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CONTENTS

FROM THE SCIENTIFIC COUNCIL

Ladies and Gentlemen,

We present you with the seventh edition of the 'Journal of Management and Financial Sciences'. We hope that these articles will present a contribution to the development of economic thought and contribute to a fuller understanding of the complex economic issues. We wish you pleasant reading.

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On Constructive Methods for Equilibrium Modelling on Dynamic Oligopolistic Markets under Uncertainty

1. Introduction

The observation of industrial sector segments shows their strong dynamics. Companies enter and exit the market, undertake long-term investments and compete against each other in prices, product quality and production levels. Selected entities develop and increase the size of their production, whereas others decide to maintain their small scale businesses. Some firms develop rapidly to achieve a dominant position on the market, while others cannot cope with the competition and are forced to terminate their activity. The companies which have collapsed are replaced by new ones, which after some time cede their position to their successors. Corporate activity seems to be doomed to unstoppable change driven by the competition between companies as well as the technological shocks to affect them.

At the beginning of the analysis of industrial sector segments it is worth answering several related questions.

1. Does the size of the company have any impact on its success and growth dynamics? If so, which companies grow faster: small of large ones? Which of them are more resistant to exogenous shocks hitting their businesses, which of them are more easily adjustable to market changes?

2. In which way can idiosyncratic uncertainty of entities affect their decisions with reference to the level of production, prices and investment? Are companies inclined to incur short-term losses in order to better familiarise themselves with the market and the effectiveness of other players; do they leave the market the moment the first negative phenomenon occurs?

3. Is the success determined by the whole course of corporate activity from the market entry or perhaps only the current events are decisive?

4. In which way is the market equilibrium created? Is it static, determined by a group of the most effective companies; or is it necessary to determine it

in a dynamic framework allowing for analysis of the segment/sector subject to constant changes, in which companies can freely enter and leave the market? Does the equilibrium depend on the individual strategy of players or on the current state of the market?

5. Why do some markets show a high asymmetry of their structures in which some entities may acquire the status of a leader on a permanent basis, while in others tough competition makes the determination of a dominant company impossible? To what extent do companies achieve the leading position in the sector through endogenous interactions among competitors, and to what extent is the market structure determined in an exogenous way through stochastically determined shocks?

6. And eventually: in which way do government policies and legal regulations affect the dynamics of oligopolistic markets?

Economic literature has tried to answer the aforementioned questions for few recent decades. One of the first studies formally analysing market was an article written by Jovanovic[1]. The author of the paper, as well as the references therein, indicate that smaller firms (present on the market for a shorter term) develop faster than large companies (present on the market for a longer term); however in their case there is a much higher chance of failure than in the case of large companies. According to Jovanovic, the key issue is not the size of the company but the ability to precisely define its individual effectiveness. As companies learn this when they are present on the market, the entities that do business longer have a better insight into their own activity and have consequently a better chance to survive.

The empirical research conducted by Ericson and Pakes[2] undermined the results achieved by Jovanovic. While analysing a large group of companies in the sector of retail sales and manufacturing, they discovered that not in every case companies with a larger and longer experience had a better chance of survival. Apparently, following the suggestions made by Jovanovic, the learning processes were of key significance in the case of retail sales, where one could not deny the interdependence between the length of market experience and the business entity success. However, within the manufacturing sector the current short-term history was more significant on results. It would indicate that the Markov structure of interactions on the market, in which the corporate decisions/strategies and equilibria depend only on the current state variable, is more suitable for the analysis of manufacturing market analysed by Ericson and Pakes, than in the

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[1]   B. Jovanovic, Selection and the Evolution of Industry, "Econometrica", Vol. 50(3), 1982, pp. 649–670.
[2]   R. Ericson, A. Pakes, Markov-Perfect Industry Dynamics: A Framework for Empirical Work, "Review of Economic Studies", 62(1), 1995, pp. 53–82.

case of retail sales, where the whole history of interactions on the market affects the success of entities (compare also with the Amir and Lambson analysis[3]).

A considerable significance of information asymmetry and learning processes are mentioned by other authors researching the problem. Ericson and Pakes[4] point to the considerable impact of individual shocks exerted on the endogenous heterogeneity of market entities. Furthermore, Hopenhayn[5] indicates the importance of shocks for the macroeconomic situation in the economy, in which the dynamics of individual corporate sectors affects both other sectors and the labour market.

This issue is connected with the structure stability of economic sectors, varied in individual cases. As indicated by Mueller[6], after World War II within 44% of the sectors in the American economy, on the average for 20 years the position of business leaders, possessing about 60% of the market share, was intact. The literature mentions both endogenous and exogenous causes of structure stability. Studies conducted by Saloner[7], Maggi[8], or Reynolds and Wilson[9] point to the issue of the accumulation of production capacity in the dynamic game of companies which are *ex ante* identical. Their models point to their strategic interactions when determining the position of every entity, but do not present a satisfactory explanation of the long-term stability of dominating companies. Firstly, it results from the fact that these authors fail to focus in their studies on the volatility of the environment in which the game takes place. Which means that the equilibrium, once achieved, remains unchanged as there are no exogenous factors to make the entities change their strategy. Thus, it is not known if in the dynamically changing environment (for instance through the stochastic shocks), it is possible to achieve the same high model stability.

Introducing to the model of production capacities depreciation, Besanko i Doraszelski[10] claim that depending on how companies compete between each

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[3] R. Amir, V. E. Lambson, Entry, exit, and imperfect competition in the long run, "Journal of Economic Theory", 110(1), 2003, pp. 191–203 and R. Amir, V. E. Lambson, Imperfect competition, integer constraints and industry dynamics, "International Journal of Industrial Organization", 25(2), 2007, pp. 261–274.

[4] *Op. cit.*

[5] H. Hopenhayn, Entry, Exit, and Firm Dynamics in Long Run Equilibrium, "Econometrica", 60(5), 1992, pp. 1127–1150.

[6] D. Mueller, Profits in the long run, Cambridge University Press, Cambridge Massachusetts, 1986.

[7] G. Saloner, Cournot duopoly with two production periods, "Journal of Economic Theory", 42 (1), 1987, pp. 183–187.

[8] G. Maggi, Endogenous leadership in a new market, "RAND Journal of Economics", 27 (4), 1996, pp. 641–659.

[9] S. Reynolds, B. Wilson, Bertrand–Edgeworth competition, demand uncertainty, and asymmetric outcomes, "Journal of Economic Theory", 92, 2000, pp. 122–141.

[10] D. Besanko, U. Doraszelski, Capacity dynamics and endogenous asymmetries in firm size, "RAND Journal of Economics", 35 (1), 2004, pp. 23–49.

other (in prices or production levels), the market structure may be different. In the case of competition of the Cournot type, the market aims at a uniform structure, in which companies do not use their full production capacities treating them as a buffer in the case of strong rises in demand. On the other hand, in the case of price competition markets tend to meet in asymmetric structures, in which one leader can be distinguished. Furthermore, as long as companies have similar characteristics, they tend to invest excessively in order to deter other companies from entering. As a result, there may appear a structure with entities of similar effectiveness levels and very high production capacities, which, to a large extent, are not used on account of too small demand. Furthermore, the higher the depreciation of conducted investments, the stronger the effect.

The empirical analysis of the impact of policies on the dynamics of oligopolistic markets was conducted, citing some, by Gowrisankaran and Town[11] or Ryan[12], with the application of tools presented by Ericson and Pakes. The results of their work were interesting as they proved that decisions about the entry, exit and investment level may be determined in such a way after the introduction of policy that they will not achieve the goal set by the decision makers, conversely in some cases the situation after the introduction of changes may become worse than the initial situation.

In conclusion, in order to precisely answer theoretically the questions asked at the beginning of the article, it seems to be necessary to create a dynamic stochastic model of the heterogenic corporate market whose analysis will outline the ongoing processes within the discussed problem. The aim of this paper is to present several basic approaches to dynamic equilibrium modelling on the oligopolistic market with entry/exit and investment undertaken by companies under uncertainty, as well as to present results within the literature concerned with the issue. The study is concerned, mainly, with the technical aspects of the discussed models rather than the concrete empirical implications resulting from them.

The modelling of the issue of dynamic competition on oligopolistic markets is related to two major problems. First, as it is the case with every issue of economic modelling based on equilibrium approach, it is crucial to define the equilibrium and the setting of necessary, sufficient conditions to allow for the equilibrium, which is the object of primary interest. Formally, the behaviour of companies on the market is modelled as a stochastic game with a finite number

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[11] G. Gowrisankaran, R. Town, Dynamic equilibrium in the hospital industry, "Journal of Economics and Management Strategy", 6 (1), 1997, pp. 45–74.

