(\frac{v_i}{1-\delta})$$

Left hand of equation indicates immediate (today's) benefits of deviation. Right hand of equation indicates total amount of benefits with the discount factor δ, if with probability δ the game would end. Discount factor in equation is used twice: first time - in order to indicate that with the probability δ game would end; for second time - in order to show that future profits are less valuable than today's profits.

The essence of equations above is captured by the EC in its Guidelines: "[…] if a company knows that it will interact with the others for a long time, it will have a greater incentive to achieve the collusive outcome because the stream of future profits from the collusive outcome will be worth more than the short term profit it could have if it deviated.*"*[236] For the illustration purpose consider the simplified repeated duopoly game expressed in a normal form. Suppose that both competitors are symmetrical in terms of payoffs and discount factors.

The matrix of the game of prisoner's dilemma. Table (8)

Competitors	**2 undertaking**		
1 undertaking	**Strategies**	cooperate	not-cooperate
	cooperate	6; 6 (CNE)	-2; 9
	not-cooperate	9; -2	0; 0

If payoffs in the table above are put in the normalized equation, it yields: $3 \le \delta\left(\frac{6}{1-\delta}\right)$ which is equal to $\delta \ge 1/3$. It means that if discount factor is at least of 1/3, then cooperation in principle should be sustainable because deviation from cooperation is not beneficial.[237] Rational undertakings would have an incentive to stick to cooperation. Note that punishment strategy for both undertakings yields NNE payoffs (0; 0); therefore, as discussed previously, such

[234] $\overline{v_i}$ is total profit from deviation. $\frac{v_i}{1-\delta}$ is deviator's profit on condition that cooperation would last forever. $\underline{v_i}$ is minimax (reservation) value, provided punishment would last until the end of a game.

[235] First equation, without loss of generality, could be normalised by the assumption that minimax value is equal to 0

[236] European Commission Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal cooperation agreements. [2011] OJ, C 11, § 84.

[237] The numerical discount value, which is equal to 1/3 could be understood somewhat that if today collusion is worth 3 000 000 Eur, then in the next period (suppose that the next period is next year) the profits of collusion would be worth only 1 000 000 Eur.

punishment is credible. This simplified example illustrated basic idea that cooperation between undertakings could be NE, provided δ is sufficiently high and punishment strategy is credible.

Stick and Carrot strategy. The Stick and Carrot strategy is not as strict as the Grim trigger. It means that upon deviation, the deviator is punished for particular periods (punishment starts immediately at the next period after deviation), but afterwards, the punisher returns to initial cooperative path:

1) $Cooperate\ if\ everyone\ cooperates, otherwise,$
2) $Deviate\ (punish)\ for\ a\ certain\ time, then$
3) $Return\ to\ cooperation$

One could ask how long punishment shall last in order to be credible deterrence from deviation. This is not an easy question. Therefore, Grim trigger, and not Stick and Carrot, strategy profile in scholarship is used as a standard punishment strategy in the analysis of collusion.[238] Stick and Carrot strategy implies renegotiation, i.e. restart of collusion. This type of strategy is more sophisticated and probably more realistic in real markets, because colluding competitors might have incentives to get back on collusive behaviour, as it is more beneficial than non-collusive competition. Nonetheless, due to Stick and Carrot strategy complexities, as mentioned, it would not be examined further in this thesis.

Other punishment strategies could be implemented as well. For example, price wars could be adopted meaning that undertakings after the breakdown of collusion may decrease the price in order to punish the deviator because, in this way, consumers are more likely to purchase from the undertaking that reduced the price. Fine empirical example of such punishment strategy is cartel in cement market in Germany.[239]

In conclusion:

In this section the idea of *self-enforceable conscious parallelism* has been attained. It was deduced from the consideration that any sustainable collusion presupposes the existence of credible punishment and capacity to monitor deviations. Self-enforceable conscious parallelism forms the set of cases that potentially could be justified under Suggested criterion (SC). Self-enforceable conscious parallelism could be sustained if exist Nash-compatible punishment strategies that are credible. The credibility of punishment could be deduced from the benefits of

[238] Feuerstein, S., *supra* note 103, p. 194: “Due to their complexity, optimal punishments and stick-and-carrot punishments are treated as a separate subject in the literature. In applications, grim trigger strategies are used.”

[239] Hüschelrath, K., Schweitzer, H. [editors] *Public and Private Enforcement of Competition Law in Europe*. Berlin: Springer Berlin Heidelberg, 2014, p. 216-219. It is so-called “The Cement Cartel” where six major cement producers of Germany cement market entered into the cartel agreement, whereas after the breakdown of the cartel, immediately, the prices of cement constantly decreased for consecutive two years (2002-2004). The same strategy could hold for collusion.

cooperation itself.

2.2.1.3. Novel game theory perspective on special case of oligopoly problem – exchange of information

Exchange of information (EOI) is important subject to both the EU competition law and game theory. EOI is special case of concerted practices and oligopoly problem in general. The CJ held in *T-Mobile* case that EOI in a single meeting between competitors is sufficient to constitute an infringement by object under Article, without necessity to proof *de facto* use of the exchanged information.[240] This is strict approach and it has been analysed by many scholars from legal and economic stances.[241] From a game theory point of view, information is valuable *inter alia* as concerns: creation, enforcement, and sustainability of collusion. US scholars attempted to apply game theory in searching for a proper standard of adjudication.[242] Hence, it seems that the topic of EOI is many-sided. For the purpose of this thesis, the examination of EOI will be focused on the main question: *whether prohibited EOI is necessary in order to attain and sustain cooperative Nash equilibrium (CNE) in oligopolies*.[243] The hypothesis is that it is not necessary. If confirmed, the following logical conclusions could be attained: (i) *CNE might spring from pure parallelism*; (ii) *not all supra-competitive effects in a market are illegal*.

In the context of this thesis, EOI resembles "contact" and "market transparency" structural elements of the Suggested criterion (SC). The subject of EOI is at the core of market transparency because EOI might directly increase market transparency. The subject of EOI is also widely acknowledged as difficult and diverse.[244] It is doubtful whether the unified standard of prohibition could be formulated. For instance, the legality of EOI depends on many parameters, such as entry barriers, market concentration, type, nature, frequency, the precision of information, etc. Taking into consideration these parameters information has a different value as concerns competition, collusion, and decision-making.[245] The existence, complexity and

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[240] *Hüls AG v Commission of the European Communities, supra* note 215, § 163.

[241] For instance: Ghezzi, F., Maggiolino, M., *supra* note 142; Švirinas, D., *supra* note 30.

[242] Carlton, D. W, Gertner, R. H, Rosenfield, A. M Communication Among Competitors: Game Theory and Antitrust. *George Mason Law Review* [interactive]. 1997, No 5: 423—440 [accessed 08-02-2015].<http://chicagounbound.uchicago.edu/journal_articles/1926/>. Scholars attempted to assess whether *per se* or rule of reason standard is better for practical purposes.

[243] This question is significant for the thesis purpose to justify that cooperative Nash equilibrium (CNE) is indeed proper constituent part of Suggested criterion (SC), because if undertakings could attain CNE without EOI, then CNE should not be prohibited.

[244] Organisation for Economic Cooperation and Development. Information Exchanges Between Competitors under Competition Law [interactive]. 2010 [accessed 15-01-2015].<http://www.oecd.org/competition/cartels/48379006.pdf>, p. 53.

[245] For instance, the strategic (private or confidential) information might be more valuable than commonly known (public) information, since it is capable to reduce strategic uncertainty. Likewise, information about future

importance of the problematic of EOI is evidenced by the fact that the EC in 2011 adopted renewed Guidelines, which *inter alia* for the first time in the EU competition law expressly deals with legal problems related to EOI.[246] Competition law should be concern with EOI because it could reduce strategic uncertainty.[247] EOI could facilitate collusive behaviour and attainment of collusive outcomes. This reasoning explains why EOI could be detrimental to competition and consumers.

Whish, R. recognised that a possession of market related information (market conditions, a volume of demand, investment plans of rivals, etc.) facilitate rational and effective decision-making.[248] These concerns directly tap to the field of game theory in the sense that EOI facilitates cooperation in infinitely repeated games. Indicated general concerns with respect to EOI in the following analysis will be examined through legal (will explain a present state) and game theory (will instruct and improve present practice) perspectives.

The standard of the prohibition of EOI under Article 101. Legal scholars make a distinction between two types of EOI: ancillary and stand-alone.[249] The meaning of this distinction is that stand-alone EOI could independently amount to an infringement of Article 101, whereas ancillary EOI is a part of a cartel. It seems that this distinction is not fundamental and does not yield significant importance because Article 101 prohibits both types of EOI. From game theory perspective, more accurate distinction, in terms of time, would be to classify EOI to pre-collusive and post-collusive stages with the meaning that pre-collusive EOI facilitates the creation of collusion, whereas post-collusive EOI facilitates the sustainability of collusion. In such way, the real function of information would be better revealed. In any case, case law on stand-alone EOI is helpful for the understanding of the standard of prohibition under Article 101.

EOI is prohibited because of several reasons. The implications of EOI, in terms of benefit and detriment to competition and consumer welfare, are not obvious and one-sided. *First reason* of prohibition of EOI, in particular, the exchange of private strategic information, could be deduced from the principle of independent behaviour. Since undertakings shall behave independently and not collusively, the EOI is capable to reduce independent behaviour and therefore shall be prohibited.[250] *Second reason* could be deduced from the considerations of

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behaviour might be more valuable, that old data due to the capacity to reduce uncertainty and allow rational planning.

[246] *European Commission Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal cooperation agreements*, *supra* note 236. In particular, the part 2 of the Guidelines.

[247] *Ibid.,* § 61.

[248] Whish, R., Bailey, D., *supra* note 13, p. 125-123.

[249] Bailey, D., Rose, V., *supra* note 28, § 6.018-6.019.

[250] For the list of CJ's case law where the principle of independent behaviour has been established see footnote 215.

procedural economy.[251] Since EOI is contrary to the principle of independent behaviour, the rebuttable presumption of existence of the infringement by object greatly reduces investigatory expenses of the EC in a way of shifting the burden of proof from the EC to undertakings. Second reason is dependent because the main function of procedural economy is to reduce administrative costs. Thus, second reason alone cannot be regarded as the justification of prohibition of EOI. It also seems that the main axis of discourse on EOI revolves around the question: whether EOI is a cause for pro-competitive or anti-competitive effects.[252] The TFEU itself does not have *expressis verbis* prohibition of EOI; therefore, the EC's and EU court's practice is especially important.[253]

The standard of prohibition of EOI could be understood and derived from the general principles that are applied to any other infringement by object under Article 101. In order to justify infringement in a way of EOI, it is sufficient that exchanged information could have potential detrimental impact to the competition (prevent, restrict or distort), whereas the actuality or reality of such impact is immaterial. For instance, the CJ in *T-Mobile case* held: "[…] in order for a concerted practice to be regarded as having an anti-competitive object, it is sufficient that it has the potential to have a negative impact on competition […] An exchange of information between competitors is tainted with an anti-competitive object if the exchange is capable of removing uncertainties concerning the intended conduct of the participating undertakings."[254] This case signifies that concerted practices could originate form EOI, which has been acquired in a single meeting between undertakings. *T-Mobile* case shows how far prohibitions under the EU competition law could extend. The existence of such strong standard is additional argument against previously criticized scholarship proposition that Article 101 is not the adequate device to address the parallelism problematic.

There are several important caveats concerning indicated standard. *Firstly*, it is theoretically possible to rebut the existence of concerted practices in cases of EOI, since the subsequent use of exchanged information is only presumed: "[…] it must be presumed that the undertakings taking part in the concerted action and remaining active on the market take account of the information exchanged with their competitors in determining their conduct on that

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[251] For instance, Carlton, D. W, Gertner, R. H, Rosenfield, A. M, *supra* note 242, p. 425. The authors present the view of USA Supreme Court position that the benefits to judicial economy of *per se* prohibition are great.

[252] *European Commission Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal cooperation agreements*, *supra* note 236. The part 2.2 of Guidelines considers detrimental effects of exchange of information, whereas the part 2.3 considers beneficial effects of exchange of information.

[253] Švirinas, D., *supra* note 30, p. 89.

[254] *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, § 31, 43 also on this point see: Švirinas, D., *supra* note 30, p. 95-98.

market."[255] Notably, it is not correct to understand that EOI itself shall be prohibited.[256] On the contrary, the concept of concerted practices implies the causality of collusion and subsequent conduct on the market.[257] Therefore, undertakings could rebut presumed infringement by proving evidences that could prove the absence of causality between exchanged information and its subsequent use. However, it is more or less only theoretical possibility because it is very hard to disprove the presumption as business decisions are ordinarily made on the totality of knowledge. Thus, once acquired to disregard fully the use of exchanged information would be very difficult. Passive behaviour is not sufficient to deny the infringement. Nonetheless, to remind, there are couple of possible ways to escape concerted practices in cases of EOI: either to expressly distance from the use of exchanged information; or to inform the EC about the fact of exchange.[258] *Secondly*, theoretically it is also possible to prove the conditions of Article 101(3). Pro-competitive and anti-competitive effects of EOI will be considered later. To conclude, the standard of prohibition of EOI under Article 101 is rather strict.

Applying game theory insights to EOI. The topic on EOI from a game theory perspective in relation with parallelism to some extent is researched.[259] However, there is no clear answer to the following question: whether CNE could be *attained* and *sustained* without infringing Article 101 in the form of EOI. The further analysis will consider and attempts to answer this question. Before that, it is important to consider whether it is important from a game theory point of view whether information is "exchanged" or just unilaterally "shared".

The problem of unilateral signalling. Based on the element of reciprocity two modes of information sharing could be distinguished: EOI (reciprocal) and signalling (unilateral). The reciprocity element could be illustrated by *T-Mobiles* or *British sugar* cases, where EOI took place at the meetings between undertakings. On the contrary, signalling is essentially unilateral and voluntary behaviour in order to spread information publicly (e.g. through newspapers, internet, emails, etc.). The significance of this distinction from the EU competition law lies in the problem of scope of Article 101: *whether unilateral signalling itself amount to concerted practices. Whether so-called "cheap talks" fall under the prohibition of EOI. Whether subsequent conduct by the recipients of concerning "signalled" information is a necessary*

[255] *T-Mobile Netherlands BV and Others v Raad van bestuur van de Nederlandse Mededingingsautoriteit, supra* note 23, § 51; *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21, § 127.

[256] Peeperkorn, L., *supra* note 38, p. 4: "[…] communication itself does not lead to collusion."

[257] *Hüls AG v Commission of the European Communities, supra* note 215, § 51. The CJ held: "[…] the concept of a concerted practice […] implies […] subsequent conduct on the market and a relationship of cause and effect between the two."

[258] Ghezzi, F., Maggiolino, M., *supra* note 142, p. 13.

[259] The summary of basic conclusions is available at: Peeperkorn, L., *supra* note 38.

element to constitute concerted practices. There is little guidance under the EU case law on these questions because as a rule the reciprocity element to some degree in most of the cases is included. From a game theory point of view, to distinguish information based on reciprocity is immature. Repeated unilateral signalling could amount to reciprocal exchange, provided signalling affects rivals' behaviour. The insufficiencies of reciprocal-unilateral division could be illustrated by game theory considerations.

Game theory provide more apt than reciprocal-unilateral standard for the adjudication of information sharing, i.e. based on whether the information is verifiable or not.[260] So-called "cheap talks" cannot affect rational decision-making process because such information are non-verifiable; hence, not credible. Thus, one could ask whether it should be prohibited. It is possible to distinguish "cheap talks" from the "real talks", if one considers rivals' reputation, made investments (e.g. for advertisement, infrastructure, etc.), public commitments to customers, so on and so forth.[261] These commitments could substantiate the credibility of revealed information. The revelation of information must be rational, meaning that sufficient incentives for such behaviour must exist. For instance, the low-cost firm in Cournot competition could have an incentive to signal the information regarding its low-costs to its rivals in order to compel them to produce less. Indeed, in such case to produce less is a rational response.[262] In this way, the undertaking who signals the information could increase sales, market share, and profits. Another incentive to reveal an information is simply to create favourable conditions for collusion because collusion could be more profitable (e.g. through revealing future pricing, production quotas, etc.).

The examination above seems to suggest two policy conclusions (solutions). *Firstly*, that *per se* prohibitions on EOI, such as in the *T-Mobile* case, is not the proper standard of prohibition. The credibility and verifiability of exchanged information are aspects that should be at the core of examination in all cases of information sharing. Non-credible and non-verifiable information does not have legally required capacity or potentiality to prevent, restrict or distort competition because it is unlikely that such information would have significant influence to independent decision making process.[263] *Secondly*, game theory justifies the prohibition of

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[260] Baird, G. D., Gertner, H. R., Picker, C. R., *supra* note 39, p. 89. The author defines verifiable information: "[…] it can be readily checked once it is revealed."

[261] There is also the opinion that social constrains, business ethics and similar parameters make "cheap talks" credible. For instance: Faull, J., Nikpay, A., *supra* note 26, § 1.103 and 1.104.

[262] Polak, B. ECON 159: GAME THEORY. *Open Yale Courses* [interactive]., 2008 [accessed 15-11-2014].<http://oyc.yale.edu/economics/econ-159#sessions>, Lecture 23: Asymmetric Information: Silence, Signaling and Suffering Education.

[263] It was previously said, that the primary reason why EOI is prohibited is that it could reduce independent decision-making, reduce strategic uncertainty and, as a result, facilitate collusion.

unilateral signalling. Reciprocal-unilateral division of information sharing is immaterial from a game theory point of view. Both reciprocal and unilateral information sharing could equally impair the process of independent decision-making. Supposing that Article 101 is not applicable to unilateral conduct, there seems to be an enforcement gap concerning unilateral sharing of information. To conclude, game theory provides valuable insights on the subject of information sharing under Article 101.

Attaining and sustaining CNE. Timely and effective monitoring of potential deviations is necessary for collusion to be sustainable. It implies the capacity of colluders to obtain sufficient degree of credible and verifiable information.

Hypothesis: ***it is possible to attain and sustain cooperative Nash equilibrium (CNE) without infringing Article 101 in a way of exchange of information*.**

To verify this hypothesis, it is necessary to resort to one example provided by scholars and to review several lawful means to acquire sufficient information. Game theory scholars provide an example, which shows that CNE could be attained without direct or indirect contact between competitors. Suppose the duopoly of gasoline stations. Furthermore, suppose that the quality of products, ancillary services, capacity is the same for both undertakings. The prices of gasoline are posted on pumps and large electronic signs. The prices of gasoline could be changed instantaneously. It is obvious that consumers would tend to buy from the undertaking, which offers the lowest prices. According to the authors of this example: "[…] in such setting cooperating pricing is thus logical outcome of the "game" without any secret meetings or additional communication."[264] The essential point is that rational undertakings will necessarily appreciate their "mutual interdependence" and will act accordingly.[265] The similar example is described in the EC's Guidelines.[266] If such example seems to be too thin or too artificial[267], this thesis proposes to consider several lawful ways to obtain the information required for collusion. It seems that there is the lack of comprehensive research on particular instances, which will be indicated below. Thus, the attempt made by this thesis is rather heuristic and illustrative, but sufficient to verify previously raised hypothesis.

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[264] Carlton, D. W, Gertner, R. H, Rosenfield, A. M, *supra* note 242, p. 428-430.

[265] *Ibid., p.* 429.

[266] Faull, J., Nikpay, A., *supra* note 26, § 190: "Collusion in the economic sense is possible without communication between the companies involved."

[267] *European Commission Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal cooperation agreements*, *supra* note 205, § 109. Example is about 4 undertakings that own petrol stations and exchange information about gasoline prices by telephone. EC's position on this case it that it is infringement of Article 101 because the fact that same information is publicly available on the gasoline stations is immaterial. However, in accordance to this thesis such reasoning of EC is immature. The example in the Guidelines is based on unjustified assumptions on alleged substantial costs to obtain information. EC as well did not considered the case of sharing information about petrol prices on websites, etc.

(i) Financial accounts.[268] The proposition of this thesis is that financial accounts could be regarded as important source of information; therefore, it should be critically assessed concerning parallelism problematic. Information in financial accounts could facilitate both creation and monitoring of collusion. In many EU jurisdictions, financial accounts are accessible to everyone free of charge or with immaterial fee.[269] Undertakings that are bound by recent Accounting Directive[270] (AD) shall give true and fair view of their assets, liabilities, financial position and profit or loss (Article 4(3)). Obviously, such data is historical, but still could have substantial impact in terms of facilitating collusion (for instance, the information on profit and loss). Suppose that one of the rival's annual profits grew substantially, while the others' decreased. Rational competitors then might think that the cheating or deviation from collusive arrangement is the case and could subsequently start the punishment phase.[271] Similarly, consider another example concerning standardised balance sheet forms (Annex III, IV of AD). The obligation to provide information about stocks (raw materials and consumables, work in progress, finished goods and goods for resale), creditors, debtors, assets (fixed, tangible, financial), etc. could be valuable in terms of collusion. From such data, rivals might verify to what extent anticipated punishment is credible (e.g. how likely the price wars are). Increased capacity could also be traced from an obligation to provide average number of employees during a financial year (Article 17(1)(e)). Moreover, large and public interest undertakings must provide the net turnovers broken down by the categories of activities and into geographical markets, insofar as those categories of activity and markets differ substantially from one another, taking into account of the manner in which the sale of product and the provisions of services are organised (Article 18(1)(a)). Notably, undertakings listed in stock markets should comply with often higher standard of information provision. Investors need even higher amount of financial data in order to make informed decisions. These examples are sufficient to illustrate the point that financial statements and other publicly available financial data could be valuable source of information, which is necessary for a creation, sustention, and enforcement of collusion. To sum up, the potential conflict between the EU competition law and EU company law concerning the

[268] There is no comprehensive scholarship on financial accounts impact to parallelism under the EU competition law.

[269] For instance in Lithuania, all financial accounts submitted by undertakings are publicly available upon payment of certain fee. For more information see: www.jar.lt. In other jurisdictions: in UK, financial accounts are available for a certain fee at: https://www.gov.uk/government/organisations/companies-house; for other EU jurisdictions financial information is available at: http://www.skyminder.com/, etc.

[270] Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC. [2013] OJ, L 182.

[271] For instance, to begin a price war, or if the collusive arrangement was restriction of output, to increase the output, etc.

provision of information cannot be excluded. The full assessment of the impact of provision of information through financial statements needs to be separately researched.

(ii) EOI in pre-concentrations.[272] Competition law practitioners recognise that pre-concentration and due diligence stages in mergers and acquisitions could be problematic as regards parallelism.[273] In the absence of scholarship on this special case[274], thesis suggest considering that the EOI in pre-concentration could deemed as valuable sources of information with regards to collusion. Indeed, a successful concentration requires thorough knowledge of target's business. Therefore, to some degree EOI or information sharing is necessary. The assessment of pro-competitive and anti-competitive effects in these cases is relevant. Article 101(3) is the closest legal ground for the assessment. Unequivocal assessment of EOI is expressed in Guidelines: "Information exchange may lead to efficiency gains"[275]. Supposing that concentrations can bring efficiency gains[276] and since pre-concentration presupposes the necessity of EOI, in principle EOI in these cases could be justified under Article 101(3). However, exchanged information in pre-concentration stage does not guarantee the completion of concentration due to various business or legal reasons.[277] If information has been exchanged, but the deal was not closed, i.e. concentration has failed, and then it could be argued that such EOI could facilitate collusion. Nonetheless, it could also be argued that Article 101(3) justifies EOI in the cases of concentration because EOI is necessary. Article 101(3) could also be applied in a larger set of cases: the standard of informed consumer presupposes the necessity of

[272] Note that in this section the term EOI and not information sharing is used. However, in acquisition cases only the target could be the undertaking who shares the information and not an acquiring undertaking. Since in acquisition cases unilateral sharing of information to high degree affects the acquirer's final decision to acquire the target or not, these cases should be construed as the cases of EOI because there is reciprocity element.

[273] For instance: Giles, I. The cost of "gun jumping": The risks of implementing a deal without competition clearance [interactive]. [accessed 07-03-2015]. <http://www.nortonrosefulbright.com/knowledge/publications/22215/the-cost-of-gun-jumping-the-risks-of-implementing-a-deal-without-competition-clearance>.

[274] For the first time pre-merger EOI has been dealt in U.S. by a federal court in *Omnicare, Inc. v. UnitedHealth Group, Inc., No. 09-1152* [2011] case. Practitioners have assessed main implications: Brumfield, N. A. *et. al.* Federal Appeals Court Clarifies the Bounds of Lawful Information Exchanges in Pre-Merger Due Diligence. <http://www.whitecase.com/alerts-02212011/>, "Pricing information had been used for legitimate pre-merger valuation purposes […]." Importantly, decision makers have been precluded for such information.

[275] Baird, G. D., Gertner, H. R., Picker, C. R., *supra* note 39, § 95.

[276] Röller, L. H., Stennek, J., Verboven, F. Efficiency gains from mergers. European Merger Control Edward Elgar, ed 2006 [interactive]. 2006: 1—140 [accessed 07-03-2015].<http://ec.europa.eu/dgs/competition/economist/publications.html>, p. 60: "There does not exist clear evidence that mergers, as a general rule, create efficiency gains. However, at least some mergers do create efficiencies. Moreover, empirical evidence indicates that (between 30 and 70 percent of) a costs savings are passed on to price."

[277] For instance, due diligence could reveal various business risks that have not been anticipated before the due diligence: a financial situation of target is less perspective, the company is under litigations for compensations damages, etc.

sufficient information. Therefore, EOI might facilitate effective consumers' decision-making.[278] To conclude, EOI in pre-concentrations when concentration itself has failed, could possibly be legitimate source of information, but as well facilitate collusion.

(iii) Facilitating devices. EOI as the central element has been recognised in various practices that potentially facilitate collusion: trade associations, price leadership, collaborative research, cross-licensing of patents, most-favoured-customer and meeting competition clauses, resale price maintenance, basing point pricing, common costing books to mention a few.[279] To detect such practices could be hard, not to mention that legal prohibition of such practices is far from obvious. For instance, price leadership might be a natural consequence of anticipated entry.[280] Furthermore, there is no research on so-called "big data" movement, where with the computer-aided analysis various market related information could be extracted. Overall, game theory consideration and capacity to obtain information through various legitimate sources, including facilitating devices, could be a workaround in term of prohibition of EOI under Article 101. Hence, previously raised hypothesis has been confirmed.

In conclusion:

Game theory perspective suggest that *per se* prohibition of exchange of information is inadequate standard of adjudication under Article 101 because in reality only credible and verifiable information should be taken into account in rational business decision making process. The category of information sharing embraces both unilateral signalling of information and reciprocal exchange of information. Information sharing could reduce independent decision-making. If unilateral signalling does not fall within the scope of Article 101, then there seems to be the enforcement gap concerning Article 101. In this section, it was confirmed that cooperative Nash equilibrium could be attained and sustained without infringing Article 101 in a form of exchange of information. Hence, the use of cooperative Nash equilibrium in previously created Suggested criterion is justified.

[278] Baird, G. D., Gertner, H. R., Picker, C. R., *supra* note 39, § 99.

[279] Faull, J., Nikpay, A., *supra* note 26, § 1.108.

[280] The explanation of price leadership could be find at: Collino, S. M. *Competition Law of the EU and UK.* New York: Oxford University Press, 2011, p. 149. According to Collino, S. M. in the markets with few producers, there could be a price leader that would be followed by its rivals. As empirical examples scholar indicate UK petrol and banking sectors. For instance, in Lithuania one could arguably observe price leadership or even price war in wholesale market, where recent behaviour of wholesaler Maxima in a way of reduction the prices of at least 1000 products have been followed by other wholesalers. In public, there are some speculations that the reason of such behaviour is to deter the entry of strong competitor into Lithuanian market, namely wholesaler LIDL.

2.2.1.4. Novel game theory perspective on leniency – procedural instrument that aims to reveal collusions

In order to understand the novelty of this thesis approach to leniency, it is necessary to explain "classical" approach. The classical application of game theory to leniency is based on prisoner's dilemma model. Leslie, R. C. (2006), has explained the main results of such approach.[281] Scholar analysed the U.S. leniency issues. *Mutatis mutandis* Leslie, R. C. analysis could be applied to the EU competition law because the basic ideas, notwithstanding jurisdictional peculiarities, are the same. It is not efficient to re-represent thoroughly the work, which has already been made. Instead, in this thesis it will be illustrated some general ideas that underlie game theory approach to the analysis of leniency. Afterwards, this thesis' novel attempt will be explained.

Firstly, the influence and significance of NE concept appears to be evident in leniency analysis. Leniency will work only if a leniency application will be a dominant strategy. Hence, the essence of leniency is to create sufficient incentives in order to stimulate voluntary reports of collusion. Presently, in the EU competition law either immunity or the reduction of fines is possible.[282] That makes leniency attractive. Leslie, R. C. suggests that undertakings are initially at a coordination game with two equilibriums: mutual confession and mutual silence[283]. The meaning of coordination game is that if no one would apply for leniency, it is better for everyone to be silent and, *vice-versa,* if someone applies, it is rational for everyone to apply for leniency as well. The instruction to competition policy is that authorities should try to create the game of prisoner's dilemma, i.e. to create a situation where the application for leniency would be a dominant strategy. The way to do this is to provide incentives and inflict distrust among colluders. The incentives could be classified in two categories: positive and negative. The meaning of such classification is that the positive incentives are not based on threat[284], whereas the negative incentives are based on threat[285]. It seems that game theory perspective to the policy of leniency is instructive and prescriptive.

Secondly, the trust between colluders is of essential importance. The category of trust

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[281] Leslie, R. C., *supra* note 37.

[282] The European Commission Notice on Immunity from fines and reduction of fines in cartel cases. [2006] OJ C 298. The part 2 of Leniency Notices regulates immunity questions, whereas the part 3 regulates the reduction of fines.

[283] Leslie, R. C., *supra* note 37, p. 462-463.

[284] For instance: granting an immunity from public fines, reducing public fines, prohibiting to use revealed evidences in private enforcement proceedings, etc. are the main examples of incentives for colluders which could stimulate an application for leniency without the element of threat.

[285] For instance, the application of criminal or personal liability, the increase of fines for cartel arrangements, etc. are the main examples of incentives for colluders, which could stimulate an application for leniency with implied element of threat.

itself implies a psychological element that cannot be objectively measured. Nonetheless, a trust between undertakings as regards parallelism should be based on rationality rather than feeling. The EC, apart from creating prisoner's dilemma, should inflict distrust between undertakings to trigger leniency applications.[286] The underlying reason, why it is necessary to create distrust between colluders is to make a confession profit-maximising (dominant) strategy. Hence, the essence of leniency, from game theory perspective, as said, is to create sufficient incentives in order to stimulate voluntary reports of illegal collusion

In legal terms, leniency could be understood as the sort of procedural solution to parallelism problem. Leniency, likewise *per se* rules and presumptions as explained at the section of exchange of information, is based on the consideration of procedural economy, i.e. leniency applications could greatly reduce work and costs that are necessary in order to find an infringement of Article 101. Information provided by the applicant is invaluable for the preparation of successful enforcement case. Further analysis of game theory perspective to leniency will be concentrated with greater detail to recent Leniency Notices (2006) (LN)[287].

Novel perspective: "leniency as punishment". Leniency application presupposes the existence of collusion. It means that previously analysed elements: sufficiently high discount factor, larger benefits of collusion *vis-à-vis* the benefits of non-colluding competition, conditions for sustainability and enforcement of collusion must have had existed before the leniency application. Leniency application also implies that collusion has not been successfully sustained. The key insight seems to be that the so-called "whistle-blower's" incentives must have changed. It was mentioned that leniency through granting an immunity or reduction of fines could be understood as the incentive. This is the prime reason behind its acknowledged success.[288] It has a potential to be successful because, indeed, it tries to tackle the root cause of collusion – rationality. However, leniency *per se* is the necessary, but not sufficient condition for the inducement of leniency applications. Causing distrust among colluders is crucial and should be the priority concern of the EC in order to make leniency effective. Again, mutual trust between undertakings is necessary condition for collusion.[289] Nonetheless, in practice there could be

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[286] Leslie, R. C., *supra* note 37, p. 468-479. The author thoroughly discusses the issues and role of trust. There are several ways to inflict distrust: to start investigations, to convince undertakings that their rivals could instantaneously apply, thus it is better for an undertaking to apply without delay, etc.

[287] *Compagnie Royale Asturienne des Mines SA and Rheinzink GmbH v Commission of the European Communities, supra* note 23.

[288] For instance, in EC's official website: "Along with the other detection and investigation tools at the Commission's disposal, the leniency policy proves very successful in fighting cartels" The European Commission's official website, *Leniency* [interactive]. [accessed 02-02-2015].<http://ec.europa.eu/competition/cartels/leniency/leniency.html>.

[289] The role of distrust is explained as: "the distrust does not change the payoffs and therefore cannot create true

multiple causes explaining why particular undertaking lodged the leniency application. The most intuitive and casual explanation is based on the existence of sufficiently threatening investigations by competition authorities, i.e. it is based on the fear of large fines. One could ask whether there are any other compelling explanations for the leniency applications. This thesis will try to advance the perspective that suggests understanding leniency from a bit different angle – "leniency as punishment". The source of threat is no longer the authority's investigation and fines, but rather the conspirator's behaviour to report collusion. Hence, leniency, if understood in such way, seems to be the mechanism that strengthens, rather than disrupts collusion. This perspective seems to yield better understanding on the question why leniency applications are being lodged.

Suppose that leniency is a punishment in game theory sense. Then one could as what would be the whistle-blower. The obvious candidate is the conspirator that was cheated by the cheater. The problem is that reporting leniency might not be the best strategy even though conspirator deviated from collusive arrangement. This is because of private enforcement. Leniency relieves from public fines, but not from the obligation to compensate private damages. Nonetheless, private enforcement in the EU ever since is rather vague; therefore, the threat of private litigation should not be overstated.[290] Recently, the EU adopted the Directive[291], which intends to strengthen private enforcement proceedings. However, at least for now, it is too early to predict whether it will have a substantial effect on the use of private enforcement. By comparison, private enforcement is much more robust in U.S.[292] Connection between private enforcement and leniency has been recognised by the EC.[293] It seems that private enforcement is not sufficiently strong to convince that leniency application cannot be used as a punishment.

prisoner's dilemma. But distrust can change the perceived likelihood of the various outcomes in a manner that makes confession rational": Leslie, R. C., *supra* note 37, p. 471.

[290] European Commission, MEMO: Frequently Asked Questions: Commission proposes legislation to facilitate damage claims by victims of antitrust violations [interactive]. Brussels: 11-06-2013 [accessed 08-03-2015].<http://europa.eu/rapid/press-release_MEMO-13-531_en.htm>: "[…] only 25% of antitrust infringements found by the Commission in the last 7 years have been followed by civil actions from victims. Most of these actions were brought by large businesses, and most actions were introduced in either the UK, Germany or the Netherlands."

[291] Directive 2014/104/EU of the European Parliament and of the Council of 26 November 2014 on certain rules governing actions for damages under national law for infringements of the competition law provisions of the Member States and of the European Union. [2014] OJ, L 349.

[292] Vanikiotis, M. T. Private Antitrust Enforcement and Tentative Steps Toward Collective Redress in Europe and the United Kingdom. *Fordham International Law Journal* [interactive]. 2014, 37(5): 1639—1682 [accessed 03-05-2015].<http://ir.lawnet.fordham.edu/ilj/vol37/iss5/6/>, p. 1649: "[…] US Federal Judicial Caseload Statistics indicate that, in 2013, ninety-eight percent of antitrust cases in federal courts were private actions."

[293] The European Commission Notice on Immunity from fines and reduction of fines in cartel cases. [2006] OJ, C 298. In § 6, the EC notices: "Potential leniency applicants might be dissuaded from cooperating with the Commission under this Notice if this could impair their position in civil proceedings as compared to companies who do not cooperate"; however, in § 39 it is expressly stated that: "The fact that immunity or reduction in respect of fines is granted cannot protect an undertaking from the civil law consequences of its participation in an infringement of Article 81 EC."

Thus, supposing that punisher applies for leniency, one should ask what the cheater should do. Obviously, rational deviator could pre-empt the application and apply first in time. Hence, the proposition emerges: *rational deviator is the one who would most likely blow a whistle first in time*.[294] Moreover, one could consider: if cheater is better-off by deviating from collusion, when why not to gain addition benefit in order to make his rivals even more worse off by applying for leniency and inflicting potential fines on them. In conclusion, "leniency as punishment" allows predicting that the cheater of the game is also the one who would apply for leniency.

"Leniency as punishment" seems plausible on theoretical level and in line with game theory reasoning, but the problem is that there is no actual data in order to verify it on empirical grounds. Therefore, this way of looking at leniency should be used cautiously. Nonetheless, if this approach would be justified on empirical grounds, then it would be a considerable improvement in understanding the competitor's behaviour as well as leniency mechanism in the sense that the EC should concentrate on the improvement of leniency with regards to potential deviators (such as maverick firms). On assumption that "leniency as punishment" is correct it could be used to obtain additional predictions and conclusions.

The paradox of leniency: ***if leniency is understood as a specific type of punishment, then collusion between undertakings is paradoxically strengthened because fines after leniency application could potentially deter prior deviation.***

The paradox of leniency assumes that conspirators before colluding weight potential benefits and losses (risks) of collusion. To verify the paradox of leniency, it is necessary to consider previous prediction, i.e. that the cheater would be most likely be a whistle-blower. On this supposition, it appears that whistle-blower could pre-empt "leniency as punishment" application. Natural question emerges – whether the paradox of leniency and contended novel perspective on leniency makes any sense because leniency then no longer could be used as the specific type of punishment. There are several arguments that could defend the validity of "leniency as punishment" and therefore "paradox of leniency". The starting point is that whistleblowing could have potential adverse consequences to whistle-blower that outweighs the benefits of immunity from fines. *Firstly*, the fear of private enforcement. It is clear that there is no guarantee that follow-on claims in private enforcement would not emerge.[295] Systematic look at leniency and private enforcement seems to suggest that increment in the use of private

[294] It interesting to note that according to Keserauskas, Š., the Chairman of the Competition Council of the Republic of Lithuanian, it is not rare that the former employees are the persons who reports about infringements. During the discussions at 11th Baltic Competition Conference, 10-09-2014, Vilnius.

[295] Scholars have recognised the importance of private enforcement. For instance, Leslie, R. C., *supra* note 37, p. 458.

enforcement proceedings could reduce leniency applications.[296] *Secondly*, the immunity under LN is not granted to the undertaking, which coerced collusion.[297] Therefore, coercers are unlikely to be the whistle-blowers. Hence, the pre-emption of leniency is obviously not the case. *Thirdly*, the loss of reputation that subsequently could reduce sales. This list of considerations is far from exhaustive.[298] In conclusion, it seems that the "leniency as punishment" and "paradox of leniency" hold because leniency inherently is not all-inclusive and its' incentives is mainly limited to public enforcement proceedings.

The "leniency as punishment" could be used even further, i.e. in order to criticize the predominant viewpoint that LN is very successful instrument in terms of revealing cartels and collusion.[299] The thesis will attempt to examine whether the success of leniency is not overstated. In order to do that, the following hypothesis is raised:

Hypothesis: ***recent Leniency Notices may be successful in terms of revelation of collusions that emerged before its entry into force: 08-12-2006, and not necessarily for the revelation of collusions that came into existence afterwards.***

The hypothesis could be verified both on theoretical and empirical grounds. *Firstly*, the fact is that it is impossible to know how many cartels are not revealed. Therefore, it is not correct methodology to measure leniency success only if one considers the totality of revealed cartel.[300] *Secondly*, there are no accessible statistics showing the number of leniency applications, which were related to "agreements" and which were related to "concerted practices" under Article 101. Obviously, to report collusion in a form of concerted practices is much harder than to report explicit cartels because in the first case there could be no substantial evidences. Furthermore, Whish, R. pointed out – undertakings could destroy evidences.[301] In these cases, there could be no evidence to reveal whatsoever. It could also be risky to reveal the evidences that do not match the standard of "significant added value" since it would not guarantee the immunity.[302] Hence,

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[296] For instance, the anticipated increment in the use of private enforcement could be deduced from the adoption of recent Directive.

[297] *Compagnie Royale Asturienne des Mines SA and Rheinzink GmbH v Commission of the European Communities, supra* note 23, § 13.

[298] Leslie, R. C., *supra* note 37, p. 458-462. The author provide non-exhaustive list of important considerations: threat of antitrust enforcement in other jurisdictions (with implied assumption that the firm is international); leniency application might invoke subsequent claims of the security law violations; harm to reputation (cf. in USA private reputation of employee might be damaged since criminal punishment is possible), etc.

[299] For instance, in the EC's official website: *"*Along with the other detection and investigation tools at the Commission's disposal, the leniency policy proves very successful in fighting cartels*"*: The European Commission's official website, *supra* note 288.

[300] To emphasize the point, suppose that the EC independently did not revealed any cartel, apart from the cartels that have been reported by whistle-blowers. In such case, the effectiveness of LN would be of 100 %. Obviously, it says very little to the effectiveness of leniency itself.

[301] Whish, R., Bailey, D., *supra* note 13, § 3.078.

[302] The European Commission Notice on Immunity from fines and reduction of fines in cartel cases. [2006] OJ C

the appropriateness and effectiveness of leniency to oligopoly problem is dubious. *Thirdly*, the effectiveness of LN could be limited in time. Rational undertakings would take into account the risk of leniency application before colluding and thus would solve for this risk before collusion. *Fourthly*, the effectiveness of LN might be limited in scope. Three instances substantiate this assertion – concerted practices; unilateral sharing of information sharing (due to enforcement gap); LN is not applicable as regards the abuses of collective dominance under Article 102.[303] *Lastly*, hardship to distinguish lawful and unlawful parallelism under Article 101. Legal uncertainty should affect the frequency of leniency applications because if it is not clear for the undertakings that they collude, then leniency application, of course, is not the case. Last point reinforces the importance of this thesis to create the appropriate criterion in order to distinguish these two types of parallelism (Suggested criterion). The overemphasis of the success of LN could be convenient, but rather dangerous position because the emergence of new legislative devices could potentially be stalled.

The hypothesis is verifiable on empirical basis. The examination of the most recent leniency applications to the EC, i.e. in the years 2013-2015[304] revealed that from 12 closed leniency cases, only 1 (Mushrooms case[305]) came into existence after the entry into the force of recent LN. Approximately 91.66 % of all leniency cases during last 2 years was related to cartels that have existed before the entry into the force of LN. Hence, empirical data seems to confirm the hypothesis. Notably, 7.69 % from all cartel/ collusion cases during last 2 years were not related to LN, i.e. from 13 closed cartel cases only one (Power Exchanges case[306]) were not related leniency. Based on examined date, one could argue that the EU law does not have any other mechanism that would facilitate public enforcement regarding cartels, not to mention collusion in oligopolies. Hence, indeed, the oligopoly problem is real. In conclusion, it is more likely that hypothesis is true, that not true. Therefore, the hypothesis seems to be confirmed. At least for now, the judgement on the effectiveness of leniency should be suspended until there would be proper data.

"Leniency as punishment", the hypothesis of this section and examined empirical data

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298 § 24; the EU case law shows that sometimes undertakings provide an evidences that does not match this standard: Case T-352/09, *Novácke chemické závody a.s. v European Commission* [2012] ECLI:EU:T:2012:673. § 38: "The application had not provided significant added value, since the applicant had only reported facts concerning calcium carbide powder, in relation to which the Commission already had sufficient evidence in its possession at that time."

303 Third instance is correct only if one accepts that the abuse of collective dominance is appropriate to tackle with oligopoly problem. This thesis, as explained in the first chapter, disagrees with such position.

304 The reason to take into account only the last 2 years period is based on the consideration that the older data could be unreliable and not capable to justify the hypothesis of this thesis. It is obvious that the closer the leniency case is to 08-12-2006, the more likely it is that the cartel has emerged before that date.

305 Case COMP/39965, *Mushrooms* [2014] OJ, C435.

306 Case COMP/39952, *Power exchanges* [2014] OJ, C334.

could be used for at least two predictions:

Prediction 1: ***the frequency of leniency applications in future would likely decrease;***

Prediction 2: ***post leniency cartels should be stronger in terms of stability.***[307]

Obviously, neither of these predictions could be tested empirically at least for now. The rationale behind the predictions is that if undertakings are supposed to be rational, then one must admit the fact that the existence of LN would be taken into account by colluders before collusion. Therefore, such cartels could be "stronger" or more sophisticated or based on the higher degree of mutual trust between colluders. It means that there would be less fragile cartels and therefore there would be less leniency applications. Hence, the function of leniency appears to be not only "revealing", but also "deterring" collusion. The paradox of leniency reinforces these predictions.

In conclusion:

Game theory reasoning allowed examining leniency through novel perspective – "leniency as punishment". It suggests that leniency applications might be a good strategy to choose in order to punish the deviators of collusive arrangement. Provided it is rational to deviate from collusive arrangement, then it may be rational as well to apply for leniency and pre-empt the rivals from using leniency as a punishment strategy.

Novel outlook on leniency allowed deriving and verifying leniency paradox: *if leniency is understood as a specific type of punishment, then collusion between undertakings is paradoxically strengthened because fines after leniency application could potentially deter prior deviation*. The hypothesis: *recent Leniency Notices may be successful in terms of revelation of collusions that emerged before its entry into force: 08-12-2006 and not necessarily for the revelation of collusions that came into existence afterwards,* has been verified. Then, based on obtained results, two predictions have been proposed.

In general, it was demonstrated that game theory reasoning allows looking at leniency from a different angle. It shows that at the moment leniency cannot be deemed regarded as a successful instrument for revealing collusions in oligopolies.

[307] This hypothesis is in line with observation that colluders shall solve two prisoner's dilemmas: firstly, at the stage of creation of cooperation and secondly, at the stage of application for the leniency. Since the general solution to prisoner's dilemma is mutual trust and, assumingly, undertakings are aware of the risk of leniency, then the degree of mutual trust, at the stage of creation of cooperation, must be higher than in the absence of leniency. To this point see: Leslie, R. C., *supra* note 37, p. 461-465.

2.2.2. Cooperative game theory perspective and fines: novel justification of joint and several liability for parallelism-related infringements under Articles 101, 102 of TFEU.

Calculation and imposition of fines is an important part of the EU competition law public enforcement. Imposed fines materially affect undertakings. Therefore, at this stage the effectiveness of EU competition law become real. The EC imposes and calculates fines.[308] In 2006, the EC issued the guidelines on fines.[309] Throughout this section, the existence of infringements of Articles 101, 102 respectively will be assumed.[310] It will focus be on substantial fines and not as regards the procedural fines because procedural fines are a marginal case. Maximum possible fine for the most serious infringements is 10 % of preceding business year's total undertaking's turnover or total aggregate turnover of each member active on the market affected by the infringement of association.[311]

The cooperative game theory, instead of non-cooperative game theory will be used in this section. This branch of game theory concerning oligopoly problem is not developed. In accordance to this thesis, there is no scholarship work on cooperative game theory application to law, needless to say, as regards oligopoly problem. Therefore, in this section this gap will be attempted to be filled. The most important concept of cooperative game theory that will be used in this section is so-called "Shapley value". The examination will be focused on verification of the following hypothesis.

Hypothesis: ***the calculation of Shapley value is proper method for calculation and allocation of fines for the infringements of Articles 101, 102[312] in duopoly and possibly in***

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[308] T-336/07, *Telefónica, SA and Telefónica de España, SA v European Commission* [2012] ECLI:EU:T:2012:172, § 16: "The Commission exercises its discretion in the specific context of each case when assessing whether it is appropriate to impose a fine in order to penalise the infringement found and to protect the effectiveness of competition law."

[309] Guidelines on the method of setting fines imposed pursuant to Article 23(2)(a) of Regulation No 1/2003. [2006] OJ, C 210. It does not have binding legal force, but is, nonetheless, significant soft law in the sense that in practice fines are imposed abiding the guidelines.

[310] Notably, the fines under Article 102 are rarely imposed. For instance, since 2004 to 2014 only six fines by EC have been imposed: Barbier, E. D. S., Lagathu, E. The Law on Fines Imposed in EU Competition Proceedings: On the Road to Consistency. *Journal of European Competition Law & Practice* [interactive]. 2014, No 5(6): 400—420 [accessed 15-02-2015], p. 400. Therefore, the focus of analysis will be dedicated to cartels.

[311] In accordance with Article 23(2) of the Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty. Recently, the CJ in *Dole Food Company Inc. and Dole Fresh Fruit Europe v European Commission, supra* note 21, § 146 also explained: "[…] the amount of the fine that may be imposed on an undertaking is subject to a quantifiable and absolute ceiling, so that the maximum amount of the fine that can be imposed on a given undertakings can be determined in advance."

[312] Article 102 is included in the hypothesis only because in scholarship, as previously analysed, scholars advance the idea to apply the "abuse of collective dominance" as regards unlawful parallelism in oligopolies. Even though this thesis will focus and presume the infringement of Article 101, the obtained results *mutatis mutandis* could be transposed concerning "abuse of collective dominance" in duopolies.

other cases.

The hypothesis primarily concerns duopoly setting, because "other cases" requires the higher degree of calculation.[313] The short introduction to cooperative game theory and the concept of Shapley value will suffice. Cooperative (coalitional) game theory is large branch of game theory that models the creation of coalitions (cf. cartels) and allocation of utility within the members of coalitions.[314] Cooperative games like non-cooperative games are solved by applying so-called "solution concepts". However, there is at least one important technical difference between these two branches of game theory: the cooperative games are described and solved without drawing a game trees or matrices as opposed to non-cooperative games, such as prisoner's dilemma, which are representable in game trees or matrices. In general, to solve a cooperative game means to answer two questions: i) which coalition will form; ii) how utility should be allocated within the members of coalition.[315] As regards the fines in *ex post* parallelism cases, only the second question is important.[316] The further examination will be restricted only to so-called "transferable utility" games, which mean that cartelists could split among themselves, obtained supra-competitive profits.

Simple mathematical calculations for duopoly case will be illuminated later in the thesis. Hence, the formal definition of coalition game is required.

The formal definition of coalition game with transferable utility. Table (9)

Coalitional game with transferable utility: *it is a game of pair* (N, v)*, where* N *is finite set of players, indexed by* i, j*; and* $v: 2^N \mapsto \mathbb{R}$ *associates with each coalition* $S \subseteq N$ *a real valued* $v(S)$ *that the coalition members can distribute among themselves. Furthermore,* $v(\theta)=0$ $(obviously, the\ utility\ of\ empty\ coalition\ must\ be\ zero)$.[317]

Suppose that undertakings that behave independently could attain profits denoted by P_i and P_j respectively. Suppose that in collusion (cartel) i and j could attain $P_m = v(S)_{max}$ [318].

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[313] The idea is that if the use of Shapley value in duopoly setting proves to be satisfactory, then the extension of its use to larger number of cases *mutatis mutandis* could be considered in further researches.

[314] Maschler, S., Zamir, S., Solan, E., *supra* note 3, p. 659-660.

[315] Jackson, O. M., Brown, L. K., Shoham, Y. Game theory courses. Stanford university [interactive]. 2014 [accessed 28-09-2014].<https://class.coursera.org/gametheory-003/lecture/91 >, Lecture 7-2: Coalitional Game Theory: Definitions.

[316] The question "which coalition will form?" is not directly significant to oligopoly problem because the fines could be imposed only if the existence of collusion (cartel) has already been proven.

[317] Jackson, O. M., Brown, L. K., Shoham, Y., *supra* note 315, Lecture 7-2: Coalitional Game Theory: Definitions.

[318] P_m denotes the profit level in case of monopoly; $v(S)_{max}$ denotes the maximisation of coalition's (cartel) profits. To say that the cartelists achieved monopolistic profits is the same as to say that they maximised the utility of the cartel.

Then $P_i + P_j \leq P_m$[319] because entering collusion or cartel should be profitable. Undertakings have two strategies: collude or not collude. Suppose undertakings decide to collude. Based on transferable utility assumption, the problem of how to split P_m emerges. The Shapley value is the solution for this problem exactly.

Shapley value as universal method for calculation of fines in unlawful parallelism cases under Articles 101, 102. One significant advantage of Shapley value is that it gives unique solution how to allocate the utility of coalition - $v(S)$. The concept has been introduced by 2012 Nobel Prize-winner in economics Shapley, L. S.[320] in order to solve cooperative games. Shapley's solution is based on four axioms: the equal treatment property, the null player property, Pareto optimality, and additivity.[321] Shapley solution applies to cases when so-called "grand coalition"[322] has been formed. Duopoly case is a simple case because the only possible coalition that could be formed is a grand coalition. Since the calculations will be provided, it is required to define formally the Shapley value:

The formal definition of Shapley value. Table (10)

Shapley value: $\phi^i(v) = \sum_{S \subseteq N \setminus i} \frac{\lvert S \rvert!(n - \lvert S \rvert - 1)!}{n!} \left(v(S \cup \{i\}) - v(S)\right).$ $For\ every\ v \in V\ and\ for\ every\ i \in N.$[323]

The general idea behind Shapley value is that each player i from the total value $v(S)$ of coalition S shall get the amount of benefits that is equal to $i's$ marginal contribution. In a legal context, to some extent, it reminds the principle of equality. To illustrate, suppose that cartel member i did not contribute to the cartel at all. He then should not participate in the allocation of collusive profits (the null player property). On the other hand, suppose j substantially contributed to the cartel. He then should get the allocation of cartel profits that reflects $j's$ marginal contribution. The key insight here is to verify the possibility to apply Shapley value to the calculation and allocation of fines under Articles 101, 102. In order to verify such possibility, it will be firstly two facilitating proposition discussed:

1st proposition: ***colluders in duopoly markets should be held equally jointly and severally liable under Articles 101, 102 of TFEU.***

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[319] Suppose that in this case the undertakings did not collude.

[320] Some key facts about Lloyd S. Shapley contribution to cooperative game theory are available at: Lloyd S. Shapley - Facts. Nobelprize.org [interactive]. 2014, Nobel Media AB 2014 [accessed 16-02-2015].<http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2012/shapley-facts.html>.

[321] Peleg, B., Sudhölter, P. *Introduction to the Theory of Cooperative Games*. 2nd edition, Berlin: Springer-Verlag Berlin Heidelberg, 2007, p. 151.

[322] The grand coalition could be defined as the situation when all the players of the game participate in coalition, i.e. form a grand coalition.

[323] Peleg, B., Sudhölter, P., *op. cit.*, p. 154.

2nd proposition: ***if there are three or more colluders in oligopoly markets, then they should be held jointly and severally liable under Articles 101, 102 of TFEU.***

To verify the 1st propositions is easier, than the 2nd proposition. *Firstly*, collusion in duopoly presupposes the existence of two colluders. Collusion (coalition) with only one player is not possible. Therefore, both colluders in duopoly equally participate in the causality of collusion (Causality argument). Hence, both colluders seem to be equally responsible for collusion. Nonetheless, the EC at the stage of determining the total value of the sales *inter alia* will attempt to identify: "[…] the relative weight of each undertaking in the infringement."[324] Causality argument allows interpreting "relative weight" from a *condition sine qua non* perspective.[325] The 1st proposition is supported by the principle of independent behaviour that binds competitors.[326] The independency itself implies the capacity to refuse participation in collusion. That means that undertaking could refuse to collude. Otherwise, it there is no compelling reason why the undertaking should not be held equally responsible. To illustrate the point, suppose that one undertaking is comparably large and made substantial damage to competition or consumers, i.e. in the amount of 10 million euros, whereas another, smaller, undertaking only in the amount of 2 million euros. Overall 12 million of damages have been made. In such case, both undertakings should be held equally responsible for aggregate 12 million. The rationale of equal liability for the smaller and larger undertakings stems not from the magnitude of their own adverse "effects" on the competition or consumer, but rather from their independent capacity not to collude and in this way to guarantee the absence of collusion in respective market. Obviously, disregarding the size, sales and other parameters, two undertakings are necessary for collusion in a duopoly. Hence, both colluders should be held equally jointly and severally liable as regards fines for the infringement.

Secondly, general theory on extra-contractual (tort) liability concerning joint and several liability is based on causality. According to Draft Common Frame of Reference, the requirement of causation is the common feature to all European tort regimes. For instance, in France "[…] every *condition sine qua non* is causal […]*"*.[327] Similarly, Article 6.279(1) of Lithuanian Civil Code establishes - "Where several persons jointly take part in causing damage, they shall be

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[324] Guidelines on the method of setting fines imposed pursuant to Article 23(2)(a) of Regulation No 1/2003, § 6, 18.

[325] In accordance to this thesis, the imposition of fines should be based on causality rather than on such criteria as size of colluder, sale figures etc. These criteria could be important, but they should be regarded as secondary importance because they are not directly related to the causality of collusion.

[326] For instance, *Sugar cartel case, supra* note 79, § 173. For relevant EU case law, see footnote 215.

[327] Bar, V. C. *et. al.* (editors) *Principles, Definitions and Model Rules of European Private Law. Draft Common Frame of Reference (DCFR)* [interactive]. 2009. <ec.europa.eu/justice/contract/files/european-private-law_en.pdf >, p. 3429.

solidarily liable for compensation thereof."[328] National law is relevant because under recent CJ's case law the individualisation of liability, within a single economic entity, should be examined in accordance with national laws.[329] The legal nature of the EU competition law cases is "civil and commercial"[330]. Therefore, it seems there are no compelling principal arguments why similar solutions, such as joint and several liability in national tort laws, cannot be transposed to the EU competition law.

Thirdly, the establishment of joint and several liability is in line with the recent developments in the field of private enforcement. Article 11(1) of Directive establishes joint and several liability for colluders against injured parties.[331] It also has certain exceptions that could by imposed by MS by a way of derogation, i.e. the standard of joint and several liability is not applicable if: i) the undertakings anytime during the infringement had below 5 % of market share; ii) the application joint and several liability would irretrievably jeopardise undertaking's economic viability and cause its assets to lose all their value; iii) MS could provide favourable regime for an immunity owners under leniency and restrict joint and several liability by the principle of subsidiarity (i.e. the immunity owner is jointly and severally liable to the persons, other than direct or indirect purchasers or providers, only if co-infringers cannot compensate injured parties in full.[332] In U.S., colluders in private enforcement proceedings are jointly and severally liable as well as in EU.[333] The conclusion is that similar private enforcement regime can be *mutatis mutandis* transposed to the public enforcement under Articles 101, 102 and there

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[328] Civil Code of the Republic of Lithuania. *Valstybės žinios*. 2000, No 74-2262. In addition, the Supreme Court of the Republic of Lithuania The Division of Civil Cases 26 March 2008 decision in civil case J. B., A. V. and J. Š. v. The Register of Legal Entities of the Republic of Lithuania (case No 3K-7-59/2008). Teismų praktika. 2008, 29 held that usually joint and several liability in extra-contractual relations arise when there is at least one of the following conditions: i) the co-infringers are related in terms of actions with respect to consequences; ii) joint and several liability is possible even one infringer did not inflict direct damages, but have a knowledge regarding actual infringer's unlawful behaviour; iii) when co-infringers are related with respect to fault in both intentional and negligence forms.

[329] C-231/11 P, *European Commission v Siemens AG Österreich and Others and Siemens Transmission & Distribution Ltd and Others v European Commission* [2014]. § 62.

[330] C-302/13, *flyLAL-Lithuanian Airlines AS v Starptautiskā lidosta Rīga VAS and Air Baltic Corporation AS* [2014] ECLI:EU:C:2014:2319, § 29.

[331] Directive 2014/104/EU of the European Parliament and of the Council of 26 November 2014 on certain rules governing actions for damages under national law for infringements of the competition law provisions of the Member States and of the European Union. Article 11(1) of Directive expressly provide: "Member States shall ensure that undertakings which have infringed competition law through joint behaviour are jointly and severally liable for the harm caused by the infringement of competition law; with the effect that each of those undertakings is bound to compensate for the harm in full, and the injured party has the right to require full compensation from any of them until he has been fully compensated."

[332] *Ibid.,* Articles 11(2) to 11(5) of Directive respectively.

[333] Baer, B. Public and Private Antitrust Enforcement in the Unites States. *Department of Justice Remarks as Prepared for Delivery to European Competition Forum 2014* [interactive]. 11-02-2014 [accessed 05-04-2015].<www.justice.gov/atr/public/speeches/303686.pdf>, p. 3: "In the United States, private treble damages actions against cartels promote both deterrence and compensation. Cartel defendants are jointly and severally liable for damages caused by the entire conspiracy."

are no convincing principal objections against that.

Fourthly, joint and several liability already exist under Article 102 in cases where an infringement has been made by single economic entity, regardless the fact that it was made by several legal entities.[334] In other words, legally separate companies within a group of companies could be held jointly and severally liable. Furthermore, the argument of coherence supports the establishment of joint and several liability to undertakings that collectively abuses the position of collective dominance. It was mentioned that the application of the abuse of collective dominance from a corporate group (single economic undertaking) has been extended to two or more economically independent undertakings. Therefore, the coherence within the System necessitates extending the application of joint and several liability regime as well. Nonetheless, presently there is no case law regarding the application of collective dominance to separate legal and economic undertakings. Arguing even further, one could say that if in principle at the *ex post* stage of enforcement it is possible to apply joint and several liability, then, by a way of analogy, the same should hold in cases of concerted practices because both the abuse of collective dominance and concerted practices tackle essentially the same legal problem – unlawful parallelism.[335]

Finally, the principle of deterrence is one of the core principles that underlie the imposition of fines.[336] The establishment of equal, joint and several liability in case of duopoly for the infringements of Articles 101, 102 is in line with general idea of deterrence. More precisely, equal, joint and several liability would mean that the risk of inability to pay fines would be transferred to colluders. Therefore, higher stakes for undertakings could make collusion less likely.[337] Equal, joint and several liability in the cases of duopoly would strengthen the effectiveness of the enforcement of the EU competition law.[338] In conclusion, it seems that there are many strong legal arguments confirming the 1st proposition.

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[334] For instance, *European Commission v Siemens AG Österreich and Others and Siemens Transmission & Distribution Ltd and Others v European Commission, supra* note 329, § 42-49.

[335] This argument is based on assumption that the abuse of collective dominance under Article 102 is proper ground to solve oligopoly problem. However, this statement has been criticized in chapter one of this thesis.

[336] Guidelines on the method of setting fines imposed pursuant to Article 23(2)(a) of Regulation No 1/2003 . § 4. The Commission shall ensure both specific deterrence – in terms of imposition of additional fines for infringers (for instance, § 31-32 of the Guidelines and general deterrence – in terms to deter engagement or continuance of the behaviour that is contrary to Articles 101 and 102 of TFEU.

[337] Posner, R. argument at: Posner, R. A., *supra* note 45, p. 1562: "If the only sanction for illegal price-fixing were simple damages or injunction, firms would have an inadequate incentive to comply with the law." is relevant. Equal, joint and several liability seems to be an adequate incentive to comply with the law.

[338] The objective of joint and several liability have been appreciated by CJ by noticing that the objective of joint and several liability relates to: i) additional legal device for EC to strengthen EC's actions with regards to collection of debts; ii) reduces the risk of infringer's insolvency; iii) is part of deterrence mechanism, *European Commission v Siemens AG Österreich and Others and Siemens Transmission & Distribution Ltd and Others v European Commission, supra* note 329, § 59.

Game theory could also justify the imposition of equal, joint and several liability for collusions in duopolies. Shapley value shows that undertakings in duopoly bring essentially the same marginal value to collusion. To find $i's$ marginal contribution the competition authorities should know the total supply of the product in the market and $i's$ total output during the collusion. Suppose that in duopoly market $i's$ market share is equal to 40%, and $j's$ market share is equal to 60%. Suppose also that:

The example of calculation of Shapley value. Table (11)

$v(S) = P_m$[339] $= 1000;$
$P_i = 240;\ P_j = 360, where\ P_i + P_j = 600\ (in\ case\ i\ and\ j\ does\ not\ collude);$
$whereas\ in\ case\ i\ and\ j\ forms\ a\ coalition\ (cartel\ or\ collusion):$
$P_i + P_j = P_m = 1000.$
$The\ value\ of\ the\ cartel\ is\ equal\ to\ 400\ (1000 - 600).$

Before counting Shapley value, note that the reasoning below applies to sequential games[340]. For collusion in duopoly, sequential aspect is immaterial because there exists only one coalition, which comprises of both undertakings. The formula for counting Shapley value has already been provided (see Shapley value definition above). Note that there are only two possible ways to make coalition ($N! = 2$): either i enters the coalition first, or j enters first. Therefore, $i's$ marginal contribution half of the time is 240 and half of the time is $1000 - 360 = 640$. Thus, $\phi_{i(shapley\ value)} = 240 * 0{,}5 + 640 * 0{,}5 = \mathbf{440}$ and $\phi_{j(shapley\ value)} = 1000 - 440 = \mathbf{560}$. Shapley value proves that in the case of duopoly total benefits of the cartel shall be split equally to both i and j (i.e. the total value of cartel – 400. It should be split equally, i.e. 200 for each undertaking). The explanation of such result stems from the axioms of equal treatment and additivity. Hypothetically, the cartel itself could be based on Shapley allocations. If employed, it could solve the question how much each undertaking should get under cartel arrangement. To summarise, the conjunction of legal arguments and cooperative game theory confirmed the validity of the 1st proposition.

Some could doubt whether the 1st proposition is compatible with the principle of equality. Colluders could differ in parameters of market power, size, sale figures, role in collusion, etc. Therefore, one might contend that equal joint and several liability would affect

339 P_i refers to *i*'s profits; P_j refers to *j*'s profits; P_m refers to joint monopoly profits.

340 The sequential games could simply be understood as games where one player implements his strategy prior to the other undertaking, i.e. with regards to time, the players does not implement their strategies simultaneously. To illustrate: one player enter the coalition, then another player enter the coalition, so on and so forth - until the grand coalitions would be formed.

smaller undertaking relatively more harshly than the larger counterpart. Hence, it is unjust. The thesis will try to provide several arguments why such reasoning is not correct.

At the outset, collusion between non-symmetrical undertakings is itself unlikely.[341] However, suppose that smaller and larger undertakings somehow managed to collude. Under the regime of equal, joint and several liability, it is likely that the EC for practical purposes would simultaneously request damages from both colluders. Arguably, it is also more likely that the larger undertaking would pay first since it is assumingly financially stronger undertakings. Apart from that, previously explained legal and game theory arguments are sufficient to rebut the concern regarding the principle of equality. *Firstly*, the fault of colluder in the EU competition law should not necessarily be intentional (negligence is sufficient). To emphasize, undertaking's behaviour of entering collusion and knowingly passively contributing to rivals infringement could be qualified as the fault in the form of negligence.[342] *Secondly*, and probably the most important aspect is that equal, joint and several liability at the EU level does not necessarily imply that one undertaking is liable for the others infringement. The individualisation of liability could and should be determined in the national civil proceedings.[343] If any of colluder paid the fine in full, obviously, the recourse proceedings at the national level would be a proper way to balance colluders' rights. In these proceedings, leader's role in the cartel and other important aspects for the individualisation of liability could be appropriately assessed. These arguments are valid in the case of duopoly, but the individualisation of liability at the national level seems to justify the 2nd proposition as well, i.e. that joint and several liability, not necessarily equal, could be adopted as universal solution in a wider range of cases. Hence, the 1st proposition is in line with the principle of equality.

Some could also argue that the differentiation or individualisation of fines could be beneficial to the EU competition law enforcement because differentiation or individualisation of fines has the deterrence effect. Because instigator (leader) is punished more severely, then no undertaking would risk taking the initiative to instigate collusion.[344] However, this argument is

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[341] Tirole, J. *et. al.* Chapter 8: The Economics of Tacit Collusion: mplications for Merger Control. *Contributions to Economic Analysis* [interactive]. Vol. 282, 2007, p. 217-239 [accessed 11-12-2014].<http://www.elsevier.com/connect/honoring-the-2014-nobel-laureates-with-free-access-to-selections-of-their-research#Economics>, p. 220: "While it may not constitute the main relevant factor for a correct analysis of an industry, market share asymmetry may reflect more profound and relevant asymmetries that tend to make collusion more difficult to sustain."

[342] The sufficiency of fault in the form of negligence is established in Article 23(2) of the Council Regulation (EC) No 1/2003 of 16 December 2002 on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty.

[343] *European Commission v Siemens AG Österreich and Others and Siemens Transmission & Distribution Ltd and Others v European Commission, supra* note 329, § 62.

[344] For instance, the role of leader or instigator currently is considered as aggravating circumstance at the stage of adjusting the basis of the fine Part 28 of the Commission's Guidelines on the method of setting fines imposed

not convincing. It is true that someone should take initiative to set up collusion, but the argument itself implies that some are active and some are passive in the collusion. However, it is not necessarily true. It is easy to conceive that all colluders could be active[345]. Therefore, to identify the "instigator" or "leader" could be very hard, and in terms of procedural costs inadequate or even not possible. Moreover, in case of duopoly the argument is not relevant because of the Causality argument.

However, several points should be emphasized. *Firstly*, this thesis argued for the imposition of equal, joint and several liability only for duopolies, whereas joint and several liability, as more general solution could be applied to any case of unlawful parallelism under Articles 101, 102. *Secondly*, supposing that equal joint and several liability would be applied in the EU competition law enforcement in parallelism cases, it should not mean that the same should hold for the subsequent national proceedings between colluders (recourse proceedings). *Thirdly*, the calculation of Shapley value could be proper and universal method for apportionment of liability in *ex post* parallelism cases. It also satisfactorily captures the "effect" element under Article 101. However, the 2nd proposition requires deeper analysis and impact assessment that exceeds the scope of this thesis. Therefore, the 2nd proposition seems to hold only provisionally.

In conclusion:

Firstly, the hypothesis that Shapley value is a proper method for calculation and allocation of fines for collusion under Article 101, 102 in duopoly and possibly in a larger set of cases has been confirmed. *Secondly*, it was also substantiated that in duopoly cases undertakings should be held equally jointly and severally liable. Thesis partially substantiated that joint and several (not necessarily equal), liability could be applied as a general solution to all unlawful parallelism cases under Articles 101, 102. It seems that such liability regime would simplify the enforcement under Articles 101, 102 and, to some extent, would deter collusive behaviour.

In the section it was demonstrated and proved that cooperative game theory, in particular the notion of Shapley value could be creatively used to reconsider present liability regime under Articles 101, 102. It is significant step towards higher integrity of game theory and legal perspectives in order to reach the ultimate goal to resolve parallelism problematic in the EU competition law.

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pursuant to Article 23(2)(a) of Regulation No 1/2003.

[345] For instance, collusion could be instigated at the meeting of undertakings.

CONCLUSIONS[346]

1. At the moment, it is not well recognized that the rational behaviour is the primary cause of collusion in oligopolies. Game theory could help solving oligopoly problem in practical and theoretical ways. The extent to which game theory could do that could be envisaged through the areas or legal problems on which novel insights could be attained: concerted practices, exchange of information, leniency, and imposition of fines.
2. Oligopoly problem should be solved systematically. The two-fold system is the best way to do this. At *ex ante* stage the European Commissions' Merger Regulation should be applied, whereas at the *ex post* stage the concept of concerted practices should be applied. The scholarship suggestions to apply the concept of abuse of collective dominance are not correct and should not be regarded as proper solution for oligopoly problem. The concept of abuse of collective dominance should be restricted to its initial purpose to solve the abuses of the dominance of single economic entity.
3. The concept of concerted practices should be clarified in a way which eliminates the requirement to prove competitors' intent (mental consensus). This subjective element is redundant and makes the application of concerted practices less effective.
4. There is a gap regarding a workable criterion for delimiting concerted practices and conscious parallelism. The proper criterion for delimiting these closely related concepts should be based on the Nash equilibrium concept. This thesis offers a concrete solution, which is proposed in the section of recommendations. In this way, legal certainty would be ensured.
5. An attainment of excessively high profits itself must not be prohibited in the European Union competition law. Game theory allows attaining the novel concept of "self-enforcing conscious parallelism", which signifies that in the markets where undertakings reapeatedly interact, market itself is sufficiently transparent and with a few undertakings, abnormally high profits are attainable without collusive behaviour.
6. There is a gap regarding unilateral signalling of information. Both exchange of information (reciprocal) and information signalling (unilateral) may facilitate collusion. In such cases the credibility of shared information must be assessed.
7. At the moment, leniency cannot be regarded as effective procedural instrument revealing collusions in oligopolies. The idea of "punishment" allowes deducing novel outlook on leniency, namely "leniency as punishment". It was demonstrated that paradoxically leniency

[346] The conclusions of this thesis apply to the EU competition law. Nonetheless, due to similarities between the EU competition law and the EU MS's national laws these conclusions could be applied *mutatis mutandis*.

could strengthen collusion. Empirical data on leniency applications and theoretic reasoning allow the prediction that in the future the frequency of leniency applications may decrease.

8. Present liability regime at *ex post* stage of public enforcement is not correct for solving oligopoly problem. Equal joint and several liability under Articles 101, 102 should be applied for infringements in a form of collusive behaviour in duopolies. The effectiveness of public enforcement under Articles 101, 102 in such way would be ensured. Similarly, joint and several liability seems to be justified as a general solution for oligopoly problem. Such liability regime may simplify the public enforcement and, to some extent, may deter collusive behaviour. The use of cooperative game theory and, in particular, Shapley value, proves to be a successful way for the justification of this liability regime.

RECOMMENDATIONS

The concepts of concerted practices and conscious parallelism could be delimited by applying the criterion that was created in this thesis: *if cooperative or non-cooperative Nash equilibrium could be justified without direct or indirect contact between undertakings, taking into consideration: (i) market transparency, (ii) market concentration, and (iii) other relevant circumstances, concerted practices under Article 101 cannot be constituted.*

At the moment, there is no similar criterion in the European Union competition law. Scholars that analyse oligopoly problem bypass this problem. Scholars and competition authorities must recognise that this gap needs to be filled. The EC, indeed, struggles with difficulties in proving concerted practices, whereas undertakings try to justify the defence of conscious parallelism. This tension is at the core of legal disputes that are related to the examination of collusive behaviour under Article 101 of the Treaty on the Functioning of the European Union. Recommended criterion of this thesis directly aims to help solving this problem.

It should be understood that the practical use of the recommended criterion implies the understanding of basics of game theory and, in particular, the understanding of the concept of the Nash equilibrium. It means that the use of recommended criterion should be accompanied with the expert report. The good practical example is *Wood pulp* case where the Court of Justice of the European Union in the proceedings and justification of the decision used two expert reports. The use of experts is welcomed practice that should be used more often.

Finally, it should be noted that recommended criterion does not require legislative amendments. This is one of its advantages. Either the European Commission or the European Union courts could establish the criteria through the case law.

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ANNOTATION IN ENGLISH LANGUAGE

Keywords: *game theory, oligopoly problem, parallelism, concerted practices*.

This thesis is based on the main idea that game theory may significantly contribute to solving collusion problem in oligopolies, which is the object of this thesis (so-called "oligopoly" or "parallelism" problem). The thesis aims to answer whether, how and to what extent game theory could do so under the European Union competition law. This aim is achieved by analysing: the concept of concerted practices, exchange of information, leniency, and imposition of fines (this defines the scope of application of game theory). Thesis greatly contributes to the scholarship debate on complex oligopoly problem.

The merit of this thesis is the significant novel results obtained: novel solution on how to delimit concerted practices and conscious parallelism; novel outlook on "leniency as a punishment"; novel justification of imposition of equal, joint and several liability (in duopolies), as well as joint and several liability (as universal solution) in parallelism cases, and many more. These results are obtained through an interdisciplinary analysis. Thesis' conclusions show how it would be possible to increase the effectiveness of public enforcement of the European Union competition law. This research stands out and goes beyond "classical" legal analysis of oligopoly problem. In doing so, this thesis fills a gap of the absence of such research in the field and significantly contributes to the better understanding of oligopoly problem.

ANNOTATION IN LITHUANIAN LANGUAGE

Reikšminiai žodžiai: *žaidimų teorija, oligopolijos problema, paralelizmas, suderinti veiksmai*.

Šis magistro darbas yra paremtas pagrindine idėja, kad žaidimų teorija gali reikšmingai prisidėti prie suderinto neteisėto elgesio problemos oligopolijose sprendimo (vadinamoji „oligopolijos“ arba „paralelizmo“ problema). Šio magistrinio darbo tikslas atsakyti į klausimą ar, kaip ir kokiu mastu žaidimų teorija gali spręsti nurodytą problemą pagal Europos Sąjungos konkurencijos teisę. Šis tikslas yra pasiekiamas analizuojant: suderintų veiksmų sąvoką, apsikeitimą informacija, atleidimo nuo baudos institutą (angl. leniency) ir baudų skyrimą (tai apibrėžia žaidimų teorijos taikymo sritį). Magistro darbas reikšmingai prisideda prie mokslinių debatų sudėtingos oligopolijos problemos tema.

Magistro darbo vertingumą sudaro pasiekti nauji ir originalūs rezultatai: naujas ir originalus sprendimas kaip atriboti suderintus veiksmus nuo sąmoningo paralelizmo; naujas ir originalus požiūris į atleidimo nuo baudos institutą (angl. leniency) kaip nubaudimą žaidimų teorijos prasme; naujas ir originalus pagrindimas lygios, jungtinės ir solidarios atsakomybės (duopolijos atvejais), taip pat jungtinės ir solidarios atsakomybės (kaip universalus sprendimas) kitiems paralelizmo atvejams, ir daugelis kitų. Magistro darbo rezultatai pasiekti tarpdisciplininės analizės būdu. Magistro darbo išvados parodo kaip viešą konkurencijos teisės priežiūrą būtų galima padaryti efektyvesne. Šis tyrimas išsiskiria ir siekia toliau, nei įprasta, teisinė oligopolijos problemos analizė. Tokiu būdu, magistro darbas užpildo tokio tyrimo nebuvimo spragą oligopolijos klausimu ir ženkliai prisideda prie geresnio problemos supratimo.

SUMMARY IN ENGLISH LANGUAGE

Jablonskis, M.: *Game Theory and Collusion: Oligopoly Problem in the European Union Competition Law*.

There are no recent and comprehensive scientific researches on interdisciplinary: game theory and legal analysis to oligopoly (parallelism) problem. Therefore, this thesis aims to answer whether, how, and to what extent game theory could contribute to solving oligopoly problem at the European Union level.

Chapter one focuses on the causality of oligopoly problem. The conclusion is attained that rationality is the prime cause of parallelism. Then, scholarship proposals and present system of available legal remedies on how to solve oligopoly problem are critically examined. The chapter is concluded with the proposition that oligopoly problem should be solved by application of the European Commissions' Merger Regulation (*ex ante*) and the concept of concerted practices (*ex post*), whereas the notion of abuse of collective dominance should not be applied.

Chapter two then draws on obtained conclusions and critically examines the concept of concerted practices, exchange of information, leniency and imposition of fines. Rationality, Nash equilibrium, Shapley value, Folk theorem, Grim trigger, Stick and Carrot, Prisoner's dilemma, punishment, discount factor and other game theory notions are applied in order to acquire novel solutions that would help to solve oligopoly problem. Notably, novel solution based on Nash equilibrium is proposed for a workable distinction of concerted practices and conscious parallelism. Thesis, moreover, verifies this solution and explains in what circumstances it could be applied. Then, game theory insights allow to justify that both unilateral and reciprocal sharing of information should be prohibited because in both cases collusion may be facilitated and strategic uncertainty reduced. The credibility of information in such cases should be assessed.

Thereafter, novel outlook on "leniency as punishment" is proposed. Several counter-intuitive conclusions are reached. Then, it is argued that leniency paradoxically could strengthen collusion. It is also contended that at the moment leniency cannot be regarded as a successful device for revealing collusions in oligopolies. In addition, empirical data on leniency applications is examined in order to verify thesis' hypotheses. Hereafter, novel outlook on leniency allows predicting that in future the frequency of leniency applications may decrease.

Finally, interdisciplinary game theory and legal analysis allows justifying the novel solution on the application of equal, joint and several liability in duopoly cases, whereas in other parallelism cases joint and equal liability should be applied. In this way, the effectiveness of public enforcement of competition law would be significantly increased. Essentially master thesis proves that the application of game theory is the effective way to analyse oligopoly problem.

SUMMARY IN LITHUANIAN LANGUAGE

Jablonskis, M.: *Žaidimų teorija ir suderintas neteisės elgesys: oligopolijos problema Europos Sąjungos konkurencijos teisėje*

Nesant tarpdisciplininių žaidimų teorijos ir teisinės analizės mokslinių tyrimų oligopolijos (paralelizmo) problemos tema, magistro darbe siekiama atsakyti į klausimą - ar, kaip ir kokiu mastu žaidimų teorija gali išspręsti šią problemą Europos Sąjungos lygiu.

Pirmame skyriuje dėmesys skiriamas oligopolijos problemos priežasčių tyrimui. Daroma išvada, kad racionalumas yra pagrindinė paralelizmo priežastis. Po to kritiškai tiriami mokslininkų pasiūlymai ir įvertinama dabartinė teisinių priemonių sistema, skirta oligopolijos problemos sprendimui. Skyriaus pagrindinė išvada, kad oligopolijos problema turėtų būti sprendžiama taikant Europos Komisijos koncentracijų reglamentą (*ex ante*) ir suderintų veiksmų sąvoką (*ex post*), tuo tarpu kolektyvinio piktnaudžiavimo dominuojančia padėtimi sąvoka neturėtų būti taikoma.

Antrame skyriuje, remiantis prieš tai gautomis išvadomis, kritiškai analizuojama suderintų veiksmų sąvoka, apsikeitimas informacija, angl. *leniency* ir baudų skyrimas. Racionalumas, Nešo pusiausvyra, Shapley vertė, Folk teorema, angl. *Grim trigger*, angl. *Stick and Carrot*, Kalinio dilema, nubaudimo, diskonto koeficiento ir kitos žaidimų teorijos sąvokos magistro darbe pritaikomos, siekiant pasiekti naujų ir originalių sprendimų, galinčių padėti išspręsti oligopolijos problemą. Remiantis Nešo pusiausvyra pasiūlomas naujas ir originalus kriterijus, kuris leidžia veiksmingai atriboti suderintus veiksmus ir sąmoningą paralelizmą. Magistro darbe taip pat įvertinama ir paaiškinama kokiais atvejais šį sprendimą būtų galima taikyti. Žaidimų teorijos įžvalgos taip pat leidžia pagrįsti, kad tiek vienašalis tiek abipusis informacijos dalijimasis gali palengvinti sąlygas suderintam neteisėtam elgesiui ir panaikinti strateginį neapibrėžtumą. Šiais atvejais labai svarbu įvertinti informacijos patikimumą.

Vėliau pasiūlomas naujas ir originalus požiūris į „angl. *leniency* kaip nubaudimą“. Prieinama prie keleto netikėtų išvadų, argumentuojama, kad *leniency* gali sustiprinti suderintą neteisėtą elgesį. Taip pat tvirtinama, kad šiuo metu *leniency* negali būti laikomas sėkmingu įrankiu, kovojant prieš suderintą neteisėtą veikimą oligopolijose. Tikrinant magistro darbo hipotezes, išanalizuojami empiriniai *leniency* pareiškimų duomenys. Naujas požiūris į *leniency* leidžia spėti, kad ateityje pareiškimų mažės.

Galiausiai, tarpdisciplininė žaidimų teorijos ir teisinė analizė leidžia pagrįsti naują ir originalų sprendimą taikyti lygią, jungtinę ir solidarią atsakomybę duopolijos atveju, o kitais paralelizmo atvejais – jungtinę ir solidarią atsakomybę. Tokiu būdu viešas konkurencijos teisės priežiūros efektyvumas būtų ženkliai padidintas. Iš esmės magistro darbe įrodoma, kad žaidimų teorijos taikymas yra efektyvus būdas spręsti oligopolijos problemą.

ANNEXES

Annex I - circumstances that facilitate collusion

This exemplary list is useful for at least two reasons: (i) it serves as indications in analysis of likelihood of future collusion (*ex ante*); (ii) it helps to analyse the sustainability of existing collusion (*ex post*).

Circumstances that facilitate collusion.[347] Table (12)

Parameters facilitating parallelism (+)	Parameters making parallelism unlikely (-)
Market transparency	Innovative markets
Market stability	Business cycles and fluctuating demand
Market growth	Market decline
Entry barriers	Number of competitors: *harder to reach coordination; smaller amount of benefits*
Market symmetries: *in terms of costs structure, output capacity and market share*	Market asymmetries: *in terms of costs structure, output capacity and market share*
Frequency of interaction and price adjustments: *easier to retaliate immediately*	Product differentiation: *retaliation is less grievous*
Multimarket contact between competitors	Demand elasticity
Structural links and agreements: *cross-ownership, joint venture, marketing, research agreements*	Countervailing buying power
	Existence of “maverick” firm: *a firm with drastically different cost structure, capacity or quality*
	Network effects: *winner-take-all and lock-in arguments*

[347] This list has been prepared based on: Tirole, J., *et al.*, *supra* note 341 and Feuerstein, S., *supra* note 103.

Annex II

Closed leniency cases under Leniency Notices in a period 2013-2014. Table (13)

No	Case No (Date)	Title	The year of earliest emergence of the cartel
1.	39748 (10-07-2013)	Automotive Wire Harnesses	2000
2.	39633 (27-11-2013)	Shrimps	2000
3.	39914 (04-12-2013)	Euro Interest Rate Derivatives	2005
4.	39861 (04-12-2013)	Yen Interest Rate Derivatives (YIRD)	2005
5.	39801 (29-01-2014)	Polyurethane Foam	2005
6.	39922 (19-03-2014)	Automotive bearings	2004
7.	39792 (02-04-2014)	Steel abrasives	2003
8.	39610 (02-04-2014)	Power cables	1999
9.	39965 (25-06-2014)	Mushrooms	2010
10.	39574 (03-09-2014)	Smart card chips	2003
11.	39924 (21-10-2014)	Swiss Franc interest rate derivatives	2008
12.	39780 (10-12-2014)	Envelopes	2003

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CONFIRMATION OF INDEPENDENCE OF THE WRITTEN WORK

2015-05-22,
Vilnius

I, Mykolas Romeris University (hereinafter referred to as the University),

Faculty of Law, Department of Business Law, European and International Business Law programme
(Faculty/ Institute, study programme)

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Hereby confirm that this academic paper Master's final thesis:
"*Game Theory and Collusion: Oligopoly Problem in the European Union Competition Law*"

1. Has been accomplished independently by me and in good faith;
2. Has never been submitted and defended in any other educational institution in Lithuania or abroad;
3. Is written in accordance with principles of academic writing and being familiar with methodological guidelines for academic papers.

I am aware of the fact that in case of breaching the principle of fair competition - plagiarism - a student can be expelled from the University for the gross breach of academic discipline.

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(Signature) *(Name, surname)*