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GAME THEORY AND CONTRACT LAW

Master thesis

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TABLE OF CONTENTS

ABBREVIATIONS

AIGs - asymmetric information games

BNE - Bayesian Nash Equilibrium

PBE - Perfect Bayesian Equilibrium

RSI - relationship-specific investment

The Act - Sale of Goods Act 1979

The UK – The United Kingdom

U.C.C. - Uniform Commercial Code

INTRODUCTION

Game theory sounds like a fun. When somebody hears these two simple words the first association is about Monopoly or other types of games. I am confident that no one will think about complicated economic theory which may help to resolve different legal problems. The person who doesn't have enough knowledge in the economy will have difficulties in understanding what Game theory is talking about. Game theory is an approach that was created in 1944 to analyzing various economic situations. Since the 1970s and till nowadays this theory is used in law to simplify situations enough to show the key points of it. Contract Law is the area which is one of the best suited to Game theory since it involves two players who know each other and know that their actions have intertwined effects. But even if you know who is your partner, like in contract relationships, it doesn't mean that the game will be simple and monosemantic. There are situations when your partner possesses information which is not available to you or when he tries to hide this information with the aim to be successful in the game and to gain the best payoff of it.

How incomplete information creates incomplete contracts?

The **aim** of the research is on the basis of the comparative analysis of economic and legal doctrines of England, France and Ukraine to analyze the concepts of incomplete information and incomplete contracts with a view to establishing legal methods which may eliminate the incomplete information in contracts.

The goal will be achieved using these **objectives:**

1. To reveal the concept of Game theory.

2. To reveal the reasons of conclusion of incomplete contracts.

3. To analyze the notion of complete and incomplete information in contract law trough Game theory.

4. To examine and to discuss possible methods for resolving the problem of incomplete information in incomplete contracts.

Relevance. Contract Law is very important nowadays. Contracts are concluded every day in different spheres of person's activity. It is of the highest importance to possess the whole amount of information about your partner as well as the deal in general in order to conclude the contract which will be profitable for you. Since the price of a contract can consist of a big amount of money the damages from incomplete information are going to be enormous. Game theory is a tool which can help to examine the problem of incomplete information in incomplete contracts. The research of this topic can contribute to the legal theory and practice. The relevance of the topic is connected with a widespread of the phenomenon of incomplete information in

incomplete contracts and consists of the need to develop methods and recommendations for improving the contract law area.

Scientific novelty. Scientific novelty of my thesis is determined by insufficient knowledge of the topic in the legal theory and practice. It is of the highest importance to improve old and to create new methods of resolving the problem of incomplete information which leads to conclusion of incomplete contracts.

Practical significance. Firstly, the research will contribute to the legal theory. Scholars can use it in the sphere of contract law as well as others where the contract will take place. Secondly, the research will contribute to the legal practice. Practical application of the methods which will be able to resolve the problem of incomplete information in incomplete contracts will be important for lawyers who are the participants to the conclusions of contracts. Thirdly, a practical application of the topic is also appropriate for the parties to a contract. The research will help to make contracts more safeguarding for parties. Fourthly, the research will contribute to the courts' practice. The methods proposed in the thesis will reduce the burden for courts and their intervention in the parties' relations.

Review of the literature. At the first time, the problem of incomplete information was mentioned by **Douglas G. Baird**[1] in 1994. He is describing different legal situations in which everyone is completely informed or when someone possess incomplete information. The author also analyzes the disclosure laws as one of the methods of resolving this problem. He states that such laws raise many problems. Unfortunately, there are no other methods described in his work how to deal with the problem of incomplete information. However, it is necessary to research this book because the author shows a connection between the economic theory and law. He also describes how the Game theory applies in the legal sphere.

The next author who did the research on this topic is **Eric Rasmusen**[2]. He distinguishes different types of information included: complete and incomplete, symmetric and asymmetric, perfect and imperfect information. The author analyzes these types mostly in the economic context, but with some examples related to the legal sphere. There are no recommendations in his book how to resolve the problem. The negative feature of these two sources is that they reveal the problem in general. They do not relate just to the contract law sphere. However, it is necessary to research this work because the author describes the Game theory very deep with all its elements and displays the economic approach to the different life-situations through the games.

[1] Douglas G. Baird, Robert H. Gertner and Randal C. Picker, Game Theory and the Law (Cambridge: Harvard University Press, 1994), 79-119.
[2] Eric Rasmusen, Games and Information: An Introduction to Game Theory (Oxford: Blackwell Publishers, Fourth edition, 2006), 38-62.

The author gives the understanding of the types of incomplete information and the difference between them.

The problem of incomplete contracts arises in the scientific article wrote in 1992 by **Ian Ayres and Robert Gertner**[3]. They analyze the notion and the types of contractual incompleteness. The reference in the article is also made to incomplete information, but not in the relation to incomplete contracts. This article only mentions about the problem, but doesn't resolve it. It is necessary to research this work because the authors describe the reasons of contractual incompleteness from legal and economic perspectives. The authors also emphasise a few methods to resolve the underlined problem, e.g. the usage of the default rules.

The legal approach to the problem of incomplete contracts is discussed by **Ewan McKendrick**[4] in his book dated 2005. The author uses the English case law in order to describe this problem. He divides his considerations on two main aspects. Firstly, the author points the cases in which it has been held by the court that the agreement is incomplete from the law perspective, but it still can be enforced. Secondly, the author points the cases in which it has been held by the court that the agreement is too vague or incomplete in order to be enforced. He mentions a few methods of resolving the problem. However, the author doesn't mention about the problem of incomplete information as one of the reason of contractual incompleteness. It is necessary to research this book because the author uses the English case law with a view to demonstrating the problem of incomplete information in real cases and the English law approach to resolve it.

The economic approach to the problem of incomplete contracts is discussed by **Oliver Hart and John Moore**[5]**.** The authors establish the basics of the incomplete contracts. They discuss partially and totally incomplete contracts. The authors discuss Maskin and Tirole's notion of describability and their irrelevance theorems. They explain the importance and the disadvantages of the Maskin and Tirole's approach to the problem of incomplete contracts. The authors also present a preliminary discussion of the role of property rights (asset ownership) when contracts are incomplete. It is necessary to research this work because the authors introduce the theoretical concept of the residual control rights and its possible application in the contracts.

Ronen Avraham and Zhiyong Liu[6] in their article relate to the incomplete contracts

[3] Ian Ayres and Robert Gertner, Strategic Contractual Inefficiency and the Optimal Choice of Legal Rules (The Yale Law Journal, 1992), 729-773.
[4] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 128-145.
[5] Oliver Hart and John Moore, Foundations of Incomplete Contracts (The Review of Economic Studies, 1999), 115-138.
[6] Ronen Avraham, Zhiyong Liu, Incomplete Contracts with Asymmetric Information: Exclusive Versus Optional Remedies (American Law and Economics Review, 2006), 523-550.

with asymmetric information. The authors attempt to start filling this gap by studying the relationship between exclusive and optional remedies which may take place when the contract is incomplete because of the asymmetric information. However, the article doesn't contain the explanation of the connection between the incomplete information and incomplete contracts. It is necessary to research this work because the authors try to resolve the problem of asymmetric information which is one of the types of incomplete information using the remedies' concept.

Defended statements.

1. The incomplete information is one of the main reasons for creation of incomplete contracts.

2. There is a necessity in identical application of the doctrine of good faith and the duty of disclosure doctrine by common law and civil law countries.

3. The legal systems may reduce incomplete information in contracts through implementation of the doctrine of residual control rights.

To achieve the goal and to answer the research question of the master thesis the following **methods** were applied. **The analysis method** was used. This method was focused on precise analysis of different scientific books and articles and on the legislation of England and France.

The modeling method was used in order to display real legal situations in models, called 'games', where the parties to a contract were transformed to the players; the gain from a contract - to payoffs; the results of performing/non-performing of a contract - to outcomes; the unexpected events - to Nature.

The historical method was used with a view to discovering roots of Game theory and Contract law and ascertain how these two different spheres, economic and legal, are related to each other.

The deduction method was also applied with the objective to examine the notion of incomplete information in contracts in general and its various types, such as complete and incomplete information structure, symmetric and asymmetric information structure, perfect and imperfect information stricture.

The analogy method was used to create the game which corresponds to the real legal situation. All players of the game, strategies, and payoffs are the analogy of the real situation. It can help to make the right choice and to get the best payoff of the game which will lead to the best result in the real life (e.g. to conclude a contract which will be profitable for the party).

The method of idealization was also used in the work. This method was applied when it was necessary to create conditions which were absent in reality but important for building the game. It is called Nature in Game theory. Nature is an element which describes the change of

circumstances which don't depend on the players' wishes.

The structure of the Master thesis. My Thesis consists of the introduction, three chapters, conclusions and recommendations. Chapter I – The concept of Game Theory; Chapter II – The concept of incomplete contracts; Chapter III – The notion of incomplete information.

The **introduction** reveals the relevance, determines the degree of scientific development of the topic, subject, purpose, tasks and methods of the research, and reveals the theoretical and practical significance of the work.

Chapter I is devoted to the concept of Game Theory. Firstly, it is explained the notion of Game theory based on the analysis of different economic books and articles. Secondly, it is described the structural components of the Game including Nature, players, strategies, payoffs, outcomes of the game and others. It is analyzed the interactions between these elements and their practical significance. Thirdly, it is explained the types and forms of the game, in particular cooperative and non-cooperative games; the games in the normal form and extensive form. All theoretical materials are showed through the practical examples with a view to describing the practical implementation of the theoretical concept. This Chapter also contains the description of the solution concepts of the game.

Chapter II is devoted to the concept of incomplete contracts. Firstly, it is explained the importance of Contract Law; its origins and definition of the contract in different countries. Secondly, it is described a concept of incomplete contracts. In particular, it is analyzed the reasons of the contract's incompleteness. The reasons are studied from the view of two main approaches: legal and economic. The examples are used with a view to showing the practical application of the concepts. The case law is used to show the existence of the problem and the necessity of its settlement. This Chapter also contains the methods which may be used with the aim to resolve the problem of contractual incompleteness.

Chapter III is devoted to the concept of incomplete information. It is revealed the understanding of incomplete information in broad and narrow senses. In this Chapter it is described different types of incomplete information: perfect/imperfect information structure; complete/incomplete information structure and symmetric/asymmetric information structure. It is also analysed the legal concepts which are referred to these types of information: silence, misrepresentation, fraud and mistake. In this Chapter it is discussed the possible methods in order to resolve the problem of incomplete information in incomplete contracts, particularly, the duty to disclose, the doctrine of good faith and the doctrine of residual control rights.

1. THE CONCEPT OF GAME THEORY

1.1. The Rules of the Game

More than a half century has passed since John Von Neumann and Oskar Morgenstern published their pioneering work that provided the foundations for the field now known as "game theory."[7] By redirecting analytical focus away from a static environment (where individuals merely "react" to their surroundings) and toward a strategic one (where each individual's very surroundings depend centrally on others' reactions), game theory offered a fresh account of human behavior that was descriptively richer and more satisfying than most of its predecessors.[8] In the decades since, the emergent field has cultivated significant advances not only in economics and finance, but also in disciplines as diverse as psychology, biology, political science, and eventually, law.[9]

This theory can be used not only in different disciplines, but in everyday life as well. It means that each person uses this theory at least once in the life. A good example was given by Randal C. Picker. He wrote:

> Let's imagine that I have risen for an early-morning walk. I would like to enjoy the view, take in the scenery, and generally ignore the cars going by me. You, unfortunately, are driving your new Mazda Miata. You want to see how the car handles, to test how it drives through turns and its acceleration. If I knew that you were driving like a maniac, I would want to take that into account in deciding whether to pay much attention to the road. If you knew that I was soaking in the countryside and ignoring the road, you would want to take that into account as well. Our behavioral decisions are intertwined, and we need to take that fact into account when we seek to predict likely outcomes. The legal system should take this into account as well when it establishes antitrust laws for oligopolistic industries or a torts scheme for ordinary accidents.[10]

The author underlined that the legal system should also use this theory in order to predict positive results and to get the best gain of them as well as negative results and try to avoid them.

Initially Game theory seems like a kind of an entertainment. When somebody hears these two simple words the first association is about Monopoly or other types of games. I am confident that no one will think about complicated economic theory which may help to resolve different legal problems.

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[7] Eric Talley, Interdisciplinary Gap Filling: Game Theory and the Law (Law and Social Inquiry, 1997), 1055.
[8] *Id*., p. 1055.
[9] *Id*., p. 1055.
[10] Randal C. Picker, An Introduction to Game Theory and the Law (Chicago Working Paper in Law and Economics, 1994), 3.

1.1.1. The Structural Components of the Game

The Game theory consists of different elements, including players, Nature, outcomes, payoffs etc. Before starting to examine each component of the game it should be established the general notion of the Game theory.

A game in the everyday sense -"a competitive activity . . . in which players contend with each other according to a set of rules", but the scope of game theory is vastly larger.[11]

So, what is "game theory"? At a high level of generality, it studies formally what might be regarded as the social scientific question: How do, or should, individuals conduct themselves when each realizes that the consequences of his individual acts will depend in part on what other independent actors do?"[12] How, in other words, does he do best at pursuing his own objectives, whatever they might be, in an interdependent milieu?[13] Game theory formalize that question by positing players and endowing them with moves, specifying what information is available to each player at each point at which he may be called upon to move, assigning payoffs to the ways all players' moves can be combined to play the game, and then investigating the kinds of conduct that might plausibly arise.[14]

Myerson[15] defines game theory as: "The study of mathematical models of conflict and co-operation between intelligent rational decision-makers". The author also explains the notion of "rational" and "intelligent" individual. [16]

The theory can be explained simpler in other words. In general, the game is a process in which two or more parties participate in the struggle for the realization of their interests. The game theory studies an abstract model of a conflict situation in which at least two parties participate, with partially or completely opposing interests. So, before acting, it is necessary to calculate the probable choice of the opponent. Game theory deals with situations in which strategy is important, that is, in situations in which what is best for one decision maker to do depends in large part on what his adversary does.[17]

With a view to better understand the essence of the game theory, it should be examined the main elements of the game. The first element of the Game theory is a player.

Players are the individuals who make decisions. Each player's goal is to maximize his

[11] Martin J. Osborne, An Introduction to Game Theory (Oxford University Press, 2003), 1.
[12] Stephen W. Salant and Theodore Sims, Game Theory and the Law: Is Game Theory Ready for Prime Time? (Michigan Law Review, 1996), 1846.
[13] *Id.*, p. 1846.
[14] *Id*., p. 1846.
[15] Morten Hviid, Games Lawyers Play? (Oxford Journal of Legal Studies, 1997), 706.
[16] By "rational" we mean that each individual's decision-making behavior would be consistent with the maximization of subjective expected utility, if the other individuals' decisions were specified. By "intelligent" we mean that each individual understands everything about the structure of the situation that we theorists understand, including the fact that all other individuals are intelligent rational decision-makers.
[17] Thomas S. Ulen, The Lessons of Law and Economics (Journal of Legal Economics, 1992), 14.

utility by choice of actions.[18]

It is very important that the player decides, because if he doesn't - he will not be considered as a player. Such a player should have an influence on the behavior of the other players by taking decisions. As an example, the following situation is presented.

"Two businessmen decided to conclude a contract. The contract leads to changes in prices for some goods in the market. Consumers will react to these changes. They will make a decision to buy or not to buy these goods".

The businessmen are the players in this game because all decisions which each of them takes will somehow influence the behavior of the other party to the contract. In contrast, the consumers are not the players in this game, because their reaction to price changes will not change anyone's behavior, particularly, the behavior of the parties to the contract (or the players of the game).

However, sometimes it is useful to explicitly include individuals in the model called pseudo-players whose actions are taken in a purely mechanical way. The second element of the game is a Nature. Nature is a pseudo-player who takes random actions at specified points in the game with specified probabilities.[19]

Nature is something which doesn't depend on the players' wishes or actions. This pseudo-player may appear or may not. The circumstances of the Nature appearance can be various. Let's move to the example which was mentioned above and modify it a little bit.

"Two businessmen decided to conclude a purchase and sale contract. They probably established the price of the goods which one party should pay to another. This price will depend on the exchange rate of the US dollar".

In the case, if the situation with the exchange rate in the country does not change during the execution of the contract no one will suffer losses because the party will pay the amount of money which was fixed in the contract. But in the case when the exchange rate changes, e.g. because of the economic crisis in the country, the party will be obliged to pay more than in the normal economic situation. The economic crisis or the changes in the exchange rate of the currency is called Nature in the Game theory. Nature will also appear in the case of bankruptcy of one of the parties to the contract.

In the time of building the game, the players may include the probability of the Nature appearance in the future. In this situation it can be with probability 0.3, Nature decides that there will be an economic crisis, and with probability 0.7 there will not.

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[18] Eric Rasmusen, Games and Information: An Introduction to Game Theory (Oxford: Blackwell Publishers, 4th Edition, 2006), 12.
[19] Rasmusen, p. 12.

The third element of the game is an action. Action or move by a player is a choice he can make. Player's action set is the entire set of actions available to him. An action combination is an ordered set of one action for each of the players in the game.[20]

Let's come back to the previous example. "Two businessmen decided to conclude the sales agreement. One party proposed the price of 100$, another party - 200$. In the case, if the price is 100$ the second party will not conclude this agreement. On the opposite, if the price is 200$ the first party will not conclude the contract."

Player's action set for the first player is {Conclude the contract; Stay out}. Player's action set for the second player is {Stay out; Conclude the contract}. The actions which the players can choose are to conclude the contract or stay out of it.

The fourth element of the game is a payoff. By player's payoff, we mean either: (1) The utility player receives after all players and Nature have picked their strategies and the game has been played out; or (2) The expected utility he receives as a function of the strategies chosen by himself and the other players.[21]

The payoff is what you will get at the end of the game. In the event of contractual relations, the payoff may consist of money, goods or services etc.

The fifth element of the game is an outcome. The purpose of modeling is to explain how a given set of circumstances leads to a particular result. The outcome of the game is a set of interesting elements that the modeler picks from the values of actions, payoffs, and other variables after the game is played out. The definition of the outcome for any particular model depends on what variables the modeler finds interesting.[22]

That is to say, an outcome is the result of interest. In the contractual relations, the most common outcome is the conclusion of the contract.

The difference between a payoff and an outcome is that the outcomes are the result of the occurrence of acts and events, on the opposite side, the payoffs are the values the decision maker is placing on the occurrences.

The last but a very important component of the game is an information. A concept of information is defined more precisely in Chapter III of the thesis. There are various types of information in the game theory. The general rule is the more information you possess the more beneficial position you have in the game.

1.1.2. Types and Forms of the Game

[20] Rasmusen, p. 12.
[21] Rasmusen, p. 12.
[22] Rasmusen, p. 14.

There are two types of games exist: cooperative and non-cooperative. In general, a non-cooperative game theory is concerned with individual conduct, while the object of interest in "cooperative" game theory is with what can be obtained by "groups" or "coalitions".[23]

The game is called a cooperative where the players can conclude binding agreements between each other. In such a game the players can reach all outcomes which are possible in the game. So, these games are not problematic as far as the parties can agree on whatever they want. And each player will have the best payoff of the game. The game is called a non-cooperative where the players can't conclude a binding agreement. In such a game each player plays according to his own strategy which can be or can't be available to other players. The player also plays with an information which is available to him, but it doesn't mean that this information will be enough to get the best payoff of the game.

As far as a cooperative game is not problematic since the players have the power to decide the way of the game it will be more efficient to deal with a non-cooperative type of the game. The form of the game depends on many details which are included in it. The game may be described in the normal form or extensive form. The extensive form description is more detailed than the normal one. The normal form is an easier form to use and it's considered to be traditional form of the game.

A game in normal form consists of three bits of information: (i) a list of players; (ii) the set of strategies available to each player; and (iii) a utility function for each player defined over the possible outcomes of the game detailing how the player evaluates the different outcomes.[24] The utility of a player from a particular outcome is referred to as this player's payoff for the outcome.[25] A strategy for the player is a complete plan of action for this player detailing what the player will do during the game whenever the player is called upon to act.[26] Given this definition, a strategy from each player will therefore determine an outcome of the game.[27]

The extensive form of the game is much more precise and complicated at the same time. The form includes different details which were skipped in the normal form of the game. It doesn't mean that the normal form is a bad choice for players. The extensive form is mostly used in the games with incomplete information or the asymmetric one.

The extensive form is particularly powerful when the players move sequentially, that is, when actions take place over time.[28] Again, a list of players is essential as well as the payoffs

[23] Stephen W. Salant and Theodore Sims, Game Theory and the Law: Is Game Theory Ready for Prime Time? (Michigan Law Review, 1996), 1846.
[24] Morten Hviid, Games Lawyers Play? (Oxford Journal of Legal Studies, 1997), 710.
[25] *Id*., p. 710.
[26] *Id*, p. 710.
[27] *Id*., p. 710.
[28] Hviid, 715

associated with each possible outcome, but now information is also needed about who takes an action at which point in time, and for each such point, what options the player should choose from and with what information about the future and past.[29]

The visual image of the extensive form is the game tree, which illustrates (a) who moves when; (b) what actions they can take; (c) what they know at that time; (d) any random move, and (e) the payoffs resulting from each outcome.[30]

With a view to better understand forms and types of the game, I would like to present the following situation by the schemes. The most prominent example of the game is the Prisoner's Dilemma.[31] The game is termed a "dilemma" because this theoretically inevitable outcome is worse for each prisoner than another possible outcome, Cooperate/Cooperate.[32] In short, there are two prisoners who are the players in the game. The police can't prove the guilt of the prisoners without the confession at least from one of them. That's why the police propose to each of them separately the next deals: "If you confess and the other prisoner doesn't, you will be free. If you both confess, you will receive the reduced sentence of 8 years. If the other prisoner confesses and you don't, you will get 10 years."[33] This is an example of a non-cooperative game, because the players can't communicate with each other.[34] The individual agents in a game theoretic situation behave differently depending on how they conceive of the choice they are being asked to make.[35] The Prisoner's Dilemma can be used not only in this situation but also in the contractual relationships.

As an example, the following situation is presented. There are two persons who concluded the sales agreement. One of them undertakes the obligation to transfer the furniture and another to pay for it. The seller proposes the price of 10 000$ and the buyer - 20 000$. They agreed on 15 000$. The game is a non-cooperative. The normal form of the game is illustrated below (Table № 1):

[29] *Id*., p. 715.
[30] Hviid, 716.
[31] Rasmusen, 28.
[32] Richard H. McAdams, Beyond the Prisoners' Dilemma: Coordination, Game Theory, and Law (Southern California Law Review, 2009), 216.
[33] *Id*., p. 28.
[34] *Id*., p. 28.
[35] Bruce Chapman, Rational Choice and Reasonable Interactions (Chicago-Kent Law Review, 2006), 9.

		Player 2 (the buyer)	
		Perform	**Not perform**
Player 1 (the seller)	**Perform**	**5;5**	**-10;20**
	Not perform	**15; -15**	**0;0**

Table № 1

There are two players in this game - the seller (Player 1) and the buyer (Player 2). We presume that the Nature will not appear in this game. The set of actions for the seller is {Perform the contract; Not perform}. The set of actions for the buyer is {Not perform; Perform}. The payoffs of this game are introduced on the scheme. In the case, when both players perform their obligations, the payoff for each of them will be 5 000$ (because the price of the furniture is 10 000$). If the Player 1 performs the contract and the Player 2 doesn't, the seller will get -10 000$ (because he executed his obligation - sent the furniture) and the buyer will get 20 000$ (because he didn't pay, but got the furniture). When the Player 1 doesn't perform the contract and the Player 2 performs, the seller will get 15 000$ (the payment on which the parties agreed) and the buyer will get- -15 000$ (because he paid, but get nothing). And in the case, if parties don't perform their obligations the payoff will be 0 $ for both.

The extensive form of this game is illustrated below (Figure No. 1):

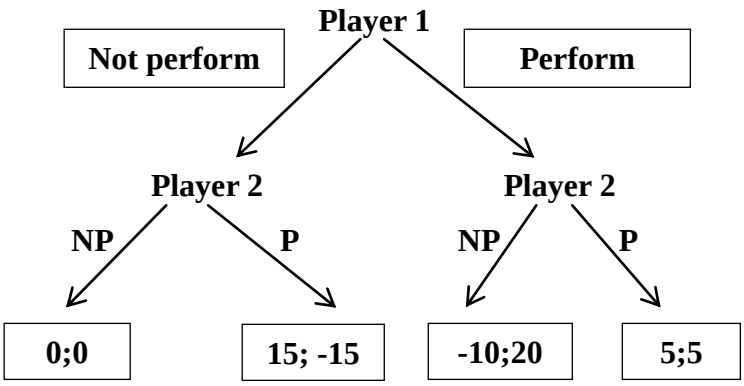

Figure № 1

1.1.3. Solution Concepts of the Game

After a person becomes a player in the game the only wish which he has is to obtain the best payoff of this game. The main aim is to predict the outcome of the game and to maximize its payoff. Basically, the player doesn't take care about the other players' payoffs. It doesn't matter for him whether other players will win or lose. All the player's efforts will be directed to make his payoff as great as possible. The payoffs of the other players are important, however, because they may offer a means to predict which strategy each player might choose, or which strategy a

player would never choose.[36] Normal form games are played simultaneously in the sense that each player makes its choice of strategy without knowing the choice of the others.[37] What is meant is that neither knows what the other has done until it is too late to react to it.[38] The problem for a player is hence to predict what strategy the others are likely to choose so that its own strategy choice maximizes its payoff given its beliefs.[39] Game theory offers a method for solving this problem.[40]

Each player has his own strategy. The strategy allows choosing an action for the player. In other words, the strategy shows different variants of actions and stresses the best one to choose. With the purpose to predict the outcome of the game, it is necessary for the player to focuses on his possible strategy profile since it is the interaction of the different players' strategies that determines what happens.[41] Predicting what happens consists of selecting one or more strategy profiles as being the most rational behavior by the players acting to maximize their payoffs.[42] The main solution concept is an equilibrium concept.

An equilibrium is a strategy profile consisting of a best strategy for each of the players in the game.[43] The equilibrium strategies are the strategies players pick in trying to maximize their individual payoffs, as distinct from the many possible strategy profiles obtainable by arbitrarily choosing one strategy per player.[44] An equilibrium concept helps to get the best payoff from the game for each player. It allows choose the strategy which is the most appropriate for the player.

The first equilibrium concept is based on the notion of dominance. There are two types of such strategies: the dominated and the dominant strategy. The strategy is a dominated strategy if it is strictly inferior to some other strategy no matter what strategies the other players choose, in the sense that whatever strategies they pick, his payoff is lower with.[45] The strategy is a dominant strategy if it is a player's strictly best response to any strategies the other players might pick, in the sense that whatever strategies they pick, his payoff is highest with.[46]

The dominated strategy is the weakest one. It doesn't matter which strategy will be chosen by other players. The dominated strategy will never lead to the best payoff of the game. On the opposite, there is the dominant strategy, which is the best choice for the player, since this strategy is the strongest one. When the player has the dominant strategy in the game he will get

[36] Hviid, 713.
[37] *Id*., p. 713.
[38] *Id*., p. 713.
[39] *Id*., p. 713.
[40] *Id*., p. 713.
[41] Rasmusen, p. 17.
[42] *Id*., p. 18.
[43] *Id*., p. 18.
[44] *Id*., p. 18.
[45] *Id*., p. 20.
[46] *Id*., p. 20.

the best payoff and outcome despite the fact which strategies other players are going to choose. Unfortunately, most games do not have dominant strategy, that's why the players should make more efforts in order to choose the best action and to predict the outcome of the game.

As an example of the dominant strategy, I would like to come back to the example which was presented in the previous subchapter. There were two persons who concluded the sales agreement. They agreed on the price of 15 000$. I have described the different variants of payoffs which the players may get. Now I am going to define the strategy which should be used in this game.

In this game, both players have the dominant strategy {Not perform in any case}. The strategy is dominant because when the Player 1 chooses "*not perform",* it doesn't make any sense which option the Player 2 will choose and vice versa. Why is it so? Firstly, if the seller doesn't perform the contract but the buyer performs - the seller is going to get the payoff of 15 000$ and moreover he will lose nothing in this situation. Secondly, if the buyer also doesn't perform the contract, the seller will get the payoff of 0 $, as well as the buyer. Again, he will lose nothing in this situation. But in the case, if the seller performs the contract and the buyer doesn't - the seller will lose the furniture and the value of it. That's why the strategy {Perform} is weak in this situation. The players can't be confident that they both will pick the right action.

There are various types of the dominated and dominance strategies. For example, a weekly dominated strategy or iterated-dominance strategy. A strategy is weakly dominated if there exists some other strategy for player which is possibly better and never worse, yielding a higher payoff in some strategy profile and never yielding a lower payoff.[47] One might define a weak-dominance equilibrium as the strategy profile found by deleting all the weakly dominated strategies of each player.[48] An iterated-dominance equilibrium is a strategy profile found by deleting a weakly dominated strategy from the strategy set of one of the players, recalculating to find which remaining strategies are weakly dominated, deleting one of them, and continuing the process until only one strategy remains for each player.[49] The significant difference is between strong and weak dominance. Everyone agrees that no rational player would use a strictly dominated strategy, but it is harder to argue against weakly dominated strategies.[50] In economic models, firms and individuals are often indifferent about their behavior in equilibrium.[51]

These types can be found in some games but not very often. Basically, the main rule is that if the player has the dominant strategy he should play this strategy anyway. It is the best

[47] Rasmusen, 23.
[48] *Id*., p. 23.
[49] *Id*., p. 24.
[50] *Id*., p. 24-25.
[51] *Id*., p. 25.

choice for him. In such a case the player shouldn't think about other players' strategies. The player will be confident that he is going to get the best outcome of the game as well as the best payoff of it.

The second equilibrium concept is called a Nash equilibrium.[52] It is the most commonly used solution concept. Nash equilibrium is the standard equilibrium concept in economics. It is less obviously correct than dominant-strategy equilibrium but more often applicable.[53] Nash equilibrium is so widely accepted that the reader can assume that if a model does not specify which equilibrium concept is being used it is Nash or some refinement of Nash.[54] The strategy profile is a Nash equilibrium if no player has incentive to deviate from his strategy given that the other players do not deviate.[55]

Nash equilibrium is a strategy profile with the property that, given the strategies of all the other players, no player can do strictly better by unilaterally choosing a different strategy than he has.[56] In the shorthand commonly employed, if the strategy choice of each player in the game is a "best response" to the strategies of all the others, that strategy profile is a Nash equilibrium of the game.[57] It is often regarded as a minimal requirement of equilibrium in a noncooperative game, since, if a strategy profile were not a Nash equilibrium, at least one player could unilaterally do better by altering his move.[58]

Nash equilibrium is used in many games. It is more likely to find this concept in the game than the dominant equilibrium concept. To describe a Nash equilibrium in short it is the situation in the game when the player has the strategy which is the best reply to the strategy of the other player. Since dominated strategies can't be the best responses they also can't be a Nash equilibrium. On the opposite, dominant strategies are always the best replies to the other player's strategy, that's why they are Nash equilibriums. However, not every Nash equilibrium is a dominant strategy equilibrium. It can be explained in the way that the dominant strategy is the best reply to all other strategies, which players will choose in the game. But when the dominant strategy is a part of a Nash equilibrium, it should be the best response only to the other players' equilibrium strategies.

In an effort to illustrate a Nash equilibrium concept, the Battle of the Sexes[59] game is presented. There is a couple who want to go out together, but each of them has preferences

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[52] *Id*., p. 27.
[53] *Id*., p. 27.
[54] *Id*., p. 27.
[55] *Id*., p. 27.
[56] Stephen W. Salant and Theodore Sims, Game Theory and the Law: Is Game Theory Ready for Prime Time? (Michigan Law Review, 1996), 1855.
[57] *Id*., p. 1855.
[58] *Id*., p. 1855.
[59] Rasmusen, 29.

regarding their amusement. The man wants to go to a football match, the woman wants to visit an opera. But it is very important for them to go somewhere together. That's why the payoff in this situation will be higher than if they go separately. The table below illustrates the payoffs of the couple (Table № 2).

		Player 2 (man)	
		Football	**Opera**
Player 1 (woman)	**Football**	**1;2**	**0;0**
	Opera	**0;0**	**2;1**

Table № 2[60]

As it is evident from the foregoing there are two Nash equilibriums in this game. The first one is the strategy profile {Football; Football}. It means that the man chooses the football and the woman does the same. And the second one is the strategy profile {Opera; Opera} when they both choose Opera, but the woman moves first. In the Battle of the Sexes, it is very important who moves first. Because the man, for instance, could buy the football tickets in advance and the woman will have no choice.

Each of the Nash equilibria in The Battle of the Sexes is pareto-efficient; no other strategy profile increases the payoff of one player without decreasing that of the other.[61] If the players choose a Nash equilibrium with the strategy profile {Football; Football} the woman's payoff will be lower than the man's one and vice versa. When the Nash equilibria is pareto-efficient it is impossible to get the same payoff for both players. As often as one player will get more, another player will get less.

The Battle of Sexes game can be used in the contract law as well. For example, two firms (players) want to conclude a sales contract but they can't agree on some provisions. Both sides might, for example, want to add a "liquidated damages" clause which specifies damages for breach rather than trust the courts to estimate a number later, but one firm might want a value of 10,000 $ and the other firm, 12,000 $.[62] The same situation as in the original game. There are two Nash equilibriums in the game. Each of them is pareto-efficient. And they both are not the dominant strategies. The payoffs of the game are illustrated in a table below (Table № 3).

[60] *Id*., p. 29.
[61] Rasmusen, 30.
[62] *Id*., p. 30.

	Player 2 (Firm 2)	10 000$	12 000$
Player 1 (Firm 1)	10 000$	2;1	0;0
	12 000$	0;0	1;2

Table № 3

1.2. The problem of Nonexistent and Multiple Equilibria

As it was mentioned in the previous subchapter Nash equilibrium is the most widely spread solution concept in game theory. When the player finds equilibrium in the game it means that he is ready to play. Moreover, the player who knows the exact playing strategy is more likely to win the game and to get the best payoff of it. Many games have a Nash equilibrium. Some games have a dominated or a dominant strategy equilibrium. But, there are games in which it is impossible to find the right strategy. These types of games are games without equilibrium. Having no equilibrium means either that the modeler sees no good reason why one strategy profile is more likely than another, or that some player wants to pick an infinite value for one of his actions.[63]

The example of the game without equilibrium is introduced below. The game is called the Heads or Tails[64]. Two players are choosing simultaneously either "heads" or "tails". If their choice is different, the Player 1 will pay 1 $ to the Player 2. If their choice is the same (e.g. heads; heads) the Player 2 will pay 1 $ to the Player 1. This game doesn't have a Nash equilibrium. Why is it so? Because in every situation it will be much more beneficial for each player to deviate from the chosen strategy. The game is presented in a table below (Table No. 4).

		Player 2	
Player 1		Heads	Tails
	Heads	1; -1	-1;1
	Tails	-1;1	1; -1

Table No. 4[65]

Another problem is multiple equilibria. The problem of multiple equilibria inheres particularly in infinitely repeated games and is enshrined in what game theorists call the "Folk

[63] Rasmusen, 19.
[64] Rajiv Sethi, Nash equilibrium (International Encyclopedia of the Social Science, 2nd edition, 2008), 540.
[65] *Id*., p. 540.

Theorem, so called because no one remembers who should get credit" for it.[66] The Folk Theorem guarantees that there will be infinity of equilibria in many games if they are repeated infinitely.[67] Thus, if the Entry Deterrence Game were repeated not twenty times but infinitely, one could prove that a wide variety of strategies-such as always fight or fight half the time-could be part of perfect Nash equilibria.[68]

The problem of nonexistence of a unique equilibrium dissipates, however, if we merely reduce the number of repetitions from infinity to a finite but arbitrarily large number.[69] As discussed above, the Chain-store paradox insures that, for any finitely repeated version of entry deterrence, the unique perfect Nash equilibrium will be new entry with incumbent accommodation in each round.[70] Finitely repeated games often produce unique equilibria-but these equilibria often are inconsistent with our expectation.[71] In a repeated game, incumbents should benefit from establishing a tough reputation to deter entry. [72]

As it is mentioned above the nonexistence of the unique equilibria can be avoided when the game will be repeated to a finite, not to infinity. The ring of truth in this theory is present. But, it is always complicated to do this in practice. There are a lot of thoughts regarding this problem. But despite the fact that the answer is presented above, the question is still open. It means that the problem of multiple equilibria can't be resolved in the way proposed.

The Battle of Sexes game which was illustrated in the previous subchapter is a good example of the existence of multiple equilibria. In this game there are two Nash equilibriums: {Football; Football} and {Opera; Opera}. But which one the players should choose? How can they evaluate all benefits and make the right decision?

Maybe one of the players will rely on the destiny and he will toss a coin. Maybe the player will spin a roulette wheel with a view to getting the answer which strategy to choose. The players can also use other kinds of randomization. But whether it will help to make the right choice? Will this choice be the best reply? And what if the other player is also using randomization?

As far as the Player 1 is indifferent between two strategies, he can choose one or another with the same probability. But the Player 2 also has two options, which means that he is indifferent too. That may lead to the situation that both of them will choose the same variant or their ways are dispersed. This situation is called *mixed strategy equilibrium* because the parties

[66] Ian Ayres, Playing Games with the Law (Stanford Law Review, 1990), 1310.
[67] *Id*., p. 1310.
[68] *Id*., p. 1310.
[69] *Id*., p. 1310.
[70] *Id*., p. 1310.
[71] *Id*., p. 1310.
[72] Ayres, 1311.

mix between their strategies.[73] On the opposite, when the strategy has been chosen for sure it is a *pure strategy equilibrium.*[74]

One of the debates among game theorists is whether mixed strategies make sense.[75] In some cases, they clearly do. If the game is between the tax payer and the tax auditor, the auditor can clearly not pursue a pure strategy equilibrium.[76] If there is no auditing, the tax payer will cheat for sure, but then auditing should occur.[77] If auditing happens for sure, then the taxpayer will clearly not cheat, but then why audit?[78] Or, in an example from tennis, you do not consistently serve to the forehand or backhand.[79] Whether or not the mixed strategy makes sense is problem specific.[80] The move from an equilibrium to a prediction of an outcome must be accompanied by a good story of why![81] In the auditing case mixed strategy equilibria sound plausible, in other games they may not. [82]

Special mention must be made of some situations when the unique equilibrium exists. If the game has the dominant equilibrium, this equilibrium will be always unique. The explanation is very simple. As far as the dominant equilibrium implies the existence of the only one strategy which will be the best reply to every other player's strategy in the game, there is no need to find another strategy. The strategy profile with the dominant equilibrium will lead to the best payoff of the game. If the game has a strong iterated dominance equilibrium, the equilibrium will be also unique. On the opposite, the weak iterated dominance equilibrium may not be unique. The weak iterated dominance equilibrium based on the situation when the strategies are eliminating till the only one strategy will remain. But there are cases when no one strategy profile remains. Then the unique equilibrium is impossible.

1.3. Conclusion

The Game theory is an economic science which was discovered in the previous century. This theory is a mathematical decision to many existing problems. Notwithstanding that the Game theory is "ancient", its achievements are still used nowadays. The theory is utilized in many spheres, including policy, economy, and law. It would seem whether an economic theory

[73] Hviid, 715.
[74] *Id*., p. 715.
[75] Ariel Rubinstein, Comments on the Interpretation of Game Theory (Econometrica, 1991), 24.
[76] Hviid, 715.
[77] *Id*., p. 715.
[78] *Id*., p. 715.
[79] *Id*., p. 715.
[80] *Id*., p. 715.
[81] *Id*., p. 715.
[82] *Id*., p. 715.

may be applied in day to day life? The answer is "definitely, yes". The evidence of this was presented in this Chapter.

The main elements of the game are the players, Nature, outcomes, and payoffs. These components are present in every game. But they differ from game to game. The primary aim of the players is to get the best payoff from the game and to reach the outcome which is the most appropriate for them. Each player has his own strategy profile. He has an opportunity to choose the strategy which will lead to the best payoff. The strategy is a set of actions which are available to the player. The right chosen action is the first step to the victory.

The solution concepts of the game are one of the most problematic issues in the Game theory. The player may have the dominant strategy equilibrium in the game. He will definitely play this strategy. However, the other player may also have the same strategy, but in the different context. There are situations where the game possesses two Nash equilibriums. The question will be which one to choose? Who from the players can make this choice? There are conflicts when there is no equilibrium at all. If one player gets more the other player gets less. This all means that there is nothing ideal exists. From the first view, the perfect mathematical theory which can resolve different difficult problems is not an exception to this.

After the careful consideration and analysis of this theory I can conclude that the Game theory is very important. First of all, it is an opportunity to think logically, to count all benefits and implications of the situation. Secondly, through building the game, a person may evaluate his chances to win this game. Thirdly, the Game theory puts the real-life situation to an economic flatness and provides players with the cold calculus which is not always possible in real life.

The logic goes that the theoretical game will help to make the right decision in the real-life situations. People use Game theory each day, even if they don't know about the existence of this science. They take different decisions which may influence other people' choices or take into account the decisions of other people with a view to making their own choice. The Game theory allows producing a decision with taking into account the interests of all involved persons. These decisions are not always the best variant to resolve a particular situation. However, the Game theory helps to predict situations in which the total chaos will occur without its intervention. Game theory also may describe the situations where there is no need for its intervention because there is no better variant of resolving a particular situation exists. The economists use Game theory with the view to find better solutions to the complex problems and to make predictions that ordinary people can't because at first glance they belie the common sense.

2. THE CONCEPT OF INCOMPLETE CONTRACTS

2.1. The importance of Contract Law

2.1.1. The definition of a contract

The notion of a contract is one of the main in different areas of law, particularly Civil Law, Commercial Law, Company Law, International Law etc. The Roman lawyers stated that contracts are one of the most widespread sources of the obligations' commencement and gave them a special value. The Roman Law had a cohesive and detailed system of the contractual mechanisms. Today a contract is one of the main tools which regulates social relations. To an economist, a contract is an agreement through which the parties make reciprocal commitments in terms of their behaviour - a bilateral "coordination" arrangement.[83]

The law of each country contains definition of a contract. The French Civil Code 1804 defined a contract as an agreement by which one or several persons bind themselves, towards one or several others, to transfer, to do or not to do something.[84] However, The French Civil Code with the amendments made in 2016 defines a contract as a concordance of wills of two or more persons intended to create, modify, transfer or extinguish obligations.[85] The Indian Contract Act 1872 determines a contract as an agreement enforceable by law.[86] And an agreement in this context is every promise and every set of promises, forming the consideration for each other.[87] The Civil Code of Ukraine defines a contract as an arrangement between two or more parties in order to establish, change or terminate civil rights and obligations.[88] The United Kingdom legislation doesn't contain the definition of a contract. However, several laws incorporate provisions related to the description of different types of a contract. For example, the UK Sale of Goods Act 1979 establishes the notion of a contract of sale of goods.[89] The Consumer Rights Act 2015 set up what does the contract mean under this law.[90] The Supply of

[83] Sugata Bag, Economic Analysis of Contract Law: Incomplete Contracts and Asymmetric Information (Palgrave Macmillan, 2018), 2.
[84] Art. 1101 of the French Civil Code 1804, accessed 2018 February 13 http://files.libertyfund.org/files/2353/CivilCode_1566_Bk.pdf.
[85] Art. 1101 of the French Civil Code 1804 (amended by Ordonnance n° 2016-131 of 10 February 2016), accessed 2018 February 13 https://www.trans-lex.org/601101/_/french-civil-code-2016/.
[86] Art. 2 (h) of the Indian Contract Act 1872, accessed 2018 February 13 http://lawmin.nic.in/ld/P-ACT/1872/A1872-9.pdf.
[87] *Id*, Art. 2 (e).
[88] Art. 626 (1) of the Civil Code of Ukraine № 435-15 from 16 January 2003, accessed 2018 February 13 http://zakon3.rada.gov.ua/laws/show/435-15.
[89] A contract of sale of goods is a contract by which the seller transfers or agrees to transfer the property in goods to the buyer for a money consideration, called the price (Sec. 2 (1) of the Sale of Goods Act 1979, accessed 2018 February 13 https://www.legislation.gov.uk/ukpga/1979/54).
[90] Contracts to supply goods include contracts entered into between one part owner and another; contracts for the transfer of an undivided share in goods; contracts that are absolute and contracts that are conditional (Sec. 3 (5) of

Goods and Services Act 1982 specifies what is relevant contract for the transfer of goods.[91] There is one common feature in all the UK contracts - the consideration requirement.

The difference between the definitions of a contract in civil law countries and common law countries relates to the notion of consideration. The concept of consideration is used in common law countries. The concept means that there will be no contract concluded if the parties don't exchange something of an economic value between themselves. On the other hand, civil law countries don't use the abovementioned concept. However, there is a common feature in both systems. All legal acts establish that a contract is an agreement giving rise to the rights and obligations which are enforced or recognized by the law.

2.1.2. The origins of contract law

Some principles of contract law go back three centuries, the majority of contract rules were established in the early nineteenth century.[92] Before that, contract hardly existed as a separate branch of law, and took up very few pages in textbooks.[93] Yet today, it is one of the core subjects which lawyers must study, and affects many areas of daily life. What caused the change? [94]

The answer to this question related to the changes in our society. During the eighteenth-nineteenth centuries the society moved from status to contract.[95] In earlier times the market relations were very simple. The person went to the market, chose, e.g. the foodstuff and bought them through free negotiations and bargaining. For the present moment, the market economy rules the world. The manufacturers should set up prices for their products. The customer has the right to buy the item he chose or not to buy it. There is no need to negotiate, because the demand is very high.

Activities such as buying goods and then selling them in the same market at a higher price, buying up supplies before they reached the market, and cornering the market by buying huge stocks of a particular commodity are all seen as good business practice now, but in the eighteenth century market for essential foodstuffs, they were criminal offences.[96] The basis for this approach was explained by Kenyon J. in R. v Rusby: "Though in a status society some may

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the Consumer Rights Act 2015, accessed 2018 February 13 http://www.legislation.gov.uk/ukpga/2015/15/section/3/enacted).

[91] In this Act, relevant contract for the transfer of goods means a contract under which one person transfers or agrees to transfer to another the property in goods, other than an excepted contract (Sec. 1 (1) of the Supply of Goods and Services Act 1982, accessed 2018 February 13 https://www.legislation.gov.uk/ukpga/1982/29).

[92] Catherine Elliott, Frances Quinn, Contract Law - 5th edition (Pearson Longman, 2005), 2.

[93] *Id*., p. 2.

[94] *Id*., p. 2.

[95] *Id*., p. 2.

[96] Catherine Elliott, 2-3

have greater luxuries and comfort than others, all should have the necessaries of life."[97] In other words, there was a basic right to a reasonable standard of living, and nobody was expected to negotiate that standard for themselves.[98]

With these changes also came others, including industrial, political and moral one. The economic doctrine called laissez-faire[99] provided an understanding of the society's relations. The doctrine brought into the society the view that everyone knows what he wants and judges his own interests better than somebody else. It means that with the purpose to satisfy its own interests the persons will negotiate with each other which will lead to a huge amount of similar transactions. The parties should decide what is better for them without any intervention.

The laissez-faire approach carved out a very important place for contracts. As it was showed, where people make their own transactions, unregulated by the state, it is important that they keep their promises, and as a result, contract law became an increasingly important way of enforcing obligations.[100]

2.1.3. Why do we need contract law?

People enter into contracts each day. We do it when we are taking a seat in a bus, a plane or a train. When we put a coin in the slot of a special machine in a laundry, we also entering into a contract. We do it when we go to a restaurant and take snacks or walking around the streets and buy a cup of coffee. We also entering into a contract when we use services of a hairdresser or massage therapist. In all these cases, not everyone even understand that he is making a contract. People engaged in trade, commerce and industry, carry on business by entering into contracts.

Contracts are important because they allow individuals and businesses to plan for the future.[101] They significantly reduce the risk of broken promises by assigning penalties to those who break their promises.[102] Because there are penalties to breaking a promise made in a contract, people are less likely to break the promise.[103] Also, even if they do break the promise, because the court will force the person or organization that broke the promise to do what they said they would do anyway, or to pay the person or organization that they broke the promise to money as compensation, the victim of the broken promise is much better off with a contract.[104] A

[97] *Id*., p. 2-3.
[98] *Id*., p. 2-3.
[99] Catherine Elliott, 3.
[100] Catherine Elliott, Frances Quinn, Contract Law - 5th edition (Pearson Longman, 2005), 3.
[101] Timor-Leste Legal Education Project, Stanford Law School, An Introduction to Contract Law in Timor-Leste, p. 2, accessed 2018 February 13 https://web.stanford.edu/group/tllep/cgi-bin/wordpress/wp-content/uploads/2012/09/Contract-Law-English.pdf
[102] *Id*., p. 2.
[103] *Id*., p. 2.
[104] *Id*., p. 2.

person entering a contract is not afraid to enter the contract because they know that the other person or organization will not want to break the contract because if they break the contract they will be penalized.[105] They are also not afraid because they know that even if the other party does break the promise, the court will make sure that either the agreement happens anyway or that the victim is compensated for the broken promise.[106]

With a view to encouraging people to enter into the contracts the Contract law was established. The person will feel safe and will participate in different transactions when he is confident that his rights are protected by the rules of law. The person will enter into the contract without any doubts when he/she knows that there is something more powerful than the words on the paper - the possibility to enforce the contract in the case one party fails to perform it. The Contract law establishes general principles of a contract. One of them is *pacta sunt servanda* (agreements are to be kept). If the party to the contract breaks the obligation, the court has the right to force this party to compensate damages. The Contract law is also important to prevent abuses and to establish fair grounds for contracts to be performed. Contract law is important because it underpins our society without it, life as we know it could not exist.[107]

2.2. The notion of complete and incomplete contracts

Paradoxically, contracts are both never complete and always complete.[108] Contracts are never fully complete, because some contractual incompleteness is inevitable, given the costs of thinking about, bargaining over, and drafting for future contingencies.[109] In addition, contracting parties may sometimes leave contracts incomplete on purpose, either because one or both of the parties withhold information necessary to complete the contract, or because the parties have determined to "agree to agree later. "[110]

At the same time, contracts are always obligationally complete, because for the purpose of a court to enforce the contract, it must conclude that the material terms are sufficiently complete that the intent of the parties can be determined.[111] In such a case, the court will opt to gap-fill any incomplete terms. In this sense, contracts are always complete, since either the court

[105] *Id*., p. 2.
[106] *Id*., p. 2.
[107] Philip Clarke, Julie Clarke, Contract Law: Commentaries, Cases and Perspectives (Oxford University Press, 2016), p. 4, accessed 2018 February 13 http://lib.oup.com.au/he/samples/clarke_cl3e_sample.pdf
[108] Kimberly D. Krawiec & Scott Baker, Incomplete Contracts in a Complete Contract World (Florida State University Law Review, 2006), 725-726.
[109] *Id*., p. 725.
[110] *Id*., p. 725.
[111] *Id*, p. 726.

will fill any incomplete terms for the parties or the contract is not enforceable.[112]

To be deemed a contract as complete the parties should definitively specify their rights and obligations in every future state of the world. When the rights and obligations of the parties are indicated for each situation (e.g. unexpected situations) in the future, there is no need to renegotiate or breach the contract when some unforeseen event occurs. However, it is impossible to reach the contractual completeness at the stage of conclusion of the contract. That's mean that the parties will renegotiate, breach and litigate the contract when such an event unfolds.

Economists and legal scholars long have recognized that this inevitable contractual incompleteness creates two types of investment problems: underinvestment and overinvestment. Both investment problems are measured against the efficient investment level - that is, the investment level that maximizes the gains from the contractual arrangement.[113]

Incomplete contracts present a danger of underinvestment because, to the extent that the parties' obligations are not optimally specified in the contract, an opportunity arises to renegotiate those obligations in the future.[114] This renegotiation raises the prospect of opportunistic behavior - during renegotiation, one or both parties may attempt to garner a higher fraction of the gains from continuing to trade.[115] If the parties can easily switch to alternative bargaining partners, then both can walk away from the existing relationship and these attempts at holdup will fail.[116] However, the greater the relationship-specific investment that a party has made in contemplation of performing on the agreement - for example, non-recoupable expenditures, information sharing, specialization, training, etc. - the more vulnerable she will be to holdup attempts by her partner.[117] Recognizing this, parties will be reluctant to engage in relationship-specific investment in the face of contractual incompleteness, unless some resolution to the holdup problem can be found.[118]

On the other hand, coupled with a damage remedy, contractual incompleteness also can lead to overinvestment.[119] In some future contingencies, the parties are better off not trading, even though the contract requires them to do so.[120] In this state, the damage remedy guarantees the investing, non-breaching party a certain return, even though the investment has no social value (the parties will not be trading and the investment only has value if the relationship

[112] *Id*., p. 726.
[113] *Id*., p. 726.
[114] Kimberly D. Krawiec, 726-727.
[115] *Id*., p. 726.
[116] *Id*., p. 726.
[117] *Id*., p. 726.
[118] *Id*., p. 726.
[119] Kimberly D. Krawiec, 727.
[120] *Id*., p. 727.

continues).[121] Anticipating this guaranteed return, the contracting party may invest too heavily in the relationship.[122]

2.2.1. The law approach to incomplete contracts

.[123] In contrast, a contract is obligationally complete if the obligations of the parties are fully specified for all future states of the world.[124] A contract that failed to specify the seller's obligations in the event of a flood or the buyer's breach would thus be obligationally incomplete.[125]

Unfortunately, the contracts are incomplete most of the time. The parties suffer from big transaction costs which they incur trying to make the contract being complete. It is much more convenient for them to agree on major points and to leave some provisions for further negotiations. The agreements may be incomplete accidentally. The parties may think that all terms and provisions are written in a proper way, but the court may consider a specific term too vague or uncertain. Sometimes it happens that such agreements will be deemed as not enforceable by the court. The courts should decide whether the agreement or its provision is "sufficiently certain" in order to be enforced by the court. It depends on a specific case. There is no general rule or guidance for the courts how to deal with this or that type of agreement.

A big problem arises when the contract is incomplete and can't be enforced. How the suffered party will claim the compensation? She will not be able to do so. That is why, the law approach scholars point the importance of the courts' role in relation to the contractual incompleteness. When the court will fill gaps, and resolve ambiguities or incompleteness in the contract it may lead to the conclusion that the contracts are never really obligationally incomplete. Because, even where the parties made the incomplete contract (e.g. failed to specify some obligations), the court may still enforce this contract, which makes this contract complete enough in order to be fulfilled and enforced.

As an example of the enforceability of the incomplete contract it would be useful to demonstrate the UK case named Foley v. Classique Coaches Ltd of 16 March 1934.[126]

By an agreement between the parties dated April 11, 1930, it was agreed that the vendor shall sell to the company and the company shall purchase from the vendor all petrol which shall be required by the company for the running of their said business at a price to be agreed by the

[121] *Id*., p. 727.
[122] *Id*., p. 727.
[123] *Id*., p. 730.
[124] *Id*., p. 730.
[125] *Id*., p. 730.
[126] Foley v. Classique Coaches Ltd [1934] 2 KB 1, 16 March 1934, accessed 2018 February 22 http://www.diprist.unimi.it/fonti/891.pdf

parties in writing and from time to time.[127]

A dispute broke out between the parties and one of the issues between them was whether the agreement to supply petrol to the purchasers was valid and binding despite their failure to reach agreement on the price at which the petrol was to be sold.[128] The purchasers argued that it was not binding. They submitted that the parties had failed to reach agreement on the price and it was not the function of the courts to make the contract for the parties.[129] The vendors, on the other hand, relied on the fact that the parties had acted on the basis of this agreement for three years and the fact that the agreement contained an arbitration clause which covered a failure to agree the price at which the petrol was to be sold.[130] The Court of Appeal came down on the side of the vendors and held that the agreement was valid and binding.[131] The judge Greer LJ pointed that, 'in order to give effect to what both parties intended the Court is justified in implying that in the absence of agreement as to price a reasonable price must be paid, and if the parties cannot agree as to what is a reasonable price then arbitration must take place'.[132]

There is one more case where the court held the agreement can't be enforced, because one of the terms of this agreement is too uncertain. The case named Scammell and Nephew Ltd v. Ouston, 1941.[133]

The defendants (appellants) wrote to the plaintiffs (respondents) and offered to sell them a Commer van for £268 and to take the plaintiffs' Bedford van in part exchange, allowing them the sum of £100 for the Bedford van.[134] The parties agreed these terms at the stage of negotiations. The following day the defendants wrote to the plaintiffs and asked them to place the official order for the van in order to enable them to complete their records.[135] The plaintiffs accordingly wrote to the defendants and the letter included the following sentence: 'this order is given on the understanding that the balance of the purchase price can be had on hire-purchase terms over a period of 2 years.'[136] This sentence reflected the plaintiffs' position throughout the negotiations, namely that they could only purchase the van on hire-purchase terms.[137] The relationship between the parties then deteriorated.[138] The plaintiffs claimed that this amounted to

[127] *Id*, p.2.
[128] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 128.
[129] *Id*., p. 128.
[130] *Id*, p. 128.
[131] *Id*., p. 128.
[132] Foley v. Classique Coaches Ltd [1934] 2 KB 1, 16 March 1934, accessed 2018 February 22, p. 6 http://www.diprist.unimi.it/fonti/891.pdf
[133] Scammell and Nephew Ltd v. Ouston [1941] AC 251, House of Lords accessed 2018 February 22 http://swarb.co.uk/scammell-and-nephew-ltd-v-hj-and-jg-ouston-hl-1941/
[134] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 137.
[135] *Id*., p. 137.
[136] *Id*., p. 137.
[137] *Id*., p. 137.
[138] *Id*., p. 137.

a breach of contract and brought a claim for damages.[139] The defendants denied any liability on the ground that no contract had in fact been concluded between the parties.[140] The defence failed at first instance and in the Court of Appeal but succeeded in the House of Lords where it was held that the words 'on hire-purchase terms' could not be given any definite meaning so that the parties had not, in fact, concluded a contract.[141]

Lord Viscount Maugham emphasized that with a view to constituting a valid contract the parties must so express themselves that their meaning can be determined with a reasonable degree of certainty.[142]

Why this case is important and why it was concluded that the contract was not valid and enforceable? This case is important because it shows again that the contract should be written in a proper way, the terms should be precisely defined with the view to be enforced in the future. The House of Lords[143] indicated that the parties didn't agree on the basic points of the contract and that they failed to establish the mechanisms by which the court may fill the gaps or resolve uncertainty.

The problem of incomplete contracts exists in every legal system. I have described a few examples of the UK case law which is a bright representative of the Anglo-American legal system. The question of enforceability of the uncertain agreements also arises in countries of Romano-Germanic legal family. Moreover, sometimes the cases of contract's incompleteness are decided by the Supreme Court of Ukraine which is the highest court instance in Ukraine. A very interesting example in this context is the ruling of the Supreme Court of Ukraine № 6-1967цс15 from 11 November 2015.[144]

Two persons concluded the loan agreement according to which the creditor gave to the borrower 500 000 USD.[145] According to the Ukrainian Civil Code, the borrower may write an acknowledgement by which he confirms the reception of the specified amount of money after the conclusion of the loan agreement.[146] The borrower (who is the plaintiff in this case) fulfilled this requirement. When the date of the debt's repayment came, the borrower didn't return money. The creditor (who is the defendant in this case) filed a claim to the court of the first instance. The Court decided to satisfy the claim. The Court ruled that the borrower should repay the debt of

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[139] *Id*., p. 137.
[140] *Id*., p. 137.
[141] *Id*., p. 137.
[142] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 138.
[143] Scammell and Nephew Ltd v. Ouston [1941] AC 251, House of Lords accessed 2018 February 22 http://swarb.co.uk/scammell-and-nephew-ltd-v-hj-and-jg-ouston-hl-1941/
[144] Case № 6-1967цс15 from 11 November 2015, Supreme Court of Ukraine, accessed 2018 February 27 http://www.scourt.gov.ua/clients/vsu/vsu.nsf/(documents)/038E81FBE43F7757C2257F010047F622
[145] *Id*.
[146] Art. 1049(1) of the Civil Code of Ukraine № 435-15 from 16 January 2003, accessed 2018 February 13 http://zakon3.rada.gov.ua/laws/show/435-15.

500 000 USD.[147] The case also was pending in the Court of Appeal and in the High Specialized Court of Ukraine for Civil and Criminal Cases. Both Courts confirmed the decision of the court of the first instance. However, the borrower wasn't satisfied by these decisions.[148] He brought a claim to the Supreme Court of Ukraine. The Supreme Court noticed that according to the Article 1049(1) of the Civil Code of Ukraine[149], it is established that under the loan agreement the borrower is obliged to return the amount of the loan within the term and in the order stipulated by the contract. Thus, the acknowledgement as a document confirming the debt obligation must contain conditions for the borrower to borrow money with the obligation to return them and the date of receiving money.

The acknowledgement which was written by the borrower didn't contain the obligation to return money. Consequently, the loan agreement was deemed as incomplete and it couldn't be enforced.[150]

The case law regarding the enforceability of incomplete contracts is controversial. There are a lot of cases where the courts of different instances made decisions that the contract is too vague, uncertain or incomplete and it can't be enforced. Furthermore, the quantity of such cases prevails over the cases where the courts decided to intervene and to fill the gaps in the contract with a view to enforcing it. However, there possibility of the court's intervention still exists. There are rules and methods how the court may act when the contract is incomplete. These methods are described in the subchapter 2.2.3 of the present Chapter.

2.2.2. The economic approach to incomplete contracts

Contracts typically omit all manner of variables and contingencies that are of potential relevance to contracting parties.[151] Economics scholars use the term "incomplete contracting" to refer to contracts that fail to fully realize the potential gains from trade in all states of the world.[152] These contracts are considered "contingently" incomplete or "insufficiently state contingent."[153] For example, a contract to deliver certain goods to a house tomorrow for $100 may be obligationally complete in the sense that obligations are fully specified for all future

[147] Case № 6-1967цс15 from 11 November 2015, Supreme Court of Ukraine.
[148] *Id*.
[149] Art. 1049(1) of the Civil Code of Ukraine № 435-15 from 16 January 2003, accessed 2018 February 13 http://zakon3.rada.gov.ua/laws/show/435-15.
[150] Case № 6-1967цс15 from 11 November 2015, Supreme Court of Ukraine.
[151] Steven Shavell, Foundations of Economic Analysis of Law (Harvard University Press, 2004), 299.
[152] Ian Ayres and Robert Gertner, Strategic Contractual Inefficiency and the Optimal Choice of Legal Rules (The Yale Law Journal, 1992), 730.
[153] *Id*., p. 730.

states of the world.[154] However, the contract may be insufficiently state contingent in that the contractual obligations fail to fully realize the potential gains from trade in all states of the world.[155] Contracts that are "insufficiently state contingent" (contingently incomplete) give private parties incentives-in at least some states of the world-to either renegotiate or breach the original contract to realize these additional gains from trade.[156]

J. Backhaus defines an incomplete contract as an agreement whose contractual obligations are observable to contractual parties but not verifiable ex post by third parties, typically a judge or an arbitrator to whom parties might eventually refer when controversies arise.[157]

The contract must be certain. For the purpose to conclude a precise contract, the parties are going through the negotiations' stage. The parties' aim is to conclude a contract which will benefit both of them. That is why the negotiation stage precedes the performance of the obligations under the contract. The parties must be confident that the specified obligations will be performed, but even if they are not, the party will be compensated. Unfortunately, to write an ideal contract is not only difficult and costly, it may also be not the best strategy for parties. Contracts that are highly specified can create cognitive problems.[158] The parties will often adhere to the strict requirements specified in the contract at the sacrifice of furthering the main objective of the deal.[159] The parties will not think for themselves; they merely will do what is required.[160] On the other hand, the incomplete contracts may facilitate this problem. Less-complete contracts that rely on trust and reciprocity rather than control can induce higher effort levels and a more cooperative principal–agent relationship than the traditional approach.[161]

The process of the contract's conclusion includes several types of transaction costs: drafting costs, performance costs, and litigation costs. The parties are trying to minimize these costs, but they want to be confident that their saving will not cause problems in the future. They may leave the agreement incomplete (from law or economic point of view), but they should draft it in a proper way, if they want to have an opportunity to enforce the contract in future.

Economic scholars have a view that it is impossible to draft a contract which will be carried out in the same way under whatever circumstances which may occur in the future. These

[154] *Id*., p. 730.
[155] *Id*., p. 730.
[156] *Id*., p. 730.
[157] Jürgen G. Backhaus, The Elgar Companion to Law and Economics, Second Edition (Edward Elgar Pub, 2005), 145.
[158] Wendy Netter Epstein, Facilitating Incomplete Contracts (Case Western Reserve Law Review, 2014), 300.
[159] *Id*., p. 300.
[160] *Id*., p. 300.
[161] *Id*., p. 300.

contracts are called 'contingently incomplete'.[162] From the law perspective, the contract may be obligationally complete, since it specifies all necessary obligations and major points. However, from the economic prospective, the same contract may be contingently incomplete, because it fails to specify the obligations in every state of the world.

However, the unexpected circumstances are not the only reason why contracts are incomplete from the economic point of view. Eric Rasmusen[163] suggests one more reason for this.

> I will suggest a new explanation: contract-reading costs. The problem is not in the social cost of discovering or writing a new contract term, nor is there any problem with incentives, commitment, or enforcement once the contract is formed. Rather, the problem is that Party A cannot understand the implications of language proposed by Party B unless he expends effort reading the contract carefully. Contracts are thus incomplete because both parties must agree to them, the problem lying in the contract-forming process that I will call negotiation. Economists usually think of contract formation as bargaining over splitting a pie, but it can increase the size of the pie, which is what we think extra contract terms could do.[164]

The problem concerns not the reading of the contract word by word, but primarily the understanding of its consequences. The contract-reading costs are the reason for the failure to realize all the gains from trade.[165]

The third reason of a contract incompleteness is an asymmetric information. The concept of an asymmetric information is defined in the third Chapter of this thesis.

In the present subchapter, I would like to describe contingently incomplete contracts more precise. As far as it happens all the time that the parties fail to realize the potential gains from trade when the unexpected event occurs, it is important to know what to do in this situation. Firstly, the parties are usually trying to resolve the problem through the renegotiation of the contract. The contract may include the provision which prescribes the obligation of the parties to renegotiate the contract in case when the event occurred doesn't allow parties to receive the gain they were expected. The parties may also renegotiate the contract by their own will, e.g. because of their good/friendly/permanent business relations. Secondly, the parties may terminate the contract. However, if the parties make a specific investment to the contract, they rather will continue the contract than terminate it. The reason is that when the specific investment was made, the party will benefit only from this contract. The party can't conclude the contract with other person, because his particular investment means nothing for others. Thirdly, the parties

[162] Ian Ayres and Robert Gertner, Strategic Contractual Inefficiency and the Optimal Choice of Legal Rules (The Yale Law Journal, 1992), 730.
[163] Eric Rasmusen, Explaining Incomplete Contracts as the Result of Contract-Reading Costs (Advances in Economic Analysis and Policy, 2001), 3.
[164] *Id.*, p. 3.
[165] *Id.*, p. 3.

may commence litigation. However, it is costly to resolve the contractual dispute in court.

The economic scholars were puzzled by the problem of incomplete contracts. They were searching for the possibilities to resolve the problem. From 1983, the scholars started to ask the right questions and to give the substantiated responses. The economists Oliver Hart[166] and Sanford Grossman[167] are dealing with the property rights, and more precise with the residual control rights. They point that a critical question that arises with an incomplete contract is, who has the right to decide about the missing things?[168] They called this right the residual control or decision right.[169] So, who has this right?

A property right on an asset, i.e., its ownership, is a bundle of decisions rights.[170] Hart argues that "ownership of an asset goes together with the possession of residual rights of control over the asset; the owner has the right to use the asset in any way not inconsistent with a prior contract, custom, or any law."[171] Walras saw ownership as vector of rights including the rights to use the asset, to sell it, and to receive the proceeds.[172]

It is important to distinguish special and residual control rights.[173] The first means the rights stipulated in the contract, and the second means rights that are not stipulated in the contract.[174] Therefore, the property operates as a tool of saving the costs in establishing of special rights. It may be difficult to define a residual control rights, because of their numerous and uncertainty regarding which of the rights may be relevant in the future. It supposes the possibility to reduce the transaction costs through the transfer of all rights, other than those stipulated in the contract, to the party, which in this case will be considered as an owner of a particular asset. The transmission of residual control rights to one of the parties means that this party possesses the right to complete a definition of a contract. The same powers will belong to the court or arbitration when the parties decide to resolve the dispute this way. Certainly, the parties may refer to the national legislation in their agreement. However, the national legislation is also not a complete contract. The residual control rights are using by economists in the effort to reduce the transaction costs and to resolve the dispute without engaging of the third parties.

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[166] Oliver Hart is a British economist. He is currently the Professor of Economics at Harvard University, where he has taught since 1993. Hart works mainly on contract theory, the theory of the firm, corporate finance, and law and economics.

[167] Sanford Grossman is an American economist and hedge fund manager specializing in quantitative finance. Grossman's research has spanned the analysis of information in securities markets, corporate structure, property rights, and optimal dynamic risk management.

[168] Oliver Hart, Incomplete Contracts and Control (American Economic Review, 2017), 1732.

[169] *Id*., p. 1732.

[170] Jean Tirole, Incomplete Contracts: Where Do We Stand? (Econometrica, 1999), 743.

[171] Oliver Hart, An Economist's Perspective on the Theory of the Firm (Columbia Law Review, 1989), 1765.

[172] Léon Walras, Théorie de la propriété, (Economica, 1898-1990), 177-178.

[173] Andrei Skorobogatov, Lectures and tasks of the theory of contracts (Yutas Publishing House, 2006), 142. (See also: Jean Tirole, 2000, p.48).

[174] *Id*., p. 142.

With a view to demonstrating the importance of the residual control rights the following real-life example is presented. Consider a petroleum refinery that locates near an oil mine with the purpose of petroleum processing to make petrol and to deliver it to the gasoline service stations. A possible way to regulate the transaction is for the petroleum refinery to sign a long-term contract with the oil mine. The contract contains all necessary provisions, such as the quantity, quality, and price of an oil for many future years. However, such contract will be incomplete anyway. The unexpected events will occur that the parties could not foresee when they drafted the contract.

For instance, suppose that the petroleum refinery needs the oil which is pure as much as possible. However, it is hard to predict in advance what purity means, because there are a lot of adventitious impurities, e.g. water, gas, sand etc. Imagine that the parties are trading for almost 15 years. The oil mine started to produce oil at a new level. This oil contains impurities, however their amount is not very big. For the petroleum refinery it is more expensive to refine such an oil, but cheaper for the oil mine to produce. Since the contract is incomplete, the oil mine may be within its rights under the contract to supply oil with impurities.

The petroleum refinery and oil mine can renegotiate the contract. However, the oil mine has a stronger bargaining position. It can demand a high price for switching to the previous level of the oil production. The main point is that the petroleum refinery does not have a good alternative. Of course, it is still possible to find a new supplier of the oil. However, it may be very expensive to transport oil from a different oil mine, because of the long distance. At the same time this oil mine is near the petroleum refinery.

Economists refer to this situation as the "hold-up" problem.[175] The oil mine can hold up the petroleum refinery because the petroleum refinery, by locating near the oil mine, has become dependent on it. The next point to realize is that although it may be impossible to write a contract that is complete enough to avoid hold-up, this does not mean that the parties will be unable to anticipate hold-up.[176] It could be for example, that the petroleum refinery locates at an equal distance between several oil mines rather than right near to this one, even though this may increase the cost of transporting oil.[177] The owner of the oil mine has residual control rights over the mine. In this case the main residual control right is the decision about what kind of oil to mine (with or without impurities) and at which level to mine the oil. It means also that the owner of the oil mine is more powerful figure in this contract. He may manipulate the other party for his own benefit.

[175] Oliver Hart, Incomplete Contracts and Control (American Economic Review, 2017), 1733.
[176] *Id*., p. 1733.
[177] *Id*., p. 1733.

What the petroleum refinery can do to avoid this situation? Firstly, to write a better contract. However, this is obviously hard to do. Secondly, he may buy the oil mine in advance. That way the petroleum refinery as owner of the oil mine will have the main residual right of control. The oil mine can no longer demand a high price by threatening to produce oil with impurities. Thirdly, the distortion in ex ante investments can be overcome if these investments are contractible.[178] In this case the parties can write a contract that specifies, say, that the petroleum refinery must locate near the oil mine in return for an upfront payment: in effect the mine compensates the petroleum refinery for its later hold-up power.[179] For the theory to work, one has to suppose that some aspects of the investment are not contractible (or are costly to contract on): for example, even if the location decision is contractible, whether the petroleum refinery installs a tool that refines this particular mine's oil efficiently might not be.[180]

This example describes the simplest economic model of the incomplete contracts which demonstrates the importance of the residual control rights. These rights are very important where the parties make a specific investment to the contract. Grossman, Hart, and Moore[181] constructed a standard model of the situation where the specific investment was made. The standard model of the incomplete contracts is presented below.

Consider the long-term relationship between a buyer and a seller of a particular good. The parties meet and contract at date 0 (t=0), and trade at date 1 (t=1). In between, at date ½ (t=1/2), say, one or both of the parties may invest (Figure № 2).[182]

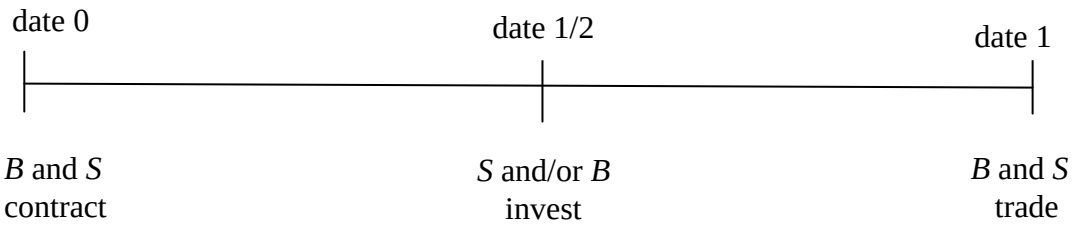

Figure № 2[183]

Assume that the volume of production is fixed to 1. It means that the only 1 (q = 1) unit

[178] *Id*., p. 1735.
[179] *Id*., p. 1735.
[180] *Id*., p. 1735.
[181] John Moore is an economic theorist with an interest in the nature of contracts, and the interplay between financial markets and the rest of the economy. Currently, he is a professor of Political Economy at the University of Edinburgh. (*See* Oliver Hart and John Moore: Incomplete Contracts and Renegotiation (Working Paper department of Economics, 1985); Foundations of Incomplete Contracts (The Review of Economic Studies, 1999); and Incomplete Contracts and Ownership: Some New Thoughts (AEA Papers and Proceedings, 2007))
[182] Oliver Hart and John Moore, Foundations of Incomplete Contracts (The Review of Economic Studies, 1999),117.
[183] *Id*., p. 117.

of goods or 0 (q = 0) is producing and trading at t = 1.[184] The buyer may invest (β) in increasing of a marginal utility from the possession of the good.[185] The seller may invest (σ) in decreasing of the marginal costs at the producing of the good.[186] How to find an optimal investment's level?[187]

υ (β, ω) - the marginal utility of the buyer (β is growing),
c (σ, ω) - the marginal costs of the seller (are decreasing under σ),
q = 1 or 0 (the volume of production); p - the price of the good[188]

The utility and costs depend on the size of the investments and the state of nature (ω).[189] Firstly, the parties conclude the contract at the stage t=0, then they observe the investments which were made (t=1/2).[190] At the final stage t=1, the parties examine the state of the nature and decide what is better: to perform a contract or to renegotiate it.[191] The payoffs of the parties are calculated as follows:

$$U(\text{buyer}) = (\upsilon - p)\, q - \beta,$$
$$U(\text{seller}) = (p - c)\, q - \sigma.$$[192]

Under the complete contract, p = p (ω, β, σ), and q = q (ω, β, σ).[193] The optimal level of investment is determined by the next formula:

$$E\{v - c\}\, q - \beta - \sigma \rightarrow \max (q, \beta, \sigma)$$
$$E \max\{v - c, 0\} - \beta - \sigma \rightarrow \max (\beta, \sigma)$$[194]

When the contract is incomplete neither investment nor the state of the world can be written into the contract, thus p and q cannot depend on ω, β, σ.[195] The only contract that can be

[184] Sergei Guriev, Andrei Bremzen, The compendium of lectures on the contract theory (Russian economy school, 2002), 59.
[185] *Id*., p. 59.
[186] *Id*., p. 59.
[187] *Id*., p. 59.
[188] *Id*., p. 59.
[189] *Id*., p. 59.
[190] *Id*., p. 59.
[191] *Id*., p. 59.
[192] *Id*., p. 59.
[193] *Id*., p. 59.
[194] *Id*., p. 59.
[195] *Id*, p.60.

signed is trade at a price that does not depend on the state of the world and investments.[196] There are six possible outcomes (Table № 5):

	q (the volume of production)	**p (the price of the good)**	**The buyer**	**The seller**
1) v > c > p	1	c + ε	v − c − ε	ε
2) v > p > c	1	p	v − p	p − c
3) p > v > c	1	v − ε	ε	v − c − ε
4) p > c > v	0	-	0	0
5) c > p > v	0	-	0	0
6) c > v > p	0	-	0	0

Table № 5[197]

The formal models of Grossman and Hart (1986) and Hart and Moore (1990) justified contractual incompleteness by appealing to the idea that it may be difficult to describe in advance what kind of good a buyer wants from a seller; this may depend on a future state of the world and there may be many such states.[198] In contrast, once the state is realized, it is easy to describe the good and hence a perfect spot contract can be written.[199] Unfortunately, when bargaining takes place ex post, ex ante investments will already have been sunk, hold-up is possible, and, anticipating this, the parties will choose these investments inefficiently.[200]

2.3. Resolving the problem of incomplete contracts

This subchapter is devoted to the techniques which may be applied with a view to resolving the problem of incomplete contracts. These methods are applicable to the contracts which are incomplete because they fail to specify some rights and/or obligations (law approach) or when an incompleteness arises from contracts that fail to fully realize the potential gains from trade in all states of the world (economic approach). In general, this subchapter doesn't describe the techniques for contracts which are incomplete by the reason of incomplete information. Nevertheless, some of these methods are also used for filling gaps in contracts with incomplete

[196] *Id*, p.60.
[197] *Id*, p.61.
[198] Oliver Hart, Incomplete Contracts and Control (American Economic Review, 2017), 1741.
[199] *Id*., p. 1741.
[200] *Id*., p. 1741.

information.

The first method is a voluntary renegotiation of a contract by the parties. In practice, parties to a contract can usually rewrite the contract's terms if they so choose; courts do not typically interfere with a mutual agreement to rescind an old contract and replace it with a new one.[201] This way is the most efficient one. Firstly, the parties continue to trade and to fulfill their obligations. Secondly, they do not incur any additional costs on litigation. Thirdly, they shouldn't pay any compensation to each other. Thus, the contract will be performed, and the reputation as well as good business relations of the parties are unchangeable. The renegotiation of a contract may be applied to the contracts which are obligationally incomplete and contingently incomplete.

The second method which may be used for both kinds of the contract incompleteness is the usage of the default rules.[202] When the parties failed to specify the rights and/or obligations in the contract, or made the provision of a contract too vague, the contract law is a tool which may filling these gaps. The law may contain provisions which are imposing obligations or refusing to impose obligations. Consequently, contract law default rules allocate bargaining power during renegotiation in much the same way that ownership does.[203]

To illustrate, consider the example of default rules in sales contract. The UK Sale of Goods Act 1979 prescribes that the price in a contract of sale may be fixed by the contract, or may be left to be fixed in a manner agreed by the contract, or may be determined by the course of dealing between the parties.[204] However, where the price is not determined as the buyer must pay a reasonable price.[205] What is a reasonable price is a question of fact dependent on the circumstances of each particular case.[206] Thus, the law establishes the possibility for the parties to create an incomplete contract as well as the possibility for courts to enforce the contract by using the term 'reasonable price'. The Act doesn't mention the definition of this term. The court is empowered to decide what is reasonable price in each case.

Almost the same default rule is stipulated by the US Uniform Commercial Code (U.C.C.) regarding the delivery of the goods. It is stated that the parties can conclude a contract for sale even though the price is not settled.[207] Because of the gap-filler, the buyer can demand delivery

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[201] Mathias Dewatripont, Eric Maskin, Contract renegotiation in models of asymmetric information (European Economic Review, 1990), 311.

[202] Default rule is a legal principle that fills a gap in a contract in the absence of an applicable express provision. It can be overridden by a contract, trust, will, or other legally effective agreement. (*See* USLegal Dictionary accessed 2018 March 05 https://definitions.uslegal.com/d/default-rule/)

[203] Kimberly D. Krawiec & Scott Baker, Incomplete Contracts in a Complete Contract World (Florida State University Law Review, 2006), 734.

[204] Sec. 8 of the Sale of Goods Act 1979, accessed 2018 March 06 https://www.legislation.gov.uk/ukpga/1979/54

[205] *Id*.

[206] *Id*.

[207] Sec. 2-305 provides: There are cases when the price is a reasonable price at the time for delivery: when nothing is

at a reasonable price and sue the seller for breach of contract if she fails to deliver.[208] The default rule in this case allocates some power to the buyer during the renegotiation of the price term and, in so doing, sets the starting point for new talks and discussions.[209]

There are a few types of the default rules. The "majoritarian" defaults are the default contract terms which mimic' those terms that the majority of contracting parties would agree upon if negotiating and drafting a relevant provision were cost-free.[210] When transaction costs are high, majoritarian defaults minimize the number of inefficient contracts that result from the failure of parties to contract around the default rules.[211] When transaction costs are low (and, therefore, parties are expected to negotiate efficient contracts regardless of the default terms), majoritarian defaults minimize the number of parties that must incur costs by negotiating explicit contract terms rather than taking the cheaper route of leaving a "gap" in the contract for a default term to fill.[212]

The next type is a 'pro-defendant' default rule.[213] A party who seeks enforcement of a deliberately incomplete agreement would be granted an option to enforce the transaction under the agreed-upon terms supplemented with terms that are the most favorable (within reason) to the defendant.[214] When the parties conclude a contract, but leave some terms "to be agreed further", the court may use this type of default rules. The party seeking the enforcement of the contract will have an advantage over the other one.

One more type is a penalty default rule.[215] Penalty defaults are designed to give at least one party to the contract an incentive to contract around the default rule and therefore to choose affirmatively the contract provision they prefer.[216] The penalty defaults are purposefully set at what the parties would not want-in order to encourage the parties to reveal information to each other or to third parties (especially the courts).[217] These default rules are used with a view to imposing a penalty on the parties, because they failed to draft an appropriate contract. However, the main aim is not to punish the parties, but to encourage sharing of the information between

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said as to price; or the price is left to be agreed by the parties and they fail to agree; or the price is to be fixed in terms of some agreed market or other standard as set or recorded by a third person or agency and it is not so set or recorded (The Uniform Commercial Code 2002, accessed 2018 March 06 https://www.law.cornell.edu/ucc/2/2-305).

[208] Kimberly D. Krawiec & Scott Baker, Incomplete Contracts in a Complete Contract World (Florida State University Law Review, 2006), 734.

[209] *Id*., p. 734.

[210] Russell Korobkin, The Status Quo Bias and Contract Default Rules (Cornell Law Review, 1998), 614.

[211] *Id*, p. 614-615.

[212] *Id*, p. 615.

[213] Omri Ben-Shahar, 'Agreeing to Disagree': Filling Gaps in Deliberately Incomplete Contracts (Wisconsin Law Review, 2004), 390.

[214] *Id*., p. 390.

[215] Ian Ayres, Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules (The Yale Law Journal, 1989), 91.

[216] *Id*., p. 91.

[217] *Id*., p. 91.

them and making more efforts in order to draft a better contract. The court using this default rule may refuse to enforce the contract, because the parties may purposely leave a contract incomplete, e.g. with a view to shifting or conceal some costs. The court may also impose a penalty on the party who drafted an incomplete contract and benefit the party who is a 'victim of circumstances'.

The practical example of using different types of default rules is presented below. Consider, two parties concluded a sales contract. The parties didn't agree on the price and left this term for further considerations. Imagine that the market price of the good to be sold under this contract varies from $1000 to $3000. Using the majoritarian default rule, the court should set a "fair and reasonable" price, reflecting the price in the majority of comparable sales agreements of the same good, which is somewhere between $1000 and $3000, perhaps $2000. Using the "penalty" default-rule, the court might want to set the price against the party who drafted the contract, with a view to giving him incentives to draft the price term more precise. The court may also refuse to enforce the contract. Using the pro-defendant rule, the price term would depend on the party seeking enforcement. If the seller is the party trying to enforce the deal, then the price will be $3000 which is benefit the buyer. But if the buyer is seeking enforcement, then he can only get a price of $1000, most favorable to the seller.

S. Baker and K. Krawiec advocate one more type of the default rules.

> We propose a default rule of contractual gap-filling and interpretation (an "RSI default") that applies to incomplete contracts only when one of the contracting parties has made a relationship-specific investment (an "RSI"). Subject to a notice requirement, the RSI default fills gaps and resolves ambiguities in the contract in favor of the party making the RSI. As a result, it allocates bargaining power during renegotiation of the contract to the investing party. By allocating renegotiation power to the contracting party most likely to fall victim to holdup (that is, the relationship-specific investor), the RSI default encourages contracting parties to make such investments. In addition, because the RSI default must not encourage inefficient overinvestment, we propose that, in order to gain the benefit of the RSI default, the relationship-specific investor must provide notice of such investment to the noninvesting party.[218]

The RSI default rule is a relevant novation for the contractual gap-filling. This rule encourages relationship-specific investment. It protects the party who made an investment. It is very important, because e.g. under the 'pro-defendant' rule, the party who invests may get less then he invested. Under the penalty rule, the party who invested may get nothing at all. But, an investment is one of the core elements of the contract. The RSI rule reduce transaction costs and force the information exchange between the parties as well as other default rules. However, this

[218] Kimberly D. Krawiec & Scott Baker, Incomplete Contracts in a Complete Contract World (Florida State University Law Review, 2006), 728.

rule benefits the party who makes an investment.

The selection of a gap-filling standard should not be arbitrary, but should depend on the reason for the incompleteness.[219] Thus, the majoritarian gap filler should apply when the parties wanted to save the cost of explicit agreement and intended to apply an average or market term.[220] The penalty gap filler should apply when one of the parties is responsible for the vagueness and could have resolved it cheaply by making an explicit stipulation.[221] The pro-defendant gap filler should apply when the parties failed to reach consensus over this issue and left it deliberately indefinite.[222]

The third method which may be used by courts with a view to resolving a contractual incompleteness is the resolutions made by one or both parties. The court usually refuse to make a contract instead of the parties. The parties can't leave the provisions of the contract unresolved, because they want to do this. They will need the justification for the uncertainty in the contract. If the reason why the contract is incomplete is justifiable, the court will participate in resolving the uncertainty or clarify the meaning of a particular word or phrase. The court will generally use the criteria that have been agreed by the parties with a view to resolving the uncertainty.

Thus, the parties can agree to entrust the resolution of the issue to one or other party to the contract.[223] For instance, in May and Butcher v. The King case, Viscount Dunedin stated that 'with regard to price it is a perfectly good contract to say that the price is to be settled by the buyer'.[224] The difficulty with such a clause is that it appears to place the seller at the mercy of the buyer.[225] But the courts may be able to imply a term into the agreement in order to place a limit on the power of the buyer.[226]

The fourth method for filling the gaps in the incomplete contracts is a separation of the contract. As it was mentioned above, the court may enforce the contract or reject to do this. However, there is one more possibility for the court - to separate the uncertain term and to enforce the rest of the contract. As an example of this method the case of Nicolene Ltd v. Simmonds[227] is provided.

The defendant agreed to sell to the plaintiff steel bars. According to the letters between them (the alleged contract) it was stated: I assume that we are in agreement and that the usual

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[219] Omri Ben-Shahar, 'Agreeing to Disagree': Filling Gaps in Deliberately Incomplete Contracts (Wisconsin Law Review, 2004), 391.
[220] *Id*., p. 391.
[221] *Id*., p. 391.
[222] *Id*., p. 391.
[223] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 140.
[224] May and Butcher Ltd v. The King [1934] 2 KB 17 accessed 2018 March 07 http://www.nadr.co.uk/articles/published/MediationLawReports/May%20v%20Butcher%201934.pdf
[225] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 140.
[226] *Id*., p. 140.
[227] *Id*., p. 145.

conditions of acceptance apply.[228] The defendant failed to deliver the goods and so the plaintiffs brought an action for damages for breach of contract.[229] The defendant denied that a contract had been concluded on the ground that there were no 'usual conditions' in operation between the parties.[230] The Court of Appeal held that the reference to 'usual conditions' was meaningless and could be struck out without impairing the rest of the contract.[231]

Denning LJ stated:

> In my opinion a distinction must be drawn between a clause which is meaningless and a clause which is yet to be agreed. A clause which is meaningless can often be ignored, whilst still leaving the contract good; whereas a clause which has yet to be agreed may mean that there is no contract at all, because the parties have not agreed on all the essential terms.[232]

As regard to this case the parties didn't leave the provisions of the agreement for further negotiations. They concluded the agreement and agreed on all the terms. One thing that happened was that the parties simply agreed that 'the usual conditions of acceptance apply'. This clause is too vague. There is no precise meaning of what the conditions are. From this point of view, the court decided to separate this provision and to enforce the rest of the contract. The court took the right decision, because even though the provision is uncertain there is no damage to the whole agreement. The clause may be ignored and the agreement should be enforced.

One more method which may be used when the contracts are contingently incomplete is the doctrine of impossibility. This doctrine is applied differently, because the Roman and Anglo-American legal systems do not have common meaning regarding it. For example, the UK law recognizes the doctrine of *frustration*[233]. The term frustration of contract includes at least three different situations: the case where the performance has become physically or legally impossible, the case where the performance has become impracticable (i.e. extremely onerous or difficult) and the case where the counter-performance has lost its value to the creditor (frustration of purpose).[234] French law contains the doctrine of *imprévision*[235] which is similar to the doctrine of impracticability, but includes special aspects.

Under the doctrine of impossibility, the performance of the contract is physically or legally impossible due to the occurrence of an unexpected event. The impossibility of performance leads to the termination of the contract by the court. The party who failed to

[228] *Id*., p. 145.
[229] *Id*., p. 145.
[230] *Id*., p. 145.
[231] *Id*., p. 145.
[232] *Id*, p. 146.
[233] *See* Momberg (2011).
[234] Rodrigo Momberg Uribe, The effect of a change of circumstances on the binding force of contracts (Series: Ius Commune Europaeum, 2011), 139.
[235] *See* Hondius (2011).

perform a contract because of the unexpected event may be excused from liability. For this to happen the following conditions should be met: (a) the unexpected event should occur after the conclusion of a contract; (b) the parties couldn't foresee this event when they were drafting a contract; (c) the performance of the contract becomes physically or legally impossible.

Under the doctrine of impracticability, the performance of the promise is physically possible and the underlying purpose of the bargain achievable but as a result of an unexpected event enforcement of the promise would entail a much higher cost than originally contemplated.[236] Thus, when performance has become excessively onerous or burdensome for the debtor the contract may be terminated by the court. However, it is not very easy to prove the impracticability or impossibility of performance. Fortunately, the case law shows that the courts are ready to excuse the party from performance if the circumstances require to do so.

The French doctrine of *imprévision* refers to cases in which unforeseen economic circumstances become apparent after a contract has been concluded and which make its performance extremely difficult or much more costly, but do not render it impossible.[237] This doctrine can be used on the assumption that there is an economic imbalance between the contractual obligations at the time of performance.[238] The civil courts failed to acknowledge the doctrine of imprévision for several years. The Court of Cassation in the famous case "Canal de Craponne" 1876 emphasized: "it was not open to the courts to modify an agreement, thereby substituting new terms to those which had been freely agreed upon by the parties".[239] However, the French Civil Code 2016 contains the provision regarding the doctrine of imprévision.[240] Currently, the courts are obliged to use this doctrine despite the fact that they still have doubts in it.

2.4. Conclusion

The definition of a contract varies from country to country. However, there are common features for the contract in all legal systems. It is always an agreement giving rise to the rights and obligations which are enforced or recognized by the law.

I can summarize that Contract Law is a good tool for promoting parties to enter the

[236] Richard Posner and Andrew Rosenfield, Impossibility and Related Doctrines in Contract Law: An Economic Analysis (The Journal of Legal Studies, 1977), 86.
[237] Ewoud Hondius and Hans Grigoleit, Unexpected Circumstances in European Contract Law (Cambridge University Press, 2011), 144.
[238] *Id*., p. 144.
[239] Eva Steiner, French Law: A Comparative Approach (Oxford University Press, 2010).
[240] Art. 1195 provides: If a change of circumstances that was unforeseeable at the time of the conclusion of the contract renders performance excessively onerous for a party who had not accepted the risk of such a change, that party may ask the other contracting party to renegotiate the contract. The first party must continue to perform his obligations during renegotiation. (French Civil Code 1804 (amended of 10 February 2016), accessed 2018 March 13 https://www.trans-lex.org/601101/_/french-civil-code-2016/

agreements. This is because it governs the provisions which should be stipulated in the contract and liability which may arise when the party breaches a contract. This gives certainty to the parties that their rights are protected by the law. Thus, they may enter the contract, perform their obligations and gain a benefit from these relations. In the case of breach, the parties may litigate the contract.

The contracts can be complete and incomplete. However, it should be noted that a complete contract is rather a miracle than a reality. After the careful analysis of incomplete contracts, I can conclude that there are at least four main reasons why it is impossible to write a complete contract. Firstly, because of the high transaction costs. Secondly, because of the impossibility to predict all circumstances which may occur in the future and substantially change the contract. Thirdly, because of the incomplete information in contracts, usually caused by the parties' incentives to hide some information with the aim to receive more gain from the contract. Fourthly, because the contract is making by people and the possibility of a mistake always exists.

My research demonstrates that contracts can be incomplete from the law or/and economic perspective. The 'obligationally incomplete' contracts (when some rights or obligations are not specified in the contract) and 'contingently incomplete' contracts (when contracts fail to fully realize the potential gains from trade in all states of the world) respectively. Legal scholars propose to write better contracts or to renegotiate them when they are obligationally incomplete. Economists propose to use the residual control rights when the contract is contingently incomplete. However, in spite of the present methods, the problem of incomplete contracting still exists. Thus, the parties have no other choice, but go to the court with the aim to resolve this problem.

There are methods which may be used by courts in these situations. The court can encourage the parties to renegotiate a contract, to use the default rules, the resolutions made by one or both parties, the separation of a contract and to apply the doctrine of impossibility. I totally agree with the usage of these methods. They allow fighting with the problem of incomplete contracts after their conclusion. These methods also try to compensate a non-breaching party or to change the contract in a way that it will satisfy both parties. However, they do not eliminate the reasons for the conclusion of incomplete contracts. Thus, I may conclude that there is a need to find new mechanisms or to modify existing ones with a view to excluding the incomplete contracts from the contractual world or at least to reduce the possibility of their appearance.

3. THE NOTION OF INCOMPLETE INFORMATION

As it was described in the Chapter II of this thesis, there are a lot of reasons why the contracts are incomplete. It may be the uncertainty of the contract terms or the failure in specifying obligations under the contract for all future states of the world. However, there is one more reason which is very widespread and difficult to overcome. One of the main reasons why contracts are incomplete is the existence of incomplete information. The party to a contract may have incomplete information about the other party's actions. It can be also situations when the party tries to hide some information from the other party to the contract. The party may also possess some information which is not available to the other party, but relates to the contract. The incomplete information may cause the contract uncertainty and the conclusion of the contracts which due to their incompleteness will be unenforced in the future. The incomplete information leads to the creation of incomplete contracts, because when there is no full information available to the parties, it is impossible to create a complete contract. That is why it is important to analyze the incomplete information and try to find possible solutions.

There is an assumption of common knowledge in the Game theory. A fact F is common knowledge among the players of a game if all the players know F, all the players know that all the players know F, all the players know that all the players know that all the players know F, and so on.[241] Games of complete information are rather special, for every important feature of the game is assumed to be common knowledge among the players.[242] In contrast, typical asymmetric information games (AIGs) assume that the players are not completely informed about one another's payoffs.[243] However, in a typical AIG, the fact that there is an asymmetry is itself common knowledge among the players, as are the players' ex ante beliefs about the forces that generate the privately informed player's information.[244] But, such breakdowns in common knowledge might take a number of other manifestations, including knowledge about the structure or rules of the game, the rationality of the players, the number of players, or the effectiveness of communication between players.[245]

The Game theory and economic scholars distinguish several types of information structures, such as: perfect and imperfect; complete and incomplete, and symmetric and asymmetric ones. All these types of information structures have their own features. However, for the purpose of my research all of them constitute the information which is incomplete in the sense that at least one player doesn't possess at least one piece of information regarding the game

[241] Michael Maschler, Eilon Solan, Shmuel Zamir, Game Theory (Cambridge University Press, 2013), 321.
[242] Eric Talley, Interdisciplinary Gap Filling: Game Theory and the Law (Law and Social Inquiry, 1997), 1066.
[243] *Id*., p. 1066.
[244] *Id*., p. 1066.
[245] *Id*., p. 1066.

he is playing in. The player may not have information regarding the other player's action or information which is available to that player, or payoffs, strategies and outcomes of the game. The player may not observe the moves of the Nature. If at least one player doesn't possess information about at least one of the abovementioned elements the game constitutes the game with incomplete information in general sense.

3.1. Perfect and imperfect information structures

The perfect and imperfect information structures constitute the first type of the incomplete information. In a game of perfect information each information set is a singleton. Otherwise the game is one of imperfect information.[246] In a game of imperfect information, at least one player must make at least one move without having observed what some other player has done.[247] Generally speaking, all players know what the game tree looks like, but if a player has imperfect information, this player does not always know precisely where in the game tree he is.[248] In the games of imperfect information, players do not know the actions chosen by other players. However, the players are aware who the other players are, what their possible strategies, and the payoffs of these other players.

With a view to illustrating the game with imperfect information the following example is presented. The simplest example is the Battle of the Sexes game which has been already described in the Chapter 1 of this thesis. There is a couple who want to go out together, but each of them has preferences regarding their amusement. The man wants to go to a football match; the woman wants to visit an opera. But it is very important for them to go somewhere together. That's why the payoff in this situation will be higher than if they go separately.

Let's presume that the man makes his move a little bit earlier than the woman. He chooses the opera or the football. However, the woman doesn't know what exactly the man chose. Thus, she doesn't know where in the game tree she is. The woman possesses imperfect information about the man's move. This makes her choice difficult, because she wants to go with the man, but she can't be confident that she will choose the right strategy. If the woman chose the same option which the man did, the payoff of the game will be high. However, if they make different choices, the payoff will be low. The game tree is presented below (Figure №3):

[246] Eric Rasmusen, Games and Information: An Introduction to Game Theory (Oxford: Blackwell Publishers, Fourth edition, 2006), 48.
[247] Stephen W. Salant and Theodore Sims, Game Theory and the Law: Is Game Theory Ready for Prime Time? (Michigan Law Review, 1996), 1859.
[248] Morten Hviid, Games Lawyers Play? (Oxford Journal of Legal Studies, 1997), 718.

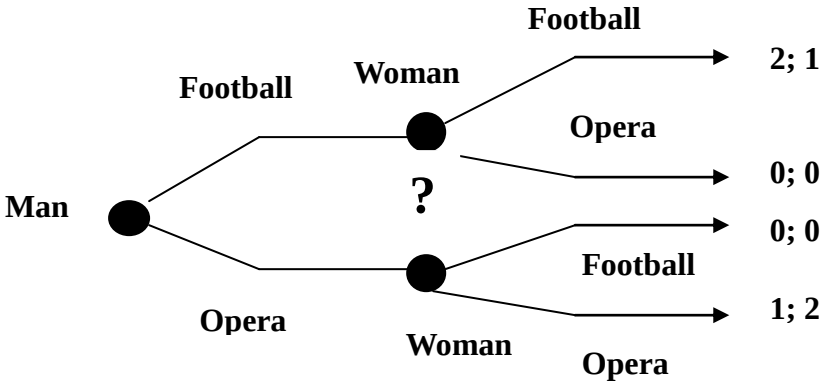

Figure № 3

As a matter of fact, the imperfect information structure has its application in contract law as well. This economic concept relates to the notions of silence and misrepresentation in contracts. For instance, the parties have concluded a sales contract of a bike. The seller is obliged to deliver the bike, and the buyer to accept and to pay for the item. Let's presume that something has happened during the delivery. There is a big scratch appeared on the bike. The seller decided to conceal it. He masked the scratch and delivered the bike. The buyer didn't observe the scratch and bought the item. The seller remained silent (or the buyer may ask whether the bike is in good conditions, and the seller says – yes). This is a misrepresentation. Let’s come back to the imperfect information structure. The buyer didn't observe the moves of the seller (how he made a scratch and hid it). The buyer doesn't know what actions the seller did in order to deliver the bike in good conditions. Consequently, the contract is incomplete because of the imperfect information and thus, it may be annulled in the case of litigation.

3.2. Complete and incomplete information structures

The term "incomplete information" is used in two quite different senses in the literature. Firstly, this term covers all the situations where at least one player doesn't possess at least one piece of information regarding the game he is playing in. From this point of view, the incomplete information includes different types: perfect/imperfect information structure; complete/incomplete information structure and symmetric/asymmetric information structure. Secondly, the term "incomplete information" is referred to the situation when Nature moves first and is unobserved by at least one of the players.[249] Otherwise, the game is one of complete information.[250] From this point of view, the incomplete information structure is one of the types of the general understanding of this term and possesses its own features. This subchapter is

[249] Eric Rasmusen, Games and Information: An Introduction to Game Theory (Oxford: Blackwell Publishers, Fourth edition, 2006), 50.
[250] *Id*., p. 50.

devoted to the second meaning of this term.

In games with incomplete information, some characteristic of a player is what some other player cannot observe.[251] The unobserved characteristic is usually called the player's type; different types of players have different motivations; and those different motivations can always be represented by ascribing distinct payoffs to players of the different types.[252] Nature randomly chooses the type of the player one, but the player two doesn't know what kind of the player one Nature chooses.

In the games with incomplete information, one player is uncertain about the preferences of the other player. He doesn't know his type. For instance, there is an accident on the road. Someone has to call 911 to get help. The player 1 doesn't necessarily know how costly it will be for the player 2 to call 911. Maybe a person is really busy with work; maybe spending 2 hours with the police seems not attractive to him/her. Or maybe it is a casual day for the person and he/she really doesn't mind spending that time. It is going to be dependent on staff that is going on in the person's life and not the life of the player 1. So, the first player doesn't necessarily know what is going on in the life of the second player and how costly for him/her to call 911. Thus, the player 1 doesn't know the preferences of the player 2. The first player doesn't know who will be this player 2. Nature will choose randomly the second player for this game.

There is still a question how to solve games with incomplete information. Every solution concept has one strategy per actor. But in the games with incomplete information, there are multiple types of actors. For example, in the case, mentioned above, people who find calling 911 cheap ought to pick up the phone more often than those who don't have cheap costs. For resolving the incomplete information games it should be a strategy per each type of an actor.

A Bayesian Nash Equilibrium[253] (BNE) is a solution concept which is used in the games with incomplete information when the moves of the players are simultaneous. The games with incomplete information have more elements than the games with complete information. These games also include types of the players and their common prior beliefs as one of the main elements. The prior beliefs help a player to adapt his strategy which will be a good response to the other player's strategy. For this to happen, a player needs to have beliefs about the type of the other player. For example, in the case of an accident, maybe the player 1 has a belief of 50 % that the call to 911 will be made by the person for whom this call is more costly and 50% belief that it will be the person for whom this call is less costly. The common prior beliefs are not only the equal probability that the player 1 is facing with the person incurred higher costs or lower costs.

[251] Stephen W. Salant and Theodore Sims, Game Theory and the Law: Is Game Theory Ready for Prime Time? (Michigan Law Review, 1996), 1869.
[252] *Id*, p. 1870.
[253] Rasmusen, p. 139.

But the player 2 knows that the player 1 has these beliefs. Moreover, the player 1 knows that the player 2 knows that he has these beliefs.

A BNE is a set of strategies, one for each type of player, such that no type has incentive to change his or her strategy given the beliefs about the types and what the other types are doing.[254] Essentially, there is a generalization of Nash equilibrium to situations where there are multiple types and uncertainty about which one is actually playing the game.

With a view to demonstrating how the BNE works, the following example is presented. Let's assume that Mike and Peter concluded a sale contract of a ball with a signature of a famous football player. Mike is a seller and Peter is a buyer. Mike doesn't know whether Peter is an honest or dishonest person. He has doubts whether the Peter will perform the contract.

This is the one-sided incomplete information game. The player 1 (Peter) can be one of two different types: A type (dishonest person) with probability *p*, and B type (honest person) with probability *1-p*. There is a single type of the player 2 (Mike). The player 1 has no uncertainty who is the player 2. But the player 2 has uncertainty who is the player 1. The player 1 knows whether he is the A or B type. But the player 2 does not know that.

Let's assume that the player 1 is the A type (Table №6). The "perform" strategy strictly dominates "not perform" strategy (because 4 is greater than 0 and 3 is greater than 0) for the player 2. If the player 2 knows that he is in the A type game, he will always play "perform", because the payoff is higher. But it is impossible to eliminate "not perform" as a dominated strategy based on this information. That is because the player 2 doesn't know whether he is in this A type world.

		Player 2 (Mike)	
		Perform	**Not perform**
Player 1 (Peter)	**Perform**	**3; 4**	**1; 0**
	Not perform	**4; 3**	**2; 0**

Table № 6 (A type)

The player 1 might be in the B type game (Table № 7). Here, there is an opposite situation. The "not perform" strategy strictly dominates "perform" strategy (because 4 is greater than 2 and 4 is greater than 1) for the player 2. But it is impossible to eliminate "perform" as a dominated strategy based on this information. That is because the player 2 doesn't know whether he is in this B type world.

[254] Rasmusen, p. 179.

		Player 2 (Mike)	
		Perform	**Not perform**
Player 1 (Peter)	**Perform**	**6; 2**	**0; 4**
	Not perform	**5; 1**	**-1; 4**

Table № 7 (B type)

At the same time, the player 1 knows whether he is A or B type. When he is A type, he can observe that "not perform" is strictly dominates "perform" strategy (because 4 is greater than 3 and 2 is greater than 1). So, the player 1 will play "not perform". Thus, the player 1 as the A type has to play "not perform" strategy in any BNE. The opposite situation is when the player 1 knows that he is the B type. The "perform" strategy strictly dominates "not perform" strategy (because 6 is greater than 5 and 0 is greater than -1). Thus, the "perform" strategy is the BNE strategy for the B type of the player 1.

There are two strategies which are benefit the player 1: for A type - "not perform" and for B type "perform". The player 2 doesn't know which type of the player 1 he is facing, but he will know the relative likelihood of facing each of those types. Let's calculate the expected utility for the player 2 in these situations:

$$U(\text{perform}) = 3p + 2(1-p)$$

$$U(\text{not perform}) = 0p + 4(1-p)$$

$$3p + 2(1-p) > 0p + 4(1-p)$$

$$3p + 2 - 2p > 4 - 4p$$

$$5p > 2$$

$$p > 2/5$$

With a view to finding the solution for the player 2 it is a need to compare those expected utilities. So, the overall Bayesian Nash Equilibrium of this game is as follows : the player 1 as the A type chooses "not perform" the contract; the player 1 as the B type chooses "perform" the contract; the player 2 chooses "perform" if *p* is greater than 2/5 and he will choose "not perform" if *p* is less than 2/5.

A Perfect Bayesian Equilibrium (PBE) is a solution concept which is used in the games with incomplete information when the moves of the players are sequential. Games of sequential timing are those where players take turns moving and have the possibility to observe previous moves and know what other players have done when they make their actions.

> Eric Rasmusen defines a perfect Bayesian equilibrium as a strategy profile and a set of beliefs such that at each node of the game: (1) The strategies for the remainder of the game are Nash given the beliefs and strategies of the other players. (2) The beliefs at each information set are rational given the evidence appearing thus far in the game (meaning that they are based, if possible, on priors updated by Bayes's Rule, given the observed actions of the other players under the hypothesis that they are in equilibrium). (3) The beliefs are the limit of a sequence of rational beliefs, is the equilibrium assessment, then some sequence of rational beliefs and completely mixed strategies converges to it.[255]

The notion of perfect Bayesian equilibrium introduced in is based on two elements: (1) rationalizability of the assessment by a plausibility order; and (2) the notion of Bayesian consistency relative to the plausibility order.[256] This is expressed as a strategy and belief pair that simultaneously satisfy sequential rationality and belief consistency.[257] In general, a PBE is a set of strategies and beliefs such that the strategies are sequentially rational given the players beliefs and players update beliefs via Bayes's Rule wherever possible.

The word "Bayesian" incorporates the idea that uninformed players put probabilities on different events and then update them using Bayes's rule when other players take actions that convey information.[258] Bayes's rule provides that the rational people should update their prior beliefs when the new information occurs. The word "perfect" reflects the idea that beliefs and actions have to be consistent with each other.[259]

A player who is uncertain about what another player has done nevertheless has beliefs, based, perhaps, on previous experience.[260] In addition, these beliefs are updated in light of new information.[261] A solution to a game should take these beliefs and a player's ability to update them into account.[262] The beliefs and the strategies of the players should be consistent with each other.[263] In traditional Bayesian decision theory, each decision maker is permitted to make whatever decision he wishes, after getting whatever information he gets.[264]

The difference between BNE and PBE lies in the notion of the players' beliefs. In the context of BNE, the concept of beliefs is not included in the definition of the BNE. This is

[255] Eric Rasmusen, Games and Information: An Introduction to Game Theory (Oxford: Blackwell Publishers, Fourth edition, 2006), 140.
[256] Giacomo Bonanno, Exploring the Gap between Perfect Bayesian Equilibrium and Sequential Equilibrium (University of California, Games, 2016), 17.
[257] Abhinav Sinha and Achilleas Anastasopoulos, Structured Perfect Bayesian Equilibrium in Infinite Horizon Dynamic Games with Asymmetric Information (in 54th IEEE Conference on Communication, Control, and Computing, 2016).
[258] Douglas G. Baird, Robert H. Gertner, Randal C. Picker, Game Theory and the Law (Harvard University Press, 1994), 83.
[259] *Id*, p. 84.
[260] *Id*, p. 84.
[261] *Id*, p. 84.
[262] *Id*, p. 84.
[263] *Id*, p. 84.
[264] Robert J. Aumann, Correlated Equilibrium as an Expression of Bayesian Rationality (Econometrica, 1987), 8.

because the beliefs are important when the player calculates his payoff, but they are not a part of the BNE itself. On the opposite side, the players' beliefs are a part of the PBE. Thus, they are a part of its determination also. The players' beliefs play a crucial role in finding the PBE. The player should observe the actions of other players and update his beliefs according to the new information he will get from these actions.

The importance of Bayesian games is in providing the tools and methodology to relax the common knowledge assumption, to enable modeling of the overwhelming majority of real-life situations in which players have only partial information about the payoff relevant data.[265]

An incomplete information structure in contracts is presented using the example of a sales contract of a ball with a signature of a famous football player between Mike and Peter. Mike is a seller and Peter is a buyer. Mike doesn’t know whether Peter is an honest or dishonest person. He has doubts whether the Peter will perform the contract. The fact that Mike doesn't possess knowledge about Peter's type is an incomplete information structure. The circumstances which do not depend on the players choose the type of Peter. Economists use BNE and PBE with a view to resolving this problem. However, in the world of contract law to use these concepts is not enough. I can conclude that the problem of incomplete information in contracts is difficult to overcome. Firstly, because it is impossible to know the human's nature and thus, the type of a person you are dealing with. Secondly, it is impossible to predict and evaluate all circumstances which may influence the person. Even the fact, that you have been known your partner to a contract for ten years doesn't guarantee his type in the game. He may be the best person ever but at the same time, he fails to perform the contract. Consequently, the contract is deemed to be incomplete and the parties will suffer in the case one party is the person she shouldn't be for this contract. The subchapter 3.4 represents legal methods which may be used to reduce the incomplete information structure as one of the reasons of the creation of incomplete contracts.

3.3. Symmetric and asymmetric information structures

One of the main prerequisites in the traditional market relations was the assumption that all market participants have complete information about the characteristics of all goods and services traded in those markets. This is an important condition for the functioning of perfect markets. However, in real life, information about the quality of goods which are traded in the markets, or other features of the transaction, is often asymmetric. The example of asymmetric information may be: when a firm hires a worker, its manager may know less about the skills of

[265] Shmuel Zamir, Bayesian Games: Games with Incomplete Information (Center for the Study of Rationality, 2008), 427.

the worker than this worker knows about himself.

One more example of asymmetric information concerns the insurance of a driver. An insurance company insures a driver against an accident. This driver knows better than an insurance company about the nature of his driving (e.g. he drives at a high or small speed). Therefore, it is easier for the driver to assess the likelihood of a possible accident. Thus, symmetric and asymmetric information structures constitute the third type of the incomplete information.

In a game of asymmetric information, the information sets of players differ in ways relevant to their behavior, or differ at the end of the game.[266] The essence of asymmetric information is that some player has useful private information: an information partition that is different and not worse than another player's.[267]

A game of symmetric information can have moves by Nature or simultaneous moves, but no player ever has an informational advantage. [268] The one point at which information may differ is when the player not moving has superior information because he knows what his own move was; for example, if the two players move simultaneously.[269] Such information does not help the informed player, since by definition it cannot affect his move.[270]

> As an example of the problem arising from asymmetric information the following situation is presented. A buyer knows something about a piece of land that the seller doesn't. The seller is a farmer and the would-be buyer is a geologist. The knowledge is whether the land has valuable minerals on it. The person who lacks knowledge, the farmer, must act notwithstanding the uncertainty. The farmer may not know whether there is oil or other minerals on the land, but nevertheless might have some sense of the probabilities. A farmer in Texas might think that there is one chance in ten that there is oil on the land, but a farmer in Illinois might think opposite. The person who lacks information can draw inferences from the way another person acts. A farmer who starts with the belief that the land is unlikely to have oil on it might think it more likely that the land contains oil if an oil company geologist comes and asks if it is for sale.[271]

When one person has information that another doesn't, this asymmetry itself affects how both parties behave.[272] Farmers will want to know the identity of their prospective buyers.[273] Potential buyers will, to the extent possible, conceal information that tends to increase the price.[274]

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[266] Rasmusen, p. 50.
[267] *Id*., p. 50.
[268] *Id*., p. 50.
[269] *Id*., p. 50.
[270] *Id*., p. 50.
[271] Douglas G. Baird, Robert H. Gertner, Randal C. Picker, Game Theory and the Law (Harvard University Press, 1994), 79-80.
[272] *Id*, p. 80.
[273] *Id*, p. 80.
[274] *Id*, p. 80.

A game has asymmetric information if information sets differ at the end of the game, even though no player takes an action after the end nodes.[275] The principal-agent model is an example.[276] Principal-agent relationships play a central role in the theory of incentives and mechanism design.[277] The principal moves first, then the agent, and finally Nature.[278] The principal does not observe the agent's move, although he may be able to deduce it.[279] This would be a game of symmetric information except for the fact that information continues to differ at the end nodes.[280]

In the principal-agent model, there are two players. The principal is a party who determines the conditions of the agreement. The agent is a party who accepts or rejects the agreement. The principal (payer 1) has a task to be performed by the agent (payer 2). However, the agent possesses or acquires in the future some information which is not available to the principal. For example, the player 1 needs to repair his car. He is going to the mechanic who is the player 2 in this game (the agent). The mechanic examines the car and points a lot of things which need to be repaired in that car. However, the mechanic possesses specific knowledge about the car and the player 1 doesn't. Thus, the principal doesn't know whether the agent tells him the truth about the car. The problem exists because the principal wants to repair his car as cheaper as possible. But, the agent has an incentive to get more money. That's why he may use an information advantage. The principal-agent model is a cornerstone in the cases with asymmetric information. This model is used in further subchapters with a view to describing different types of asymmetric information.

3.3.1. Adverse selection, screening and signaling as models of asymmetric information

The first model of asymmetric information is the adverse selection. In this model, the principal offers the agent a contract, while at the time of conclusion of a contract the agent has information that is not available to the principal (usually this information relates to the "type" of the agent). After the conclusion of the contract, all actions and events are observed by both parties. The problem is to identify the information and to offer the agent the optimal contract (which, by definition, should depend on its type).

Although the adverse selection occurs in different spheres of individual's activity,

[275] Rasmusen, p. 50.
[276] *Id.*, p. 50.
[277] Eva I. Hoppe, Patrick W. Schmitz, Contracting under Incomplete Information and Social Preferences: An Experimental Study (Review of Economic Studies, 2013), 2.
[278] Rasmusen, p. 50.
[279] *Id.*, p. 50.
[280] *Id.*, p. 50.

originally this term appeared in the insurance area. This is not accidental, because the market of insurance services is the most susceptible to the information asymmetry and to the adverse selection.

The individuals who want to insure something have private information about their specific personal situations. People who buy health insurance know their general state of health better than any insurance company, even if the latter conducts a medical examination. Therefore, there is an adverse selection. If the insurer could distinguish healthy clients from unhealthy clients, then he would establish for them a different price of insurance policy: for the healthy people- a lower one, and for the unhealthy people - a higher one. Then, the so-called "separating equilibrium" would be established and the problem of adverse selection would be solved. However, the insurer cannot do this. Therefore, the insurer sets an average price of the insurance policy. For unhealthy people, this average price is low, and they will be happy to insure themselves. For healthy people, this price is high, and many of them will not buy a policy. Thus, the proportion of unhealthy people in the total amount of insured people will increase. This will further increase the average price of the insurance policy. Thus, the proportion of unhealthy people increases even more, which again raises the price, until only this category of people remains on the insurance market. Therefore, an insurance activity becomes unprofitable.

Screening is a special case of adverse selection and the second model of asymmetric information. Many scholars, but not all of them, don't separate screening and adverse selection. They explain these models as one single model of asymmetric information. That is because these models are interrelated. In the case of screening the uninformed player moves first. However, such a player may offer an interaction mechanism, or a menu of choices, as a result of which the information available to the other player will be taken into account. For example, if a university is interested in hiring high-level scientists and only such scientists can publish their work in the best journals, then the university can offer two types of contracts: a fixed average annual salary contract without bonuses and a low salary one with a huge bonus for each publication in a high-level journal.[281] High-level scientists would rather agree to the second type of the contract, while others - to the first one.[282]

The third model of asymmetric information and one more special case of adverse selection is signaling. According to this model the informed player moves first and reveals a part of information by his actions. Based on some objective reasons and technological capabilities, such a player may prefer to hide the information or to disclose it. For example, the seller of a second hand car can provide a guarantee to the buyer, thereby showing that the car is of a high

[281] Sergei Izmalkov, Konstantin Sonin, Basics of contract theory (Voprosy Ekonomiki, 2017), 7.
[282] *Id.*, p. 7.

quality.[283] By offering a guarantee, the seller sends a signal about the quality of the car, because the seller of a poor quality car would not provide such a guarantee.[284]

The signals are the mechanisms that allow people to overcome information asymmetry. One type of a signal is a reputation. People buy goods in the shop, where they know that the products are of a good quality. A person goes to the restaurant, where the products are fresh and tasty. The consumer buys a mobile phone "Apple", because he is confident that the quality of the product is very high.

One more example of a signal is standardization. Let's consider a McDonald's cafe. There are special standards for the ingredients which are used and their quality. These standards are common for all cafes of the franchise no matter where the McDonald's is located. Therefore, the consumer knows exactly what he will buy there.

The price is also a signal. One the one hand, if the product is sold at a low price, then the consumer should expect that it has hidden defects. On the other hand, a high price is almost always a signal about a good quality of the goods.

With a view to illustrating these models of asymmetric information the figures, using the principal-agent example, are presented below. Adverse selection models have incomplete information, so Nature moves first and picks the type of the agent, generally on the basis of his ability to perform the task.[285] In the simplest model, Figure (4), the agent simply accepts or rejects the contract.[286] If the agent can send a "signal" to the principal, as in Figure (5) and (6), the model is signaling if he sends the signal before the principal offers a contract, and is screening otherwise.[287]

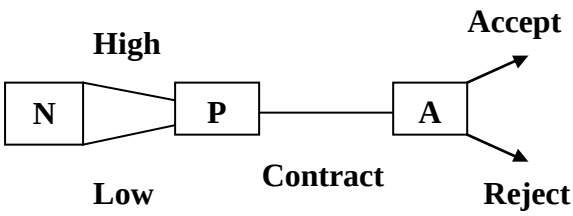

Figure № 4[288]

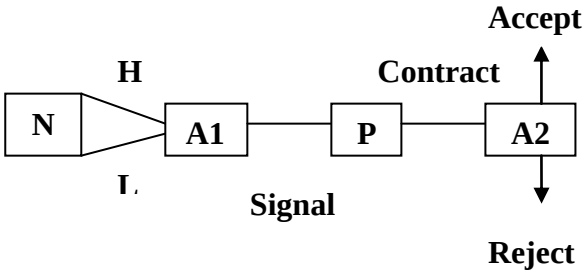

Figure № 5[289]

[283] *Id*., p. 7.
[284] *Id*., p. 7.
[285] Rasmusen, p. 161.
[286] *Id*., p. 161.
[287] *Id*., p. 161.
[288] *Id*., p. 161.
[289] *Id*., p. 161.

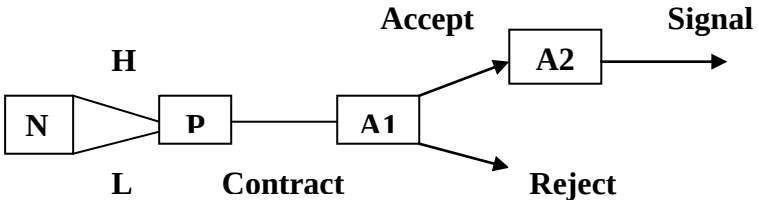

Figure № 6[290]

There are two types of the solution concepts for the games with asymmetric information. The equilibrium in a game in which a player has private information tends to be one of two general kinds.[291] First, there is a solution in which the outcome is the same regardless of the information the other player has.[292] Such a solution is a pooling equilibrium.[293] In a pooling equilibrium, the different types of informed players choose the same strategy in equilibrium, preventing the uninformed players from deducing their opponents' types.[294] The second possibility is one in which a player is better off taking an action, even though the action communicates information.[295] Such a solution is a separating equilibrium.[296] In a separating equilibrium, different type players' choices of different equilibrium strategies reveal their types to the previously uninformed player.[297]

3.3.2. Moral hazard as a model of asymmetric information

Moral hazard is considered as one more model of asymmetric information. Moral hazard has two types: moral hazard with hidden actions and moral hazard with hidden information. The moral hazard models are games of complete information.[298] The principal offers a contract, and after the agent accepts, Nature adds noise to the task being performed.[299] In moral hazard with hidden actions, in Figure (7), the agent moves before Nature and in moral hazard with hidden knowledge, in Figure (8), the agent moves after Nature and conveys a "message" to the principal about Nature's move.[300] A "signal" in adverse selection is different from a "message" in moral

[290] *Id*., p. 161.
[291] Douglas G. Baird, Robert H. Gertner, Randal C. Picker, Game Theory and the Law (Harvard University Press, 1994), 83.
[292] *Id*., p. 83.
[293] *Id*., p. 83.
[294] Ian Ayres, Playing Games with the Law (Stanford Law Review, 1990), 1307.
[295] Douglas G. Baird, Robert H. Gertner, Randal C. Picker, Game Theory and the Law (Harvard University Press, 1994), 83.
[296] *Id*., p. 83.
[297] Ian Ayres, Playing Games with the Law (Stanford Law Review, 1990), 1307.
[298] Rasmusen, p. 161.
[299] *Id*., p. 161.
[300] *Id*., p. 161.

hazard because it is not a costless statement, but a costly action.[301]

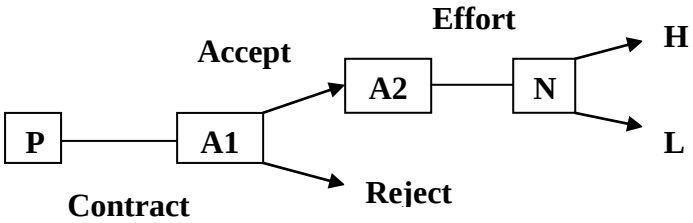

Figure № 7[302]

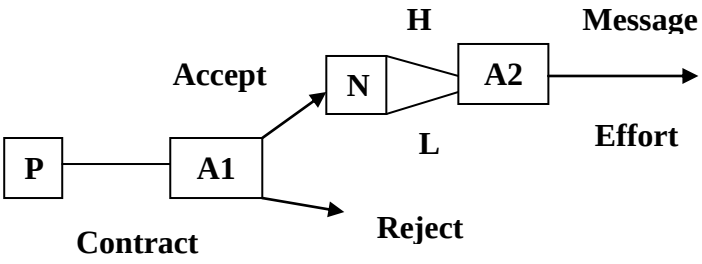

Figure № 8[303]

Originally, the term "moral hazard" appeared in the insurance area. The moral hazard arises when an insurance company cannot observe whether the insured client makes any efforts to avoid possible losses. As an example, consider the fire insurance.

How will a rational owner of the house behave, when he doesn't have fire insurance? He may use different methods to avoid a fire, e.g. to install the most sensitive smoke sensors. The reason for taking such measures is that they reduce the risk of a fire, and hence an expected damage from it.

Will the behavior of the house owner differ if he has an insurance policy? Suppose that the house owner buys an insurance policy that fully covers all the costs of building a new house if the old one is burned out in a fire. In this situation, the house owner may not use the precautions measures to keep his house in safe. This is because he has an insurance which will cover all costs in the case of a fire and to install special protection measures is too expensive.

The absence of such the precautions measures significantly increases the likelihood of a fire, and, consequently, the likelihood of the insurance company to pay. This is the problem of moral hazard in the insurance market.

It is not surprising, therefore, that many insurance companies take into account the precautionary measures taken by the owners of the insured property. Thus, for example, different rates are set for those who use the fire protection system in their houses, and for those who do not use it.

In this model, the asymmetry of information is absent at the time of the contract

[301] *Id*., p. 161.
[302] *Id*., p. 161.
[303] *Id*., p. 161.

conclusion, but appears after it is signed: the agent chooses an action (for example, the level of efforts or investment) that the principal does not observe directly. However, the principal may observe different changes (for example, the increase or decrease of his income), the probability distribution of which depend on the agent's efforts. Because one party cannot observe the actions of the other party, the later one has an information advantage. For example, an employer is not confident whether an employee works using all his efforts. A football player who has signed a contract with the football club may play to the full extent of his power or may not.

In the principal-agent model, the agent may have a personal preference for shirking.[304] If the principal cannot directly observe the agent's effort, it may be difficult to deduce whether lower profits in a given period derive from shirking or from a random decrease in demand.[305]

It is especially important for legal scholars to note that moral hazard may be possible even when the principal can directly observe an agent's behavior.[306] If the principal cannot prove in court that an agent is shirking, then the agent's effort is noncontractible in that a binding contract cannot be conditioned on effort.[307] The presence of noncontractible terms can have a dramatic effect on the remaining terms in a contract.[308]

> To sum up all the asymmetric information's models, consider the following example. There is a contract between A and B where A pays B to carry out a project, and where there is a time-gap between agreeing on the terms of the contract and the contract being completed. Assume that B has some private information. Two aspects are crucial. B may acquire information before or after the contract is agreed and A or B may be proposing the contract. If B acquires the information before the contract, there is a case which is often referred to as adverse selection. If A offers the contract the game has the uninformed moving first and is about screening; if B offers the contract the game has the informed moving first and is about signaling. If B acquires the information after the contract is signed, there is a case commonly referred to as moral hazard, where A has to give B the incentive to use this information in A's interest.[309]

The example demonstrated above shows the application of models of asymmetric information in contract law sphere. My research gives me an opportunity to conclude that the asymmetric information is the most widespread reason for the creation of incomplete contracts. Adverse selection and moral hazard are used very often in the contract world. These models of asymmetric information are referred to the concepts of silence, misrepresentation, fraud and mistake. These concepts are described in the subchapter 3.4 of the present Chapter. In a few words, the asymmetric information arises when one party has private information. In the case of

[304] Ian Ayres, Playing Games with the Law (Stanford Law Review, 1990), 1308.
[305] *Id*., p. 1308.
[306] *Id*., p. 1308.
[307] *Id*., p. 1308.
[308] *Id*., p. 1308.
[309] Morten Hviid, Games Lawyers Play? (Oxford Journal of Legal Studies, 1997), 721-722.

silence, misrepresentation, fraud and mistake the private information available to the player is a cornerstone for each concept. Consequently, the contracts with asymmetric information are incomplete. The existence of asymmetric information may lead to the conclusion of a contract with the uncertain terms or with the absence of provisions which are important. As a result the contract will be annulled and the parties will suffer losses. Thus, I come to the conclusion that it is a need to discuss possible legal solutions of this problem.

3.4. Incomplete information in the legal world. The methods to resolve the problem

In the previous subchapters the different types of incomplete information were analyzed from the economic point of view. This subchapter is devoted to the incomplete information in the legal world. The incomplete information creates incomplete contracts. Thus, the parties to such a contract, in general, have no possibility to enforce the contract. Moreover, it is very difficult to continue normal business or fiduciary relations between parties when one of them failed to provide the partner with the complete information.

The incomplete information in contracts is reflected in such notions as silence, misrepresentation, fraudulent misrepresentation and sometimes even in fraud and mistake. The contracts which arise as the consequences of these concepts are incomplete. It happens because the lack of information causes the contract uncertainty. This uncertainty may be displayed in the terms of the contract which are too vague or in the failure of the parties to specify rights and obligations. In this thesis I focus mostly on the legal approach of England, France and Ukraine, as the representatives of common and civil law legal systems, respectively, with a view to demonstrating the differences and similarities in regulation of the problem of incomplete information in contracts.

With the aim to reduce providing of incomplete information by the parties to a contract and thus, the creation of incomplete contracts, the law of each country prescribes the duty to inform (duty of disclosure). In general, the party with knowledge does not owe the other party a "duty of disclosure."[310] Justice Holmes asserted: "Nowhere is the confusion between legal and moral ideas more manifest than in the law of contract."[311] The common and civil law systems divide over the pre-contractual obligation to provide information.[312] Very generally, civil law

[310] Robert Birmingham, The Duty to Disclose and the Prisoner's Dilemma: Laidlaw v.Organ (William & Mary Law Review, 1988), 254.
[311] Robert Birmingham, Legal and Moral Duty in Game Theory: Common Law Contract and Chinese Analogies (Faculty Articles and Papers, 1969), 110.
[312] Ruth Sefton-Green, Mistake, Fraud and Duties to Inform in European Contract Law (Cambridge University Press, 2005), 24. (See also: P. Legrand, 'Pre-Contractual Disclosure and Information, English and French Law Compared' (1986) 6 OJLS 322; J. Ghestin, The Pre-Contractual Obligation to Disclose Information: French Report', pp. 151 ff. in D. Harris and D. Tallon (eds.), Contract Law Today: Anglo-French Comparisons (Oxford, 1989)).

countries impose a pre-contractual duty to inform more liberally than their common law counterparts.[313] It appears trite to state that the common law does not recognize a general duty of disclosure; on the contrary some would say that it discourages such a principle on the grounds of inter alia economic-based analyses.[314]

> The presence of a duty to provide information can be ascertained first by examining its negative aspect, which is most clearly seen by the differing attitudes towards silence. For example, French law's attitude to silence is that it can be penalized if framed in terms of a fraudulent concealment. Other national laws call this negative fraud. In Dutch law this is framed as a mistake, caused by a breach of the duty to inform. The mere existence of the duty implies that silence is reprehensible. It may even be more accurate to suggest that a positive duty to inform has been inferred from silence. In contrast, the common law's view of silence is that no remedy is available unless a positive statement has been made. Thus, misrepresentation, a common law concept, cuts straight across mistake and the duty to inform. Moreover, misrepresentation cannot be equated to a duty to inform since the duty to tell the truth does not arise at the same point in time. Whereas a duty to inform imposes a positive duty to tell the truth (and sometimes a negative duty not to conceal the truth), misrepresentation does not impose a duty (positive or negative) to make an initial statement. The point of misrepresentation (including conduct, half-truths and active fraudulent concealment) is that when statements are made, they must be truthful.[315]

As a general rule, English law does not recognize the existence of a duty to disclose material facts known to one party but not to the other.[316] As Viscount Maugham stated in Bradford Third Equitable Benefit Building Society v. Borders [1941] 2 All ER 205, 'mere silence, however morally wrong, will not support an action of deceit'.[317] Something more than silence is therefore required in order to constitute a representation of fact.[318] A representation is a statement of fact made by one person to another which influences that other in making a contract with the representer, but which is not necessarily a term of that contract.[319] The statement may be made at or, more often, before the time the contract is made.[320] English law does not require that the representation take the form of words.[321] As Spice Girls demonstrates, the representation can

[313] *Id*, p. 25.
[314] Ruth Sefton-Green, Mistake, Fraud and Duties to Inform in European Contract Law (Cambridge University Press, 2005), 25. (See also: P.B. Rudden, 'Le juste et l'inefficace, pour un non-devoir de renseignement' (1985), RTDCiv, 91 ff).
[315] Ruth Sefton-Green, Mistake, Fraud and Duties to Inform in European Contract Law (Cambridge University Press, 2005), 25.
[316] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 600. (See also: Keatesv. Cadogan (1851) 10 CB 591)
[317] *Id*. (See also: Bradford Third Equitable Benefit Building Society v. Borders [1941] 2 All ER 205)
[318] *Id*.
[319] *Id*.
[320] Michael H. Whincup, Contract Law and Practice: The English System and Continental Comparisons (Kluwer Law International, 2001), 277.
[321] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 600.

be made by conduct or can be inferred from the facts and circumstances of the case.[322]

In Spice Girls Ltd v Aprilia World Service BV1 the defendants agreed to sponsor a Spice Girls tour.[323] The group appeared in promotional material, including a photo-shoot, before the contract was concluded when they knew that one of their number, Geri Halliwell, was about to leave the group.[324] It was held that there had been a misrepresentation by conduct - taking part in the photo-shoot amounted to a statement that the group did not know or believe that a group member would leave before the end of the contract.[325]

In particular, the courts have been willing to find the existence of a misrepresentation in cases where one party has actively sought to conceal a defect in the subject matter of the contract from the other party.[326]

The general rule is that to remain silent does not amount to a misrepresentation - there is no duty to disclose facts which might influence the other party's decision to enter or not to enter the contract.[327] However, there are some exceptions to this rule. These cases do not strictly involve liability for non-disclosure, but are examples of silence combining with other statements or circumstances to create a misrepresentation.[328] Firstly, the cases where there is a partial non-disclosure. A statement that is misleading in that it does not present the whole truth may be regarded as a misrepresentation.[329] Thus in Nottingham Patent Brick and Tile Co v Butler on a sale of land the vendor's solicitor was asked by the purchaser whether the land was subject to any restrictive covenants.[330] The solicitor replied that he was "not aware of any restrictions".[331] However, he did not add that he had not read the relevant documents.[332] Lord Esher M.R. said that the solicitor had led the other party to believe that he was stating ". . . facts within his own knowledge.,. his statements in fact misled them, so that what he said amounts to a mis-statement of fact".[333] It was held that the purchaser was entitled to rescind.[334]

> Secondly, a silence may constitute a misrepresentation in the case of the change of circumstances. In January 1934, the plaintiffs entered into negotiations for the purchase of the defendant's medical practice. Dr O'Flanagan represented that the takings of the practice were J2000 per annum. This statement was true at the time that it was made but, when Dr O'Flanagan subsequently fell seriously ill and a number of locums ran the practice, the takings fell to an average of J5 per week. This

[322] *Id*., p. 600.
[323] Robert Duxbury, Contract Law (Sweet & Maxwell, 2008), 243.
[324] *Id*., p. 243.
[325] *Id*., p. 243.
[326] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 600.
[327] Robert Duxbury, Contract Law (Sweet & Maxwell, 2008), 242.
[328] Janet O'Sullivan and Jonathan Hilliard, The Law of Contract (Oxford University Press, 2016), 225.
[329] Duxbury, p. 244.
[330] *Id*., p. 244.
[331] *Id*., p. 244.
[332] *Id*., p. 244.
[333] *Id*., p. 244.
[334] *Id*., p. 244.

> change in circumstances was not revealed to the plaintiffs before the contract was signed in May 1934. The plaintiffs brought an action for rescission of the agreement. The trial judge refused to set aside the agreement on the basis that the representation was true when it was made and that there was no duty on the defendant to disclose the change in circumstances. The Court of Appeal allowed the plaintiffs' appeal and held that the defendant had made a misrepresentation in failing to reveal the change of circumstances and that, accordingly, the agreement between the parties should be set aside.[335]

Thirdly, a silence in the contracts of the utmost good faith (uberrimae fidei) may lead to the misrepresentation.[336] In this class of contracts, there is a duty to disclose material facts on the basis that one party is in a strong position to know the truth.[337] The leading such example is the contract of insurance where there is a duty on the insured to disclose every circumstance which would influence the judgment of the prudent insurer in fixing the premium or deciding whether they will take the risk.[338] It makes no difference that the applicant for insurance has not been asked about such matters, although insurance companies often use detailed questionnaires which people taking out, e.g. life insurance, have to complete.[339]

The fourth case when a silence may amount to a misrepresentation is the existence of fiduciary relationships.[340] A fiduciary relationship is one where a person has placed confidence in another, such that the latter is bound to exercise their powers in good faith for the benefit of the former.[341] Examples of such relationships include solicitor and client, trustee and beneficiary and partnership.[342] Where such a relationship exists, a duty of full disclosure will arise.[343]

The civil law approach is slightly different from the common law one. For example, French law imposes a pre-contractual obligation to disclose information.[344] It is based on a mixture of statutory (consumer protection by French Civil Code) and case-law intervention, but the courts have been prepared to award damages on the basis of tort responsibility (or "responsabilite delictuelle") for non-disclosure of certain essential and material facts.[345] As it is for misrepresentation, misrepresentation by silence or "omission" in French law makes the contract voidable.[346] Thus the party can ask for rescission of the contract in a situation of

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[335] Ewan McKendrick, Contract law: text, cases, and materials (Oxford University Press, 2008), 602. (See also: With v. O'Flanagan [1936] Ch 575, Court of Appeal).
[336] Duxbury, p. 244.
[337] *Id*., p. 244.
[338] *Id*, p. 245.
[339] *Id*, p. 245.
[340] Duxbury, p. 245.
[341]*Id*., p. 245.
[342] *Id*., p. 245.
[343] *Id*., p. 245.
[344] Florence Caterini, Pre-contractual Obligations in France and the United States (Georgia Law, 2005), 19. (See also: Paula Giliker, Pre-contractual liability in English and French law, 128 (Kluwer Law International, 2002)
[345] *Id*., p. 19.
[346] *Id*., p. 19. (See also: Valerie Toulet, Droit Civil, Obligations Responsabilite Civile, [Civil Law, Obligations Civil

"omission".[347] French law provides that silence is considered as a "dol" and more precisely a "dol negatif" if this silence is fraudulent and the party which has the duty to reveal some elements failed to do so.[348] For example, a "dol negatif" or "reticence dolosive" was recognized in a case where an automobile mechanic kept silent about the fact that an engine was very old.[349] The buyer purchased the automobile with a strong believe that the engine was a new one regarding its mileage.[350] The automobile mechanic modified the mileage of the engine and kept silent about this change.[351] Thus, in cases like this one, courts consider that voluntary silence is in reality lack of good faith.[352] In France, most cases of the pre-contractual liability for the non-disclosure are based on the lack of abidance by a good faith.

A silence may also lead to the mistake, i.e. causing a mistake by (negligently) omitting to inform.[353] Such a foundation exists in Dutch law and gives rise to a remedy in addition to damages since the contract can obviously be annulled on this ground.[354] However, in German law, a mistake which is not about the subject-matter or is not regarded as important in an objective sense is classified as one of motive only and there is no relief.[355] In English law mistake was ‘marginalized’, ‘subordinate’ to the objective principle of formation and ‘almost wiped out’.[356]

With regards to Ukraine, there is no general obligation of duty to disclose all relevant information in Ukrainian legislation. However, there are provisions in the Civil Code of Ukraine which stipulate a duty to disclose particular information in special types of contracts. For example, under the sales contract, the seller is obliged to reveal to the buyer the information of all rights of third parties to the goods being sold (e.g. the right of pledge etc.).[357] If the seller fails to fulfill this requirement, the buyer has the right to demand a reduction in price or termination of the sales contract. Under the Deed of Gift agreement, if the donor is aware of the defects of a gift or its special features which may be dangerous for life, health, property of the Donee or other

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Responsability], 64 (edition centre de publications universitaire 1999)
[347] *Id*., p. 19.
[348] *Id*., p. 19. (See also: Valerie Toulet, Droit Civil, Obligations Responsabilite Civile, [Civil Law, Obligations Civil Responsability], 64 (edition centre de publications universitaire 1999)
[349] Id, p. 20. (See also: Cour de Cassation, Civ. 1re, 19.06.1985, Bull. civ. I, Numero 201, the court indicates that "en s’abstenant d’indiquer [a l’acheteur non specialiste] que le moteur, remonte sur un modele de 1975 annonce comme en parfait etat, datait de 1968").
[350] *Id*, p.20.
[351] *Id*, p. 20.
[352] *Id*, p. 20. (See also: Valerie Toulet, Droit Civil, Obligations Responsabilite Civile, [Civil Law, Obligations Civil Responsability], 64 (edition centre de publications universitaire 1999)
[353] Ruth Sefton-Green, Mistake, Fraud and Duties to Inform in European Contract Law (Cambridge University Press, 2005), 28.
[354] *Id*., p. 28.
[355] Hugh Beale, Mistake and Non-Disclosure of Fact: Models for English Contract Law (Oxford University Press, 2012), 54.
[356] Jonathan Morgan, Great Debates in Contract Law (Palgrave Macmillan, 2015), 9.
[357] Art. 659 (1) of the Civil Code of Ukraine № 435-15 from 16 January 2003, accessed 2018 February 13 http://zakon3.rada.gov.ua/laws/show/435-15

persons, he is obligated to reveal this information to the Donee.[358] If the Donor fails to notify the Donee, he will be obliged to compensate all damages occurred as a result of his silence.

Considered all the above mentioned, the first method which may reduce the incomplete information in contracts is the duty to disclose all relevant information. One more method which is related to the first one is the good faith principle.

In spite of the fact that many legal systems recognize the principle of good faith and that some countries have included this principle in a number of their regulations, no specific definition has yet been given for "good faith".[359] Some argue that good faith is a concept which is seemingly easy, yet difficult to interpret, whereas others believe good faith is a subjective, qualitative, and vague concept which is difficult to define.[360] Accordingly, perhaps the following might serve as a better definition: "Good faith is the honest, fair, and reasonable behavior expected from both parties towards each other as well as towards the third parties related to a contract during the preliminary negotiations, conclusion, execution, and interpretation stages of that contract."[361]

Without defining good faith, Art. 1104 of the French Civil Code stipulates that contracts must be negotiated, formed and performed in good faith.[362] The general assumption in the French legal system is that all contracts are based on good faith.[363] For this reason, by citing the sporadic regulations wherein this principle has been implied, French courts and jurors recognize the principle of good faith and adhere to the results thereof in different cases.[364]

> English law does not currently recognize a universal implied duty on contracting parties to perform their obligations in good faith. English courts have been reluctant to recognize a universal implied duty of good faith other than for certain categories of contract – such as employment and fiduciary relationships. This is in part due to concerns that it could create too much uncertainty – deciding what the actual obligation entails can be vague and subjective. It also goes contrary to freedom of contract – why interfere with a contract where the parties have freely negotiated the terms?[365]

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[358] Art. 721 (1) of the Civil Code of Ukraine № 435-15 from 16 January 2003, accessed 2018 February 13 http://zakon3.rada.gov.ua/laws/show/435-15

[359] Shahram Aryan and Bagher Mirabbasi, The Good Faith Principle and Its Consequences in Pre-Contractual Period: A Comparative Study on English and French Law (Journal of Politics and Law, 2016), 232.

[360] *Id*, p. 233. (See also: Ansari, A. (2009). Theory of Good Faith in Contracts. Tehran: Jangal Publications)

[361] *Id*, p. 233.

[362] Art. 1104 of the French Civil Code 1804 (amended by Ordonnance n° 2016-131 of 10 February 2016), accessed 2018 February 13 https://www.trans-lex.org/601101/_/french-civil-code-2016/.

[363] Shahram Aryan and Bagher Mirabbasi, The Good Faith Principle and Its Consequences in Pre-Contractual Period: A Comparative Study on English and French Law (Journal of Politics and Law, 2016), 233. (See also Dietrich, J. (2001). Classifying pre-contractual liability: A comparative analysis. Legal studies, 21, 153)

[364] *Id*., p. 233.

[365] Mayer and Brown Law Firm, Good faith – is there a new implied duty in English contract law? (The Mayer Brown Practices, 2013), 1.

In a recent case, the court said a duty of good faith could be implied into a contract but only as a term in fact, based on the presumed intention of the parties.[366] Instead, on the facts, the court implied a term that the parties would not act dishonestly in the provision of information.[367]

> Under English law, there is no generally applicable definition of "good faith" in performing contracts. Examples of different interpretations by the courts include: faithfulness to an agreed common purpose, acting within the spirit of the contract, observing reasonable commercial standards of fair dealing and acting consistently with the justified expectations of the parties. In a recent case, the Court of Appeal found an express obligation to co-operate in good faith meant the parties would work together honestly endeavoring to achieve the stated purposes expressly linked to the duty.[368]

Under the Ukrainian law, there is a presumption of good faith in civil law. Article 3 of the Civil Code of Ukraine[369] states that the good faith principle (often referred to the honesty principle) is one of the general principles of civil law. Article 509[370] states that the relations between the creditor and debtor should be based on the principle of good faith. However, there is an interesting situation with the Article 627. Under this Article, the parties are free to enter into an agreement, choose counterparty and determine the terms of the contract, taking into account the requirements of this Code, other civil law acts, business practices, and requirements of reasonableness and fairness.[371] The Article requires parties who want to enter into a contract to act in a good faith but indirectly - through the "taking into account the requirements of this Code". However, there is no an obligation to conclude and perform a contract in a good faith. Thus, I may conclude that this provision should be improved including the obligation to conclude and perform a contract in a good faith.

The good faith principle is a moral and ethical category, which is evaluative in civil law; it combines the objective element - the requirement of certain behavior of the subject of legal relations, which is provided by specific legal rules, and the subjective element, which is related to the actions of the subject of the legal relations, which have to meet such criteria as honesty, truthfulness, respect to the rights of other persons, unconditional fulfillment of their obligations and internal understanding of the need of certain behavior.[372] The meaning of the principle of

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[366] *Id*., p. 1.
[367] *Id*., p. 1.
[368] *Id*., p. 1.
[369] Art. 3 (1 (6)) of the Civil Code of Ukraine № 435-15 from 16 January 2003, accessed 2018 February 13 http://zakon3.rada.gov.ua/laws/show/435-15
[370] *Id*, Article 509.
[371] *Id*, Article 627.
[372] Nadiia Chubokha, Honesty as a Civil Law principle in Ukraine (Porivnialno-analitychne pravo, 2013), 174;(See also: Julia Aleksashyna, The realization of the principles of good faith, equity, reasonableness in the contract regulation of civil relationships (Yurydychna Ukraina, 2012); Olga Bakalinska, The principle of good faith in the Civil Law of Ukraine (Scientific Journal "Chronicles of KUL",2011)).

good faith is still debatable in Ukraine. It applies not just to the contract relations, but rather to the whole spectrum of the civil ones. After the analysis of the Ukrainian legislation, I can summarize that there is a necessity to improve the definition of the good faith principle as well as its application in contract law sphere.

3.5. Conclusion

The term "incomplete information" is used in two quite different senses in the literature. Firstly, this term covers all the situations where at least one player doesn't possess at least one piece of information regarding the game he is playing in. From this point of view, the incomplete information includes different types: perfect/imperfect information structure; complete/incomplete information structure and symmetric/asymmetric information structure. Secondly, the term "incomplete information" is referred to the situation when Nature moves first and is unobserved by at least one of the players.

In the games of imperfect information, at least one player must make at least one move without having observed what some other player has done. In the games of incomplete information, one player is uncertain about the preferences of the other player (about the type of the other player). In the games of asymmetric information, one of the parties has private information and therefore, obtains an information advantage.

These types of incomplete information are referred to the following legal concepts: silence, misrepresentation and sometimes even fraud and mistake. The incomplete information creates incomplete contracts. Thus, the parties to such a contract, in general, have no possibility to enforce the contract. Moreover, it is very difficult to continue normal business or fiduciary relations between the parties when one of them fails to provide the partner with the complete information.

After the careful consideration and analysis of the legislation of England, France and Ukraine I may conclude that there are four main legal tools which may be used with a view to resolving the problem of incomplete information and consequently, to reduce the possibility of the creation of incomplete contracts. They are the default rules, the renegotiation of a contract, the recognition of a good faith principle and the recognition of a duty of disclosure doctrine. However, the research shows the difference in the application of these methods. Particularly, common law countries do not recognize the good faith principle and the duty of disclosure doctrine. This creates the impossibility to enforce the contract under English law. This is a problem because a lot of contracts are concluded under the English law nowadays. Contrary to the common law approach, civil law countries do recognize the good faith principle and the duty of disclosure doctrine. However, they do not have a common definition of a good faith.

Moreover, the obligation to act in a good faith with regards to contract relations is not specified enough in Ukrainian legislation.

CONCLUSIONS

1. On grounds of analysis of academic literature and works of various economic and legal scholars, it is possible to summarize that there is an absence of common regulation concerning the incomplete information which creates incomplete contracts. The economic and legal scholars provide different reasons for the contract incompleteness. Taking into account all opinions and suggestions I have pointed out the main reason of the contract incompleteness: the existence of incomplete information. The incomplete information creates a contract uncertainty. Thus, the parties to such a contract, in general, have no possibility to enforce it. Moreover, it is very difficult to continue normal business or fiduciary relations between the parties when one of them fails to provide the partner with the complete information. Consequently, the problem of incomplete information creates the problem of incomplete contracts.

2. Taking into consideration the fact that the problems of incomplete information and incomplete contracts are closely related to the economy, the Game Theory made its contribution to the development of the methods of resolving these problems. Particularly, the game theorists developed the concept of the residual control rights which may be used as one of the legal tools in order to resolve the problem of incomplete information. The concept prescribes that all the rights that are not included in the contract belong to the party, who will be considered as an owner of a particular asset. However, it is a theoretical concept which is not covered by the law; thus, the parties can't rely on it at the time of litigation. Consequently, there is a need to include the notion of the residual control rights into the contract or civil legislation of each country

The Game theory also expands the understanding of incomplete information and reveals different types of it. Particularly, the incomplete information in a broader sense takes three different forms: imperfect information (when at least one party must make at least one move without having observed what some other party has done), incomplete information in a narrow sense (when one party is uncertain about the preferences of the other one (about the type of the other player)), and asymmetric information (when one of the parties has private information and therefore, obtains an information advantage).

3. On the basis of comparative analysis of national contract and civil legislation and case law of England and France have been outlined the differences in the application of methods which are used with the aim to reduce an incomplete information and thus, to avoid the creation of incomplete contracts. There are two methods which are identically used by civil law and common law countries: the default rules and the renegotiation of a contract. However, there are methods the application of which differs in different legal systems. In France, there is recognition of the good faith principle. The French Civil Code stipulates that contracts must be

negotiated, formed and performed in good faith. Thus, there is an obligation of the parties to act in a good faith. If the party to a contract is in breach of this principle, she may be held liable. The French contract and civil law also recognize the duty of disclosure (duty to inform). There is a pre-contractual liability for the party who fails to reveal all necessary information to the other party at the stage of the negotiations. If the party breaches this duty, the contract will be annulled.

In Ukraine, the good faith principle is one of the general principles of civil law. This principle is widely used. It happens because there is no general and exact definition of the good faith in Ukrainian legislation. However, the laws of Ukraine do not stipulate directly an obligation of the parties to act in a good faith in contract relations. The absence of the provision causes uncertainty in the application of this principle. With regards to the duty of disclosure doctrine, there is no general rule which prescribes the obligation of the contracting parties to reveal the information. Nonetheless, the Civil Code of Ukraine contains a few provisions which are devoted to the duty to disclose particular information in special types of contracts. Thus, there is a necessity to recognize and to apply the good faith principle to all contracts.

In England, there is no recognition of the good faith principle. There are judges who pointed in a few English cases that the UK is not ready to accept the doctrine in full. The parties may use this principle as a contract term, but there is no recognition of it at the state level. There is no responsibility for the party who breaches the good faith principle unless she acts in a bad faith. The English contract law and case law also do not recognize the duty of disclosure (duty to inform). In general, there is no pre-contractual liability for the party who fails to reveal all necessary information to the other party. There are a few cases when the person is obliged to reveal the information (e.g. insurance contracts) otherwise, the contract will be annulled.

4. Results of analysis of a concept of incomplete information as the main reason for the creation of incomplete contracts and possible legal tools of the problem's regulation allowed me to point out main disadvantages of the existing methods and reasons for the contract incompleteness. The lack of recognition of the duty to disclose information and the good faith principle in the common law countries, and particularly, in the UK, enhances the contract incompleteness. The lack of common understanding of the good faith principles and its application to contract relations in the civil law countries leaves contracts incomplete. Consequently, a contract may be deemed annulled from the time of its conclusion. Thus, there is a need to improve the existing tools and to implement the method of the residual control rights into the legislation of England, France and Ukraine.

RECOMMENDATIONS

1. It is recommended to recognize the doctrine of good faith at the state level and to include into the UK legislation the obligation of the parties to a contract to act in a good faith. Particularly, the following laws should be updated with this kind of provision "the contracts must be negotiated, formed and performed in good faith": the UK Sale of Goods Act 1979, the UK Consumer Rights Act 2015 and the UK Supply of Goods and Services Act 1982. An absence of recognition of the good faith leaves space for individual interpretation and application of this principle that strengthens contract incompleteness. The recognition of the good faith principle will promote the parties to reveal the information and thus, will reduce the number of incomplete contracts caused by this reason.

2. It is recommended to recognize the duty of disclosure and to include into the UK legislation the obligation of the parties to a contract to disclose all the relevant information. Particularly, the following laws should be updated with this kind of provision "the party to a contract is obliged to reveal all the available information which may influence the other party's intention to conclude a contract": the UK Sale of Goods Act 1979, the UK Consumer Rights Act 2015 and the UK Supply of Goods and Services Act 1982. An absence of recognition of the duty of disclosure leads to the conclusion of the incomplete contracts on the basis of incomplete information. The recognition of this duty will promote the parties to disclose the information and thus, will reduce the number of incomplete contracts caused by this reason.

3. It is recommended to include into the contract or civil legislation of each country the provision which will specify the obligation of the contracting parties to use the concept of the residual control rights in each contract. The provision concerning the residual control rights may be written in contracts as follows: "the residual control rights under the current contract belong to (the name of the person). The residual control rights are all the rights which are not specified in this contract and allow the party to complete the definition of the current contract in the case of change of circumstances or parties' disagreement". The existence of this provision will allow parties to complete the terms of a contract initially incomplete without being engaged in the litigation and without any additional costs.

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ANNOTATION IN ENGLISH LANGUAGE

The main problem raised in this master thesis is the following one - how incomplete information creates incomplete contracts? In this research, it is outlined main elements of the Game theory and its application to the legal cases, clarified the notions of incomplete contracts and incomplete information, analyzed types of incomplete information and showed its interrelation with the legal concepts. The author also examines reasons for the creation of incomplete contracts and underlines one of the main grounds - the existence of incomplete information. Comparative analysis of English, French and Ukrainian contract and civil legislation is made with a view to defining the methods which are used for resolving the problem of incomplete information and their different application in common and civil law countries. In the final chapter, the author outlines main types of incomplete information, explains how it creates incomplete contracts and shows possible methods to resolve this problem.

ANNOTATION IN LITHUANIAN LANGUAGE

Pagrindinė magistro darbe iškilusi problema yra tokia: kaip nepilna informacija sukuria neužbaigtas sutartis? Šiame tyrime išdėstyti pagrindiniai Žaidimų teorijos elementai, jų taikymas teisminėse bylose, paaiškintos sąvokos "nebaigtos sutartys" ir “neužbaigta informacija”, išnagrinėti neužbaigtos informacijos tipai ir atskleista jų sąsają su teisinėmis sąvokomis. Autorius taip pat nagrinėja priežastis, dėl kurių sudaromos nebaigtos sutartys, ir pabrėžia vieną iš pagrindinių priežasčių - netikslios informacijos egzistavimas. Lyginamoji anglų, prancūzų ir ukrainiečių sutarčių ir civilinės teisės analizė pateikiama siekiant nustatyti metodus, kurie naudojami išspręsti nepilnos informacijos problemą ir jų skirtingą taikymą bendrosios ir civilinės teisės šalyse. Paskutiniame skyriuje autorius apibūdina pagrindines nepilnos informacijos rūšis, paaiškina, kaip tai sukuria neužbaigtas sutartis, ir nurodo galimus šios problemos sprendimo metodus.

SUMMARY IN ENGLISH LANGUAGE
GAME THEORY AND CONTRACT LAW

In this master thesis examined theoretical concepts and proposed practical recommendations regarding methods which may be used with the aim to eliminate the incomplete information as the main reason for the creation of incomplete contracts.

Pointed out three main reasons for the creation of incomplete contracts: the uncertainty in the contract terms; the failure in specifying rights and obligations for all future states of the world; and the existence of incomplete information in contracts. It was outlined main types of incomplete information in a broader sense: imperfect information structure (when at least one party must make at least one move without having observed what some other party has done); incomplete information structure (when one party is uncertain about the preferences of the other one (about the type of the other player)); asymmetric information structure (when one of the parties has private information and therefore, obtains an information advantage). These types of incomplete information were transformed into the legal concepts such as silence, misrepresentation, fraud, and mistake. On the basis of theoretical and practical analysis detected an absence of unitary application of legal methods which may be used with a view to eliminating incomplete information in contracts. From the perspective of these positions made a comparative analysis and emphasized differences in interpretation and application of the legal methods in England, France and Ukraine.

Justified the legal tools which are used with the aim of eliminating incomplete information in contracts: the renegotiation of a contract, the default rules, litigation, the duty of disclosure, and the good faith principle. Formulated and proposed recommendations regarding the common application of these legal methods by civil and common law countries. The following recommendations have been formulated: to recognize the doctrine of good faith at the state level and to include into the UK legislation the obligation of the parties to a contract to act in a good faith; to recognize the duty of disclosure and to include into the UK legislation the obligation of the parties to a contract to disclose all the relevant information; to include the provision which will specify the party who is the owner of the residual control rights into each contract.

Key words: *incomplete information; incomplete contracts; the duty of disclosure; the good faith; the residual control rights; silence; misrepresentation; asymmetric information.*

SUMMARY IN LITHUANIAN LANGUAGE

ŽAIDIMŲ (LOŠIMŲ) TEORIJA IR SUTARČIŲ TEISĖ

Šiame magistro darbe nagrinėjamos teorinės koncepcijos ir siūlomos praktinės rekomendacijos dėl metodų, kurie gali būti naudojami siekiant pašalinti nepilną informaciją kaip pagrindinę nebaigtų sutarčių sudarymo priežastį.

Išdėstytos trys pagrindinės nepilnų sutarčių sudarymo priežastys: sutarties sąlygų neapibrėžtumas; nesugebėjimas nustatyti teisių ir pareigų visoms būsimoms pasaulio valstybėms; ir sutartyse esančios nepilnos informacijos buvimas. Buvo apibūdinti pagrindiniai neužbaigtos informacijos tipai plačiąja prasme: netobula informacijos struktūra (kai bent viena šalis turi atlikti bent vieną veiksmą, nepastebėjus, ką padarė kita šalis); Neišsami informacijos struktūra (kai viena šalis nesupranta kitos šalies pageidavimų (apie kito žaidėjo rūšį)); asimetrinė informacijos struktūra (kai viena iš šalių turi privačią informaciją ir todėl įgauna informacijos pranašumą). Šios nepilnos informacijos rūšys buvo pakeistos į tokias teisines sąvokas kaip tyla, klaidinga informacija, sukčiavimas ir klaida. Remiantis teorine ir praktine analize nustatyta, kad nėra vieningo teisinių metodų taikymo, kurie gali būti naudojami siekiant pašalinti neužbaigtą informaciją sutartyse. Iš šių pozicijų perspektyvos parengta lyginamoji analizė ir pabrėžta teisinių metodų interpretavimo ir taikymo skirtumai Anglijoje, Prancūzijoje ir Ukrainoje.

Išaiškintos teisinės priemonės, naudojamos siekiant pašalinti netikslią informaciją sutartyse: derybos dėl sutarties, numatytos taisyklės, teismo procesas, atskleidimo pareiga ir sąžiningumo principas. Parengtos ir siūlomos rekomendacijos dėl šių teisinių metodų bendro taikymo civilinėse ir bendrosios teisės šalyse. Buvo suformuluotos tokios rekomendacijos: pripažinti sąžiningumo doktriną valstybės lygmeniu ir į JK teisės aktus įtraukti sutarties šalių pareigą veikti sąžiningai; pripažinti atskleidimo pareigą ir į JK teisės aktus įtraukti sutarties šalių įsipareigojimą atskleisti visą svarbią informaciją; įtraukti nuostatą, pagal kurią kiekviena sutartis nurodo šalį, kuri yra likusių kontrolės teisių savininkė.

Raktiniai žodžiai: *neišsami informacija; nepilnos sutartys; atskleidimo pareiga; sąžiningumas; likusios kontrolės teisės; tyla; klaidinga informacija; asimetrinė informacija.*

HONESTY DECLARATION

14/05/2018

Vilnius

I, **Marharyta Tolmach**, student of

Mykolas Romeris University (hereinafter referred to University), Faculty of Law, European and International Business Law,

confirm that the Master thesis titled

"Game theory and Contract Law"

1. Is carried out independently and honestly;
2. Was not presented and defended in another educational institution in Lithuania or abroad;

3. Was written in respect of the academic integrity and after becoming acquainted with methodological guidelines for thesis preparation.

I am informed of the fact that student can be expelled from the University for the breach of the fair competition principle, plagiarism, corresponding to the breach of the academic ethics.

Marharyta Tolmach