[12] S. Ryan, The costs of environmental regulation in a concentrated industry, Duke University, Durham, mimeo, 2005.

of players and states[13], so the issue of equilibrium determination on the market leads the Nash equilibrium of stochastic game on the space of strategy suitable for the modelled corporate behaviour. Apart from the equilibrium perceived in this way, from the empirical perspective what seems to be important is the issue of the existence and parameterisation of invariant distribution generated by the model dynamics.

The other problem within the modelling of the discussed phenomena is connected directly with practical issues and the opportunity to use the tools created for the numerical and empirical analysis of changes made in different segments of the corporate sector. As indicated by the authors themselves (Ericson and Pakes) in one of the first articles referring to the formal modelling of dynamic equilibria on oligopolistic markets, one cannot be sure of the convergence of the proposed numerical algorithm which is to calculate equilibrium. Besides, even if such convergence exists, due to excessive calculation complexity, it may be used to empirically analyse only the simplest markets. More importantly, the calculation complexity of the aforementioned model occurs despite the imposed limitations of interaction of the entities which were meant to simplify it. The discussed problem of numerical equilibrium calculation is connected with the so-called non-constructiveness of the proof of equilibrium existence, and refers also to many studies published after Ericson and Pakes's article.

There are a few papers aimed at the further simplification of the Ericson and Pakes model and the reduction in the calculation complexity of the problem[14]. These studies, as a rule, attempted to simplify the definition of equilibrium used in the model so as to minimise the number of operations to be made by the introduced algorithm in order to determine the solution. It includes both the study by Weintraub, Benkard and Van Roy[15], who introduced the so-called oblivious equilibria and studies by Doraszelski and Satterthwait[16] focusing on symmetric equilibria.

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[13] Cf. L. Shapley, Stochastic games, Proceedings of the National Academy of Sciences of the USA, 39, 1953, pp. 1095–1100 and A. Neyman, S. Sorin (ed.), Stochastic games and applications, NATO Advanced Science Institutes Series D, Behavioural and Social Sciences, Kluwer Academin Press, Boston, 2003.

[14] Cf. U. Doraszelski, K. Judd, Avoiding the Curse of Dimensionality in Dynamic Stochastic Games, NBER Technical Working Papers No. 0304, 2006; U. Doraszelski, A. Pakes, A Framework for Applied Dynamic Analysis in IO, in: Handbook of Industrial Organization, Vol. 3, (ed. M. Armstrong, R. Porter), North-Holland Amsterdam, 2007, pp. 1887–1966; G. Y. Weintraub, C. L. Benkard, B. Van Roy, Markov Perfect Industry Dynamics With Many Firms, "Econometrica", 76(6), 2008, pp. 1375–1411; U. Doraszelski, M. Satterthwaite, Foundations of Markov-Perfect Industry Dynamics: Existence, Purification, and Multiplicity, Harvard University, mimeo, 2007; U. Doraszelski, M. Satterthwaite, Computable Markov-Perfect Industry Dynamics, "RAND Journal of Economics", 41 (2), 2010, pp. 215–243.

[15] *Op. cit.*

[16] *Op. cit*.

The rest of the article is organised as follows. Chapter 2 presents the economic problem together with the major issues connected with the modelling of this kind of economic phenomena. Part 3 focuses on modelling of dynamic equilibria on oligopolistic markets defined through decisions or strategies, for games with the finite number of players. Chapter 4 characterises in detail numerical properties of methods of equilibrium calculation on the markets presented in Chapter 3. Eventually, Chapter 5 presents a different literature area in which equilibria on large markets (i.e. with a continuum of players) are defined by probability distributions. The study concludes with a summary to indicate the future research areas and selected thematic literature.

2. An economic problem

The literature on modelling dynamic, stochastic oligopolistic markets presents relatively uniform approach to the problem. Despite numerous differences between the studies completed by different authors, it is possible to distinguish several key characteristic features typical of a large part of the literature.

In the decisive majority of cases the discussed problem is analysed in partial equilibrium. The standard model of a dynamic oligopolistic market describes interactions between companies maximising future, expected and discounted profits under the conditions of individual risk. Every company may be characterised by a parameter determining its productivity. In every period it is drawn from the known distribution determined by the investments made by the entity. Depending on the model, companies may be treated as price takers[17] or they may strategically set the production and price levels[18].

The company possessing information on its productivity, knowing also the distribution of the effectiveness of the remaining companies, makes a decision on investment in technology or possible market exit, on the basis of the expectation of future profit. In the case of market exit, the company incurs one-time costs (some authors indicate that companies could recover some scrap value after having finished their business activity; however, this does not affect the major results of the analysis). Additionally, there are companies ready to enter the market when their expected profit from future activity reaches the threshold value, with the assumed cost necessary to launch production. Like companies operating on the market, entities beginning their activity know their productivity with the accuracy of probability distribution. In order to define its position on

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[17] Cf. Jovanovic, *op. cit.*, and Hopenhayn, *op. cit.*
[18] Amir and Lambson, *op. cit.* or Doraszelski and Satterthwaite, *op. cit.*

the market, the company has to incur the cost of entry and wait for one period in order to decide, based on the drawn state variable, on its further presence on the selected market.

A decisive majority of models found in the literature focuses on anonymous games. Only a few studies rescind this assumption[19]. This refer to, not only the so called "large games" which make an assumption of an infinite number of players[20], but also the case of the finite number of players. This, in turn, that when making decisions entities do not consider types and individual player's decisions but their distribution. Anonymity means that companies are only interested in the number of entities possessing a given type and playing a definite strategy rather than assigning them to specific units. Technically, it consists in the introduction of symmetry in relation to the strategy of other players to the goal function of players, as a result of which their payoffs are constant for any vector permutation of decisions made by the remaining entities. Due to this operation in every period, state variables may be determined through measures counting the number of companies assigned to a given type without the necessity of tracking the decision made by individual entities**.**

Apart from a few studies contained within the literature available, equilibria in games characterised in such a way are based on the idea of the Markov stationary (non-strategic) decision rules or (strategic) Markov equilibria, in which every entity deciding about the entry/exit and the scale of undertaken investment, maximises their profits with state variables drawn at the beginning of every period. The motivation to use the concept of the Markov stationary decisions/equilibria is their usefulness in conducting simulation and econometric empirical research as well as a number of properties simplifying the analysis from the technical point of view. As indicated by Maskin, Tirole[21], through the Markov stationary equilibria we can replicate a large class of allocations in the subgame perfect Nash equilibria. The equilibria may be determined by decision rules/strategies of the companies, with which expectations of future states are compliant with the real probability of their occurrence, or through invariant probability distributions reflecting the stationary market structure. Only a few studies defined equilibria by means of non-Markovian[22] subgame perfect Nash equlibria.

For economists, the major point of interest was the determination of necessary and sufficient conditions for the existence of equlibrium in the discussed

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[19] Cf. Amir, Lambson, *op. cit.*

[20] The issue of oligopolistic markets with infinite number of entities was presented in Chapter 5.

[21] E. Maskin, J. Tirole, Markov Perfect Equilibrium: I. Observable Actions, "Journal of Economic Theory", 100(2), 2001, pp. 191–219.

[22] Thus, decisions in period T depend on the implementation of the whole history of interaction.

models as well as their characteristics with reference to optimality and dependence on the parameters. The application of the models in empirical research also enjoyed an extensive interest.

3. The modelling of dynamic equilibria on oligopolistic markets

3.1. Market analysis through the Markovian decision rules

The first studies in the area of dynamic oligopolistic markets[23] focused on the analysis of models with infinite (actually continuum) number of entities acting on the principles of perfect competition, not observing their direct impact on the behaviour of other entities. Simultaneously, equilibria were defined through invariant probability distributions determining the structure of companies acting on the market.

From the theoretical point of view, the aforementioned specification possesses many properties which allow for the determination of equilibrium with relatively poor assumptions. The analysis of the continuous space of players and world states as well as the elimination of strategic interaction of companies make functions of optimal policies of corporate entry/exit continuous (or multivalued mappings of policies have a continuous selection), thus, it is possible to explicitly determine equilibrium in which the measure of companies active on the market is constant (i.e. invariant).

While the analysis of equilibria defined through distributions of players is useful to prove the existence of equilibrium, it is hardly useful from the empirical perspective.

Firstly, corporate sectors are characterised by the finite number of entities. This means that even if we allow for a certain discretisation so that the number of companies would correspond to the actual number on the market, we omit certain aspects connected with strategic corporate interactions, which in the case of a small number of companies on the market may considerably affect the state of the market. Additionally, earlier empirical analysis focused on the market structure in which entities were anonymous, and companies defined their decisions depending on the state of the market and not the behaviour of individual players. From the empirical point of view, what is important is not only the structure (distribution) of companies on the market and their decisions but also the information about the behaviour of concrete entities.

The aforementioned limitations of theoretical analysis lead to the search for a tool allowing for the empirical research of oligopolistic markets, looking at

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[23] Cf. Jovanovic, *op. cit.*, and Hopenhayn, *op. cit.*

the corporate behaviour from the perspective of tools in the area of theory of dynamic games and defining the market equilibrium through equilibria based on strategies undertaken by the players.

One of the first, and at the same time most important work in the field of empirical analysis of dynamic oligopolistic markets was presented by Ericson and Pakes[24]. They analyse a market model in which there is a finite number of entities, each of which makes decisions concerning entry and exit under the conditions of individual uncertainty. Like in the whole line of presented literature, entities determining levels of their investments as well as entry and exit policies, strive to maximise their future discounted profits, with incomplete information about individual effectiveness.

Unlike previous studies conducted by Jovanovich and Hopenhayn, Ericson and Pakes they analyse (Markov) equilibria defined by means of company decisions depending only on the current market structure and company effectiveness, which are treated as state variables. Thus, their work departs from the analysis of company distributions focusing on decisions taken by every entity, and the only conditions imposed on transition probabilities in the equilibrium concern the so called expectations consistency, i.e. the condition in which the expected transition probability between any two states must be equal to the actual transition probability to a new market structure, affected by the investments made by other companies. Additionally, the literature is abounding in extensions of the Ericson and Pakes model in the area of intertemporal competition structure and transition probability between state variables[25]. Let us note that the discussed extensions/changes are dictated by the model adjustment to the analysis of a specific market as well as the technical features of these models or eventually the numerical properties of algorithms calculating equilibria.

The work completed by Ericson and Pakes is much more biased towards empirical research than it was the case in earlier studies of the same period. The article does not only analyses the market with the finite number of entities but also with the finite number of states in which companies may operate. However, in earlier studies, the analysis of the strategic behaviours of entities was limited. The decisions are made by entities only on the basis of the observed states and are not directly dependent on the strategy chosen in every period by the other players. Every company decides about the entry/exit and investments to be made based on the observed effectiveness and market structure. This means that the equilibria analysed by them are non-Markovian subgame perfect Nash equilibria

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[24] *Op. cit.*
[25] Cf. A. Pakes, R. Ericson, Empirical Implications of Alternative Models of Firm Dynamics, "Journal of Economic Theory", 79, 1998, pp. 1–45; and U. Doraszelski, A. Pakes, *op. cit.*

because actually in the period analysed by them the companies did not conduct games between each other in the individual periods. Their equilibrium decision rules affect only the market structure which is formed in the following period.

Such a game structure was imposed on the model as a result of two assumptions concerning companies entering the market. First, Ericson and Pakes assume sequential market entries, i.e. enterprises wanting to launch operations do it one by one until it stops being profitable for all the companies outside the market. Besides, new companies, on arrival, cannot make investments which would enhance their chance of survival in the following periods. These assumptions have their strong implications. First of all, they eliminate from the model all behaviours aimed at discouraging new companies from entering the market. As indicated by Doraszelski and Satterthwaite, processes that occur in the oligopolistic competition often have a form of race, in which companies try to overtake rivals when launching new kinds of business. Companies of a similar position invest heavily in order to improve their effectiveness, but the moment one of them achieves an advantage the remaining companies retreat allowing space for the strongest. This means that companies entering the market earlier have a better chance of survival than those that decide to make the same step later. The assumption concerning the sequential market entry eliminates all strategic behaviours aimed at deterring new firms by those operating on the market as well as strategic decisions to be made by companies racing for market entry precedence (and the related problem of shakeout). What is more, the incapacitating of new companies to make investment decisions results in the difficulty of catching up with the old competitors.

Eventually, as mentioned before, due to the calculation complexity of the Ericsson and Pakes model, the application of their algorithm is highly imprscal. Simultaneously, the simplification of analysis to do research of only symmetric equilibria in their model is possible without making any additional assumptions.

As indicated by Gowrisankaran[26], Doraszelski and Satterthwaite[27] the existence of symmetric equilibrium in the discussed Erikson and Pakes model is indispensable to allow for the opportunity to make mixed decisions on a discrete action space (entry and exit). This means that the introduction of randomness in decision about discrete variable (entry and exit) enables the convexify the best response mapping, thanks to which the symmetric equilibrium of the game is shown to exist. Doraszelski and Satterthwaite give an example in which with the

[26] G. Gowrisankaran, A Dynamic Model of Endogenous Horizontal Mergers, "RAND Journal of Economics", 30, 1999, pp. 56–83.
[27] *Op. cit.*

deterministic cost of market exit, symmetric equilibrium does not exist, despite satisfying all the remaining conditions defined by Ericson and Pakes.

The high calculation complexity of the Ericson and Pakes model[28], growing exponentially with the number of companies considered in the model, may not be possible to eliminate even if the research is confined to symmetric equilibria. This is so, first of all, due to the growing number of possible states depending on the number of entities within the model. As remarked by Weintraub, Benkard and Van Roy, in the analysis of the market of 20 companies to consider 40 states, 20 gigabytes of computer operational memory is required in order to examine optimal policies chosen by the companies in this way. In conclusion, despite a number of simplifications, the model of the dynamic oligopolistic market is so complex that conducting empirical research is in fact impossible from a practical point of view. The literature describes the problem as the *curse of dimensionality*.

The technical issues connected with the discussed class of economic models necessitate considerable simplifications affecting the structure and results generated by the model. As mentioned before, one of the most important simplifications in the line of models proposed by Ericson and Pakes is confining the company strategic interactions to the "game of entities with the market structure", and not its individual members. Such an approach requires the search for Markov equilibria (depending only on the states) and not the Nash equilibria (in which decisions made by other players are also significant). The extension of strategic interactions between companies could lead to much more interesting results that cannot be generated by means of the Markovian decision rules.

3.2. Analysis of oligopolistic markets through Markovian strategies

One of the extensions of the Ericson and Pakes work in this direction was presented for instance by Doraszelski and Satterthwaite. They analysed the Markovian subgame perfect Nash equilibrium. This type of extension in relation to the Ericson and Pakes study was possible thanks to the modification of the sequence of company market entry discussed before. In the study by Doraszelski and Satterthwaite companies simultaneously decide about launching business, which is why each of them treats the number of new market entrants endogenously. Additionally, new entities have an opportunity to invest in the first period of their activities in order to maximise their chance of survival in the following stages. As a result, competitors' strategies affect every company's expectations

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[28] Applying the algorithm from: A. Pakes, P. McGuire, Computing Markov–Perfect Nash Equilibria: Numerical Implications of a Dynamic Differentiated Product Model, "RAND Journal of Economics", 25, 1994, pp. 555–589.

of the future market state and are considered in the process of making decisions about investments and market entry/exit. Unlike in the work by Ericson and Pakes where, in their model, companies participate in the game in every period, and a subgame perfect, pure strategy equilibrium concept is used in the infinite horizon game.

Doraszelski and Satterthwaite focus additionally on the proof of existence of the symmetric Markovian equilibria. In their 2010 work, they try to improve the results of their earlier publications through the elimination of the necessity of using mixed entry and exit decisions in the model of the dynamic oligopolistic model. In order to do this, with the simultaneous guarantee of equilibrium existence, they apply the so called purification of Nash equilibria in mixed strategies[29], proposed for the first time by Harsanyi's for static games. The authors modify this method in such a way that it may be used for the Markov equilibria in stochastic games. The idea is based on the introduction of incomplete information to the game through private knowledge of the entities concerning their entry and exit costs. As a result, companies maximise their payoffs using pure strategies; however, as they are dependent on randomly determined entry and exit costs, constituting private information, in real terms competitors may treat them as if they were mixed. This means that in a way Doraszelski and Satterthwaite transfer randomness imposed on the decision space to the space of parameters characterising the model, with simultaneous retention of all properties that would guarantee the existence of symmetric equilibria. Besides, they present a class of transition probabilities which guarantee that the optimal investment policy of every company is a function and not multivalued mapping as it was the case in earlier studies. As a result, after the introduction of slight modifications to simplify the analysis, it is possible to use models and calculation algorithms in empirical research proposed by Ericson and Pakes, Pakes and McGuire, or their followers[30].

A constructive approach to analysis of dynamic oligopolistic models based on the structure proposed by Ericson and Pakes was presented by[31] Besanko and Doraszelski. In their study they extended the earlier analysis with the consideration of the possibility of forgetting the knowledge acquired by entities in the course of their market operations. Introducing the process being the reverse

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[29] J. Harsanyi, Games with Randomly Disturbed Payoffs: A New Rationale for Mixed-Strategy Equilibrium Points, "International Journal of Game Theory", 2, 1973, pp. 1–23.

[30] Por. A. Pakes, P. McGuire, Stochastic Algorithms, Symmetric Markov Perfect Equilibrium, and the 'Curse' of Dimensionality, "Econometrica", 69, 2001, pp. 1261–1281.

[31] D. Besanko, U. Doraszelski, Capacity dynamics and endogenous asymmetries in firm size, "RAND Journal of Economics", 35 (1), 2004, pp. 23–49.

of learning, the authors made markets become more competitive as the mechanism consisting in the market domination of companies operating on it the longest, and knowing the market conditions best, loses its earlier significance. In the case when the acquired knowledge does not depreciate, every strategy chosen by companies has a double motivation. On the one hand staying on the market lets enterprises acquire further knowledge that contributes to their later success. On the other hand, forcing competitors to leave the market, the company deters them from further learning, and consequently it reduces the set of entities that could threaten it in the future. When the depreciation of knowledge becomes possible, there is a field open to completely new strategies of how to retain the market position. In such a situation staying on the market lets the company create a certain buffer of knowledge. Companies, as a result of this, may act more aggressively than in the earlier environment. What is more, forgetting may also be a source multiplicity of equilibria, examined by the earlier algorithms. As shown by Besanko and co-authors in the game defined by them, for two successively ordered equilibria determined by the algorithm of Pakes and Mc Guire there is always one equilibrium between them which cannot be calculated by means of their method. In order to solve this problem they propose their own algorithm based on the method of homotopy.

3.3. The analysis of the non-Markovian subgame perfect Nash equilibrium

The approach applying the idea of the subgame perfect Nash equilibrium within measurable strategies was used with reference to the discussed problem also by Amir and Lambson. Like Ericson and Pakes, they analysed the dynamic oligopolistic market under the conditions of individual uncertainty with the finite number of entities and states. The authors focused on entry and exit strategies eliminating all other aspects of strategic interactions.

According to Amir and Lambson companies decide about market entry/exit on the basis of the whole market history (i.e. sequences of states drawn and decisions made) up to a given period. The goal of every entity is to maximise the future discounted profit. Because decisions on investment and effectiveness are not considered, temporary payoffs depend only on the number of companies on the market (Amir and Lambson make an assumption that in every period companies play the Cournot game, whose outcome depends only on the number of players on the market).

The equilibria analysed by Amir and Lambson are called LIFO (last in first out), determined for a specific sequence of entity market entry and exit. In their study, the company that entered the market last, always leaves it first. This kind

of construction allows for the analysis of game with the infinite time horizon by means of the so-called truncated game, i.e. analysis, for any period T, of all the histories finishing in period T. It enables the division of a set of companies that are not on the market into a calculable number of subsets with one assigned history truncated in a certain period T. The subsets are defined in such a way so that all companies belonging to a given subset would decide to enter the market in the last period of the history assigned to it. The operating companies decide about the exit according to the lifo principle in every next stage of the game induced by the history finishing in period T. Thanks to such a market scheme, for every set of histories truncated at moment T, one can be found for which corporate strategies concerning entry and exit are the perfect Nash equilibrium in pure strategies for the game finishing in period T. Furthermore, Amir and Lambson indicate that together with moving T towards infinity, the sequence of truncated histories at moment T, generating perfect equilibria, is convergent, which proves the existence of equilibrium in the infinite time horizon.

The approach of Amir and Lambson is original as it defines the equilibrium model through the pure strategy subgame perfect Nash equilibrium. Admittedly, the proof of the existence of the equilibrium was possible thanks to further simplification of the model structure in comparison with the study by Ericson and Pakes, but the characterisation of market equilibrium allowed for the presentation of firm conclusions in the field of comparative model statics. First of all, on the basis on their model Amir and Lambson prove the result of the excessive number (in relation to the optimal) of companies entering the market in equilibrium, when conditions are positive (strong positive shocks) or excessive number of companies leaving the market when the market situation is deteriorating (negative shocks). Numerous examples presented in their study contribute to a better understanding of the processes which lead to it, from information asymmetry concerning the costs of market entry and exit resulting in market concentration, through strategic corporate market entries aimed at the deterrence of potential competitors before they launch their businesses. The analysis of strategic interactions allows for more detailed cognition of processes within the corporate sector, exceeding the choices made exclusively on the basis of the observed state variables. The complexity of analysis based on strategies enforces a considerable simplification of the model itself.

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Let us emphasise that while Ericson and Pakes and their followers used topological arguments when proving the existence of equilibria, Amir and Lambson in their studies construct equilibrium proposing a method of its calculation.

The extension of results achieved by Ericson and Pakesa as well as Amir and Lambson is offered eventually by Balbus, Reffett and Woźny[32], who present a general model of a stochastic game with the infinite time horizon and a finite number of players, to be used in the analysis of dynamic decision made by companies (in the area of prices, production volume or investment in research and development; however, not in relation to the entry/exit decisions) on oligopolistic markets. Thanks to the application of a specific[33], but still general kind of transition probability between states, they are able to retain a supermodular structure of an intertemporal game. It is the property of game supermodularity in the extensive form that allows for the retention of constructive results on (i) the existence of the greatest and least stationary Markov equilibrium (in a stationary game), and also (ii) building an algorithm to calculate equilibrium strategies (in product or uniform topology). Furthermore, thanks to their method, it is possible to calculate (iii) (in weak topology) invariant distributions implied by equilibrium strategies (in the first order stochastic dominance). The authors also present results in the field of (iv) comparative statics of set of equilibria as well as a set of invariant distribution. The application of these results to analyse the economy of dynamically competing companies (though without entry/exit decisions) and cost reducing investments was formally presented in their study and allows for further empirical research.

4. On the methods of equilibria calculation and the estimation of invariant distribution parameters

In this section we will discuss the major results of theoretical studies on the modelling of equilibria on dynamic stochastic oligopolistic markets. In particular we will focus on the methods of calculation of equilibrium strategies as well as on invariant distributions on the state space implied by model dynamics. In the previous chapter we also introduced differentiation between: (i) constructive methods suggesting tools of calculation of equilibria[34] and (ii) non-constructive methods in which the existence of equilibrium is most often proved by topological fixed points theorems. Let us emphasise that models applying methods belonging to the second group may also be used empirically, but the algorithm to calculate relevant equilibria should be constructed first. That is why we will discuss in

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[32] Ł. Balbus, K. Reffett, Ł. Woźny, A Constructive Study of Markov Equilibria in Stochastic Games with Strategic Complementarities, mimeo, 2010.

[33] Cf. A. Nowak, On perfect equilibria in stochastic models of growth with intergenerational altruism, "Economic Theory", 28, 2006, pp. 73–83.

[34] Cf. Amir, Lambson, *op. cit.* or Balbus, Reffett, Woźny, *op. cit.*

detail a few selected methods solving this problem just for the so called non-constructive methods.

The basic algorithm used to find equilibria in the Ericson and Pakes model (with finite number of firms, states and actions, but infinite time horizon) was proposed by[35] Pakes and McGuire[36]. It consists in iterating on the value function and simultaneous calculation of optimal strategies based on the best response correspondence. Unfortunately, as indicated by the authors themselves, there is no guarantee that their algorithm is convergent or that it will be able to calculate all equilibria. In particular, it will not calculate the equilibria of a static game which are not stable. Furthermore, as already mentioned, the algorithm is susceptible to the so called curse of dimensionality. This means that the numerical complexity of their algorithm is able to effectively calculate equilibria only for small markets and small state spaces. A partial solution to the problem of dimensionality is provided by the algorithm of Pakes and McGuire[37], which through the application of stochastic methods stimulates game values (according to the method of approximate expectations) and a path of drawn states from the ergodic set, thanks to which the numerical complexity of the procedure is considerably limited[38].

As far as the problem of multiple equilibrium is concerned, a partial solution is presented by Besanko and others[39]. Admittedly, Pakes and McGuire suggest that the equilibria in the Eriscon and Pakes model are most frequently explicit, but for instance Besanko and co-workers present a model (derived from the Erickson and Pakesa study), allowing for the existence of a multiple (symmetric) Markovian equilibria with learning by doing and depreciation of organisational knowledge, e.g. forgetting). More examples of multiple equilibria are given by Doraszelski and Pakes[40]. In order to solve the problem Besanko and co-authors propose a method of equilibria calculation based on the homotopy methods. Knowing one solution (obtained for instance with the Pakes and McGuire algorithm) for the initial model parameterisation and assuming that the conditions determining the equilibrium are locally differentiable (around equilibrium) in relation to a selected parameter and model equilibrium, they construct the whole (path) manifold of equilibria solving a respective system of differential equations. More about this

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[35] A. Pakes, G. Gowrisankaran, P. McGuire, Implementing the Pakes–McGuire algorithm for computing Markov perfect equilibria in Gauss, Working paper, Yale University, New Haven, 1993 present a computer code calculating equilibria applying this method.

[36] Pakes and McGuire, 1994, *op. cit*.

[37] Pakes, McGuire, 2001, *op. cit*.

[38] Cf. J. Rust, Using Randomization to Break the Curse of Dimensionality, "Econometrica", 65(3), 1997, pp. 487–516.

[39] D. Besanko, U. Doraszelski, Y. Kryukov, M. Satterthwaite, Learning-By-Doing, Organizational Forgetting, and Industry Dynamics, "Econometrica", 78(2), 2010, pp. 453–508.

[40] *Op. cit*.

method is presented by (also software to implement it) Borkovsky, Doraszelski, and Kryukov[41]. The method of homotopy is efficient enough to find many model equilibria (not only extreme, as with the application of ordinal methods and monotone operators of Balbus, Reffett and Woźny), but from a given initial one. Hence, there is no guarantee that the method of homotopy calculates all equilibria.

Eventually, Doraszelski and Escobar[42] supply arguments to confirm that the number of Markov equilibria in almost every stochastic games (with finite number of players, states and actions but infinite time horizon) is finite and equilibria are regular. These results are significant with regard to the discussed numerical and econometric techniques of the calculation of equilibria and invariant distribution parameters but also to the conclusion in the area of comparative statics.

The discussion so far has focused on the methods of calculation of equilibria (strategic profiles) in dynamic models. Knowing these equilibria and combining them with the imposed transition probabilities between states, we can calculate invariant distributions generated by by the model dynamics. However, there is a separate issue of invariant distributions estimation methods on the basis of empirical data. Let us emphasize that apart from the aforementioned problems of calculation of the equilibria themselves, at this stage of analysis there is an extra problem of non-identifiability of distribution parameters resulting from the potential multiplicity of equilibria and invariant distributions[43].

5. The modelling of dynamic equilibria on large oligopolistic markets

The modelling of behaviours on large markets, i.e. with a continuum of players, is a natural extension of analysis of this problem in the case of the finite number of entities. Such an approach is applied when we wish to analyse the market

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[41] R. Borkovsky, U. Doraszelski, Y. Kryukov, A User's Guide to Solving Dynamic Stochastic Games Using the Homotopy Method, "Operations Research", 58(4), 2010, pp. 1116–1132.

[42] U. Doraszelski, J. Escobar, A Theory of Regular Markov Perfect Equilibria in Dynamic Stochastic Games: Genericity, Stability, and Purification, mimeo, 2009.

[43] Eventually, let us add that there are methods of estimation of invariant distribution model parameters without the necessity of calculating the equilibria themselves. Readers interested in the subject are referred to studies by V. Aguirregabiria, Pseudo Maximum Likelihood Estimation of Structural Models Involving Fixed-Point Problems, "Economics Letters", 84, 2004, pp. 335–340; V. Aguirregabiria, P. Mira, Sequential Estimation of Dynamic Discrete Games, "Econometrica", 75(1), 2007, pp 1–53; A. Pakes, M. Ostrovsky, S. Berry, Simple estimators for the parameters of discrete dynamic games (with entry/exit examples), "RAND Journal of Economics", 38(2), 2007, pp. 373–399 solving these problems theoretically and practically. (Cf. V. Aguirregabiria, H. Roman, P. Mira, An Estimable Dynamic Model of Entry, Exit and Growth in Oligopoly Retail Markets, "American Economic Review", 97(2), 2007, pp. 449–454) for models of the discussed dynamic games applying NPL method (nested pseudo maximum likelihood). Discussed in detail also by D. Ackerberg, L. Benkard, S. Berry, A. Pakes, Econometric Tools for Analyzing Market Outcomes, Handbook of Econometrics, 6(1), 2007, pp. 4171–4276.

with a large number of anonymous players, where strategic interactions are held rather through aggregate variables than individual strategies. Another way to apply these models is their technical and numerical usefulness. Thus, some treat the literature of large games as a set of methods allowing for the solution to a part of the problems arising in the models of finite number of entities discussed in chapters 3 and 4.

One particular case of assumption of anonymity, may be the limitation of the interactions of entities only to price channels (treated by the entities as given), though let us emphasize that such strong limitation of interaction is not necessary. Furthermore, let us emphasize that anonymity does not exclude the fact that companies in the model may observe the whole distributions of decisions in population, what is more "play" against them. Before we present in detail the application of this class of games in research of equilibrium on oligopolistic markets we will discuss briefly the concepts of equilibria applied in large static games.

In large (static) games there is an idea of the so-called distributional equilibrium[44]. Thus, the equilibrium is a distribution of both: players individual characteristics (for instance preferences) and equilibrium decisions (in a dynamic model also to states) satysfying two conditions: firstly, the measure of the set of decisions-players, in which a.e. player chooses an optimal decision, is equal to 1; secondly, it meets the technical condition of equilibrium compatibility of the marginal equilibrium distributions with the assumed measure of players. Let us emphasize that in the equilibrium defined in this way, payoffs and „strategies" of individual players depend only on the distribution of action in population, and not on who actually applies a given action. Hence, such games and their equilibria are sometimes called anonymous games/equilibria. A more specific notion of equilibrium than distributional equilibrium is used by Schmeidler[45]. The Schmeidler equilibrium is the simplest generalisation of Nash equilibrium with a continuum of players[46]. The difference between the Schmeidler equilibrium and Mas-Colell's consists in the fact that in Schmeidler's payoffs and equilibria depend on which of the continuum of entities chooses a given strategy, so the game stops being anonymous. Hence, the Schmeidler equilibrium is called strategy equilibrium, and Mas-Colell's distributional equilibrium. Let us emphasize that

[44] Cf. A. Mas-Colell, On a theorem of Schmeidler, "Journal of Mathematical Economics", 13(3), 1984, pp. 201–206.

[45] D. Schmeidler, Equilibrium points of nonatomic games, "Journal of Statistical Physics", 17(4), 1973, pp. 295–300.

[46] Cf. discussion in M. A. Khan, On extensions of the Cournot–Nash theorem, in: Advances in Equilibrium Theory (ed. C. D. Aliprantis, O. L. Burkinshaw, N. Rothman], Springer, Berlin, 1986.

the idea of anonymity may be modelled in Schmeidler's equilibria, e.g. when payoffs for individual players depend only on the (anonymous) aggregate (for instance the average) of the (price) decision of individual competitors.

Let us mention that each of the types of equilibrium may be represented by the other, i.e. strategy equilibrium implies equilibrium distribution of players/ decisions, and from the distributional equilibrium one can read the value of decision strategy (depending on the individual state), for equilibrium distribution. This division fades in the case of symmetric games and equilibria, when strategy equilibrium is still described by functions, but the same for every player and is determined only on the space of aggregate distributions and individual shocks; though there are still some differences (strategy equilibrium determines the behaviour of players also off the equilibrium).

Remembering these definitions and difference, we will now present key results in the field of modelling competition between companies on the markets with many entities. Let us emphasize that the assumption of the continuum of entities is often a purely technical issue to simplify the analysis of complex decision problems, but in itself it does not exclude the analysis of the strategic behaviour of players (in both distributional equilibrium and Schmeidler equilibrium).

The first works to generalise large games models in the dynamic, stochastic case (with infinite time horizon), and applying them to analyse the behaviour of companies on the market were studies by Jovanovic, Rosenthal[47] and Bergin, Bernhardt[48]. The assumed concept of equilibrium is the distributional one.

Jovanovic and Rosenthal present a general model of dynamic, stochastic, strategic interactions between the continuum of entities. Knowing the individual state and distribution of states of other entities they make decisions which together with the decisions made by other entities determine the probability of drawing an individual state from a given distribution. It is worth emphasizing that in the Jovanovic and Rosenthal model there is no aggregate risk, i.e. aggregate distribution in the following period is set in a deterministic way. Thanks to this, the authors avoid problems connected with strategy measurability (and proving that the law of large numbers works in their economy) and the necessity of treating the whole distribution as a state variable[49] and the related correlation between individual and aggregate shock. Furthermore, in the study by Jovanovic

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[47] B. Jovanovic, R. W. Rosenthal, Anonymous sequential games, "Journal of Mathematical Economics", 17(1), 1988, pp. 77–87.

[48] J. Bergin, D. Bernhardt, Anonymous sequential games with aggregate uncertainty, "Journal of Mathematical Economics", 21(6), 1992, pp. 543–562.

[49] K. Judd, The law of large numbers with a continuum of IID random variables, "Journal of Economic Theory", 35(1), 1985, pp. 19–25.

and Rosenthal players are symmetric, i.e. their payoff functions are the same. The latter is not very much restrictive, because as indicated by the authors, payoffs may be differentiated through an appropriate selection of state variables. The authors present determinants of the existence of equilibrium and invariant distribution equilibrium in such an anonymous game. The question about the existence of stationary equilibrium, i.e. the one dependent only on state variables, and not on time index remains unanswered. Eventually, the authors discuss a possible application of such games and give examples in the area of competition for location (the Hotelling type) and advertising expenditures.

The Jovanovic and Rosenthal model was successively extended in the case of aggregate risk by Bergin and Bernhard. These authors introduce the notion of a conditional no aggregate risk, i.e. when tomorrow's distribution is a deterministic function of today's distribution provided the aggregate state variable value is known. Thanks to the application of the law of large numbers of Feldman and Gilles[50], they managed to transfer the results of Jovanovic and Rosenthal to the case of the conditional no aggregate risk. They considerably extended the analytical capacity of the original model giving an example of modelling market entry and exit during the business cycle. Eventually, Bergin and Bernhard[51] present a method of proving the existence of the Markov stationary equilibrium (for a stationary game) affirmatively answering the question asked at the end of the work by Jovanovic and Rosenthal. This result is of a particular importance due to the application of the aforementioned models in empirical research based on the calibration/estimation of equilibrium invariant distributions parameters. The problem remaining to be solved is the non-constructiveness of the results of these studies resulting from the application of topological arguments[52] when proving the existence of a relevant equilibrium.

The application of the Schmeidler concept of equilibrium in an anonymous stochastic game with the aggregate is presented by Chakrabarti[53]. The assumption that payoffs and transition probability depend on the decision made by other players only through the aggregate is essential not only from the economic but also technical perspective. Games with a continuum of players, countable action space and (general) dependence of payoffs and passage probability on the whole

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[50] M. Feldman, C. Gilles, An expository note on individual risk without aggregate uncertainty, "Journal of Economic Theory", Vol. 35(1), 1985, pp. 26–32.

[51] J. Bergin, D. Bernhardt, Anonymous Sequential Games: Existence and Characterization of Equilibria, Economic Theory, 5(3), 1995, pp. 461–89.

[52] The authors use topological statements on the fixed point worked out by i.a. Fan-Glicksberg and statement on the existence of measurable selection by for instance Himmelberg.

[53] S. K. Chakrabarti, Pure strategy Markov equilibrium in stochastic games with a continuum of players, "Journal of Mathematical Economics", 39(7), 2003, pp. 693–724.

distribution of decisions made by remaining players, may not have equilibria in strategies. The application of the Chakrabarti game to analyse dynamic, stochastic models of corporate market behaviour would be possible after finding proper functions aggregating corporate market behaviour. In conclusion, let us emphasise that Chakrabarti proves the existence of (Schmeidler) Markov equilibrium in pure strategy with general assumptions and use of construction close to the so called APS method[54], which although topological in nature, may have a constructive interpretation through reference to the partial order (namely set inclusion order) in the set of all subsets of the set of aggregate value[55]. Such a formulation of method used by Chakrabarti allows for approximation (in topology generated by Hausdorff metric) of the set of all aggregate values in the sequential equilibrium, although it does not characterise numerically the set of strategies or equilibrium invariant distributions.

Sleet[56], to face the problem, analyses the competition model between the continuum of firms, the decision variable is the price, and the individual previous period state is: the price, individual shock and (aggregate) price distribution of every company. The concept of equilibrium is the Markovina symmetric one, described by the function on the set of previous period states. Sleet analyses the market under the conditions of strategic complementarity, i.e. increases in actions of individual players and the whole action distribution in population (where the order on distributions' set is given by the first order stochastic dominance). Let us emphasise that as in other studies discussed above, Sleet analyses a model without aggregate risk. Thanks to the application of lattice programming results and monotonic operators, Sleet proves the existence of monotonic and continuous function being Markov symmetric equilibrium on this market, as well as implied invariant distribution. Let us emphasize that Sleet's results are constructive, i.e. using tools from monotone operators, he shows how to create a (monotone) sequence of functions convergent (pointwise) to the equilibrium, and as a consequence he shows the method of calculation (pointwise).

A careful reader of Sleet's work notices that his results and procedures of equilibrium calculation may be considerably generalised and specified using for instance the latest results of Balbus, Reffett and Woźny[57] in the area of monotone operators on sigma-complete lattices or partially ordered sets in which

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[54] D. Abreu, D. Pearce, E. Stacchetti, Toward a Theory of Discounted Repeated Games with Imperfect Monitoring, "Econometrica", 58(5), 1990, s. 1041–1063.

[55] More in Balbus, Reffett, Woźny, *op. cit*.

[56] C. Sleet, Markov perfect equilibria in industries with complementarities, "Economic Theory", 17(2), 2001, pp. 371–397.

[57] Ł. Balbus, K. Reffett, Ł. Woźny, A constructive method for studying time-consistent Markov policies of quasi-hyperbolic consumers under uncertainty, mimeo, 2010.

every countable chain has its supremum. Thanks to it, one can not only point to the conditions necessary for the convergence of the proposed algorithm but also to characterise, with respect to the order structure, a set of equilibria and the respective invariant distributions. Let us note that the extensions in question are not trivial as the sets of distributions (even on lattices) do not have to be a lattice themselves, and sets of measurable and bounded functions (of the Markov strategy) do not have to be complete lattices as well.

Another method to achieve the constructiveness of result and calculate equilibrium distributions is proposed by Hopenhayn[58]. He analyses a market model with a continuum of competitive companies deciding on market entry and exit and the optimal employment of production factors in the conditions of individual shocks. The behaviour of companies is competitive, which means that the decisions made by other companies affect the payoffs of particular players only through prices, and these are treated as given. Thanks to this the simplification of interaction Hopenhayn proves the existence of (the unique) stationary equilibrium being both the optimal decision rule and the distribution of aggregate states. The Hopenhayn analysis also uses results of monotone operators[59], as a simple structure of the decision process allows for easy calculation and numerical simulation of the equilibrium defined in this way. The application possibilities of Hopenhayn's results and simulation are strongly limited within the assumption of the structure of interactions between market entities and remains useful in market analysis from the macroeconomic perspective, i.e. numerous companies operating non-strategically, where the price taking assumption is justified.

Another idea of how to avoid the problem of the non-constructiveness of results and calculation of equilibrium strategies and distributions is the application of the so called games with oblivious players. They are symmetric stochastic games in which the decisions of individual players affect each other only through the aggregate (defined for instance as the sum of decisions of the remaining players), due to which strategic interactions between entities are limited to these within (invariant) distributions of variable states in population. The equilibrium in such a game is defined by a couple: (i) strategy (i.e. function of individual state) which is the best response to the proposed population distribution of states and (ii) optimal strategy implied invariant distribution. In other words, games and equilibria with oblivious players allow for a considerable simplification of the decision process complexity, thanks to which they enable the effective calculation of equilibrium strategies and invariant distribution for economies and even numerous entities.

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[58] *Op. cit.*

[59] Cf. H. Hopenhayn, E .C. Prescott, Stochastic Monotonicity and Stationary Distributions for Dynamic Economies, "Econometrica", 60(6), 1992, pp. 1387–406.

Let us emphasize that while the interpretation of equilibrium defined in this way makes sense with regard to a large number of players, the literature does not formally define the measure of players in these games, as it is the case in models derived from the discussed studies conducted by Schmeidler or Mas-Colell.

Adlakha and Johari[60] present a proof[61] of the existence of the greatest and least (in product order on the state space) equilibrium defined in this way for a game of supermodular structure with oblivious players, with lattice programming tools applied. An important result of the literature within this area shows that "oblivious" equilibria in games are a good approximation of stationary Markov equilibrium on invariant distribution[62], when the number of players grows to infinity. Analysing the results of Adlakha and co-workers it is easy to reach the conclusion that research concerning the combination of (i) asymptotic properties of the stationary Markov equilibrium in a stochastic game parameterised by a growing (finite) number of players (on invariant distribution), with (ii) stationary Markov equilibrium on invariant distribution (i.e. in the spirit of Mas-Colell) in a game with a continuum of players or eventually with (iii) stationary euquilibrium on strategies and implied invariant distribution (i.e. in the spirit of Schmeidler, as analysed for instance by Chakrabarti[63]) in the game with a continuum of players, leaves many open questions to be answered.

Admittedly, the studies of Adlakha and co-workers do not focus directly on the analysis of behaviours of players on the oligopolistic markets, but their application to face the problem is direct. To exemplify, Weintraub, Benkard, Van Roy[64] analyse the Ericson and Pakes model (entry/exit and investment decisions) with numerous (continuum) companies and present the algorithm to calculate equilibrium with the assumption that players are "oblivious".

6. Summary

Beginning with the article by Eriscon, Pakes the study discusses selected models of dynamic, stochastic, oligopolistic models with both a finite number of players and their continuum. The key criterion of usefulness of the described studies is

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[60] S. Adlakha, R. Johari, Mean Field Equilibrium in Dynamic Games with Complementarities, Stanford University, mimeo, 2010.

[61] Note: unpublished version of the study includes minor mistakes in characterisation of the structure of equilibrium sets.

[62] Por. S. Adlakha, R. Johari, G. Weintraub and A. Goldsmith, Mean Field Analysis for Large Population Stochastic Games, Stanford University, mimeo, 2010.

[63] *Op. cit.*

[64] *Op. cit.*

the constructiveness of obtained results, i.e. its theoretical and practical calculation possibility.

As indicated by Doraszelski and Pakes in their summary of the literature, further research of dynamic interactions on oligopolistic markets under the conditions of risk should focus on a few economic areas: (i) changing number of companies considering a potential market entry, (ii) information asymmetry on the space of states, in which individual companies operate and (iii) dynamic decision on the part of consumers (e.g. loyalty, supplier switching costs). From our perspective there are a few technical aspects to be mentioned. As already indicated, it is well justified to (iv) formally examine the interdependence between equilibria for large games and oblivious players with asymptotic Markov games with the finite number of players. Eventually, it is well founded to precisely analyse the theoretical properties of numerical algorithms of calculation of the whole equilibrium value sets (with the application of the APS method extended to partial orders) or extreme value equilibrium (i.e. the greatest and least) in the context of firms dynamics on the market. The last problem was addressed at the end of article by Balbus, Reffett and Woźny, but it still requires a thorough examination.

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The Early Internationalisation of Polish Companies. Research results

1. Introduction

The early internationalisation of companies has been the subject of research and discussions since the beginning of the 1990s. However, in this particular case 20 years' time appears to have been too short for researchers to reach consensus on the applied terminology and the way the phenomenon is defined. Such a situation has resulted in a lack of comparability of research results and has delayed a solid cognition of this phenomenon.

The aim of this article is to present the research results indicating that, in Poland, there are companies undertaking early internationalisation, i.e. born global companies, no matter how they are defined in an operational way. The article presents, firstly, on the basis of literature, the definitional differentiation of born globals. Then, the research method is discussed. Next, there is a presentation and discussion of the research results identifying and characterising born globals among medium-sized enterprises in Poland. Eventually, conclusions are drawn with reference to the different definitions of born globals.

2. Definitions of early internationalisation

The phenomenon of early internationalisation has been observed since the end of the 1980s but according to G. A. Knight and S. T. Cavusgil the examples of companies entering international markets early were already documented 10 years before[1].

Initially companies undertaking early internationalisation were described in a variety of ways, eg. *innate exporters* or *high technology start ups*. In 1993 M. W. Rennie coined the term *born globals*, and a year later B. M. Oviatt and P. P. McDougall introduced a phrase *international new ventures – INV* in order

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[1] G. A. Knight, S. T. Cavusgil, The Born Global Firm: A Challenge to Traditional Internationalization Theory, "Advances in International Marketing", 1996, No. 8, p. 16.

to describe young companies, dynamically developing on the international market. These two terms are used at present in the literature to describe early internationalisation and are treated as synonyms by many researchers[2]. In this article companies undertaking early internationalisation will be described as born globals irrespective of what terms were used by the quoted researchers.

The first attempt to formulate the modern theory of early internationalisation[3] was the article, treated now as a seminal study, written by B. M. Oviatt and P. P. McDougall entitled *Toward a Theory of International New Ventures*. The authors formulated a theoretical definition of new international ventures – INV. According to B. M. Oviatt and P. P. McDougall an INV is "a business organization that, from inception, seeks to derive significant competitive advantage from the use of resources and the sale of outputs in multiple countries[4]".

A slightly different theoretical definition of born globals is presented by G. A. Knight in his doctoral dissertation which was a significant contribution to the research of the phenomenon of early internationalisation[5]. According to G. A. Knight "the born global is defined as a company which, from or near its founding, seeks to derive a substantial proportion of its revenue from the sale of its products in international markets[6]". Earlier, G. A. Knight together with S. T. Cavusgil defined born globals as "small, technology-oriented companies that operate in international markets from the earliest days of their establishment[7]".

The review of the literature in English concerning early internationalisation shows that the majority of researchers refer to at least one of the aforementioned definitions of born globals in their publications. However, due to a high level of generality of these definitions, researchers adopt an operational definition for the purpose of their research. Unfortunately, there is no consensus on how to identify a born global in the research practice.

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[2] An interesting review of terms used to describe companies undertaking early internationalisation is presented by E. Duliniec in: E. Duliniec, Koncepcje przedsiębiorstw wcześnie umiędzynarodowionych. Rozważania terminologiczne (Concepts of early internationalised companies. Terminological deliberations), „Gospodarka Narodowa", 2011, No. 1–2, pp. 67–77.

[3] Early internationalisation is an alternative to the theory of stage development of firm internationalisation. More on different internationalisation theories see: e.g. M. Gorynia, Strategie zagranicznej ekspansji przedsiębiorstw (Strategies of foreign corporate expansion), PWE, Warszawa 2007, pp. 63–85 or G. A. Knight, S. T. Cavusgil, The Born Global..., *op. cit*.

[4] B. M. Oviatt, P. P. McDougall, Toward a Theory of International New Ventures, „Journal of International Business Studies", 1994, No. 25 (1), p. 49.

[5] More on research of the phenomenon of early internationalisation see: M. Jarosiński, Urodzeni globaliści w badaniach na świecie i w Polsce (Born globals in research in Poland and in the world), „Studia i Prace Kolegium Zarządzania i Finansów", 2012, No. 114, p. 14–20.

[6] G. A. Knight, Emerging Paradigm for International Marketing: The Born Global Firm, doctoral dissertation, Department of Marketing and Supply Chain Management, Michigan State University, East Lansing 1997, p. 1.

[7] G. A. Knight, S. T. Cavusgil, The Born Global..., *op. cit.*, p. 11.

There are two major criteria used in the definitions presented by researchers: the time between the establishment of the company and the beginning of international operations and the share of foreign sales in the total sales of the company. In the majority of presented definitions both criteria are used together, or at least one of them. Apart from these two basic criteria, researchers often take into account such criteria as the year of establishment of the company, the minimum number of countries or regions of operations and a global vision. Table 1 presents 10 deliberately selected definitions of born globals from among 40 definitions analysed by the author. The selection has been made in such a way as to clearly present different approaches to the definition of a born global on the one hand, and to show examples of application of all kinds of criteria on the other.

Table 1. Selected definitions of born globals

No.	Author/authors	Operational definition of born globals
1.	G. A. Knight and S. T. Cavusgil (1996)	Firms that "begin exporting one or several products within two years of their establishment and tend to export at least a quarter of total production[8]"
2.	S. Kandasaami (1998)	"Business activities in 5 or more countries and selling more than 40% of the produce … and international sales commenced within the first two years of the first commercial sales[9]"
3.	T. K. Madsen, E. Rasmussen and P. Servais (2000)	Company established after 1976, a share of foreign sales of 25% or higher, exports started within three years after its inception[10]
4.	J. Larimo and J. Pulkkinen (2002)	Establishment of the company after 1990, exports started within three years of its establishment, exports forming more than 50% of total sales[11]
5.	Ø. Moen i P. Servais (2002)	Establishment of the company after 1989 and beginning of exports within less than two years after establishment[12]

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[8] Ibid., p. 18.

[9] S. Kandasaami, Internationalisation of Small- and Medium-Sized Born-Global Firms: A Conceptual Model, ICSB Singapore Conference Proceedings, Singapore 1998, pp. 4–5.

[10] T. K. Madsen, E. Rasmussen, P. Servais, Differences and Similarities Between Born Globals and Other Types of Exporters, "Advances in International Marketing", 2000, No. 10, p. 250.

[11] J. Larimo, J. Pulkkinen, Global Orientation, Competitive Advantages and Export Strategies of Different Types of SMEs: Empirical Evidence from Finland, Proceedings of the 28th Annual Conference of European International Business Academy (EIBA), Athens 2002, p. 12.

[12] Ø. Moen, P. Servais, Born Global or Gradual Global? Examining the Export Behavior of Small and Medium-Sized Enterprises, "Journal of International Marketing", 2002, No. 10 (3), pp. 58–59.

continued Table 1

No.	Author/authors	Operational definition of born globals
6.	M. Gabrielsson, V. Sasi and J. Darling (2004)	"Companies that have rapidly (within a maximum of 15 years, most within two to three years) reached a stage where over half of their sales is generated external to their home continent[13]"
7.	G. A. Knight, T. K. Madsen and P. Servais (2004)	"Firms less than 20 years old that internationalised on average within three years of founding and generate at least 25% of total sales from abroad[14]"
8.	R. Luostarinen and M. Gabrielsson (2006)	"Firms deriving most of their income (over 50%) from non-domestic continents … or those … with a lesser global degree of sales when they have a clear global vision and are obviously on a global growth path[15]"
9.	A. Jantunen, N. Nummela, K. Puumalainen and S. Saarenketo (2008)	Firms starting their foreign operations within 3 years of inception, deriving at least 25% of turnover from outside the home market within 3 years[16]
10.	D. Crick (2009)	"Level of commitment in the broadly defined triad markets … within the first three years of operations … and … commitment to each market by having a turnover within three years … of at least 10% in each region[17]"

Source: own selection based on the literature.

According to M. Jarosiński the most frequent definition of born globals is: "internationalisation undertaken within 3 years from the establishment and generation of at least 25% of revenue from international markets[18]". The threshold values, for example applied by E. S. Rasmussen and T. K. Madsen, of 3 years and 25% of revenue from sales abroad[19] are the most frequently used parameters in the majority of definitions also completed with other criteria. It is reflected in Table 1: three out of ten presented definitions are based on these

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[13] M. Gabrielsson, V. Sasi, J. Darling, Finance Strategies of Rapidly-Growing Finnish SMEs: Born Internationals and Born Globals, "European Business Review", 2004, No. 16 (6), p. 592.

[14] G. Knight, T. K. Madsen, P. Servais, An Inquiry into Born-Global Firms in Europe and the USA, "International Marketing Review", 2004, No. 21 (6), p. 649.

[15] R. Luostarinen, M. Gabrielsson, Globalization and Marketing Strategies of Born Globals in SMOPECs, "Thunderbird International Business Review", 2006, No. 48 (6), p. 780.

[16] A. Jantunen, N. Nummela, K. Puumalainen, S. Saarenketo, Strategic Orientations of Born Globals – Do They Really Matter?, "Journal of World Business", 2008, No. 43, p. 164.

[17] D. Crick, The Internationalization of Born Global and International New Venture SMEs, "International Marketing Review", 2009, No. 26 (4/5), p. 458.

[18] M. Jarosiński, Urodzeni globaliści w... (Born globals in...), *op. cit.*, p. 15.

[19] See: E. S. Rasmussen, T. K. Madsen, The Born Global Concept, paper for the EIBA conference, December 2002, p. 14.

two parameters. Two of them, and in the whole table another three definitions, additionally describe the time when companies were established. This is the approach of T. K. Madsen et al. who assume that companies may be considered to be born globals if they were founded in a specific period, i.e. in this case after 1976[20]. However, the author is doubtful about such an approach as there are documented examples of born globals in earlier periods. For instance, the research conducted by A. Aspelund and Ø. Moen points to a company established in 1874[21] as the oldest identified born global.

Not all researchers agree that early internationalisation is the one to be effected within the first three years. Some, as for instance Ø. Moen and P. Servais (2002) or A. Rialp et al. (2005) claim that a period of two years should be taken into account. Some other researchers think that the time between the establishment of the company and entering international markets may be longer and may amount to a maximum of 5 years (A. Zucchella, 2002), 10 years (Z. Falay et al., 2007), or even 15 years (M. Gabrielsson et al., 2004) under additional conditions, like having a global vision (A. Zucchella, 2002), generating at least 80% of sales outside the home market and at least 20% of sales outside the home continent (Z. Falay et al., 2007), or a little less restrictive: generation of more than half of sales outside the home continent (M. Gabrielsson et al., 2004).

The condition mentioned by A. Jantunen et al. (2008) also seems to be restrictive. The required minimum of revenue from foreign activity at the level of 25% is to be already generated within the first 3 years of operations on the foreign market. Certainly such a definition allows for the identification of companies which develop dynamically on the foreign market. However, it should be remembered that it may reduce significantly the number of companies to be examined and also limit their comparability, as researchers did not consider such restrictive criteria in the past.

In some definitions there is also a condition determining the number of countries in which born globals should operate, e.g. a minimum of 5 countries (S. Kandasaami, 1998), or even several different countries (J. Larimo, 2006). This condition seems to be well grounded. It may happen though that the company may have a high turnover only on one foreign market and could hardly be called a born global then. Furthermore, a born global may be expected to enter not only a number of different countries but also different continents, as the company

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[20] See: T. K. Madsen, E. Rasmussen, P. Servais, Differences and Similarities..., *op. cit.*, p. 250.

[21] A. Aspelund, Ø. Moen, Small International Firms: Typology, Performance and Implications, "Management International Review", 2005, No. 45 (3) (sec.:) J. Larimo, Different Types of Exporting SMEs: Similarities and Differences in Export Performance, "Advances in International Marketing", 2006, No. 17, p. 22.

called global should have a global scope of operations or at least seek to achieve it. In this respect, the definition of D. Crick (2009), seems most appropriate: it states that a born global should be committed to triad markets within the first 3 years of operations generating within these 3 years minimum 10% of total sales in each region[22].

Also in Polish literature there is considerable diversity of operational definitions of born globals. The most frequently quoted definitions include achieving the share of foreign sales in the total sales at the level of at least 25% within the first 2 years from establishment (E. Duliniec, 2004, 2007, 2009; M. Berliński 2007) and achieving 25% of revenue from export within the first 3 years of operations (W. Nowiński i W. Nowara, 2010, 2011).

It should be stated that definitions proposed by Polish authors are quite restrictive. The literature in English reviewed by the author indicates that researchers do not determine the time to achieve a given threshold of sales. K. Przybylska (2010) proposed an even more restrictive definition assuming the achievement of 30% share of foreign sales in the annual revenue of the company within the period of the first 3 years of operations[23].

3. Research method

The study attempts to show that in Poland there are born globals irrespective of how restrictive they are defined operationally. The identification of born globals was conducted on the basis of four different operational definitions of born globals of: T. K. Madsen, E. Rasmussen and P. Servais (2000), J. Larimo and J. Pulkkinen (2002), S. Kandasaami (1998) as well as M. Gabrielsson, V. Sasi and J. Darling (2004). The definitions were chosen in such a way as to make use of different approaches to the definitions of born globals on the one hand and apply definitions of various levels of restiveness on the other. An additional aim was an attempt to describe the "quality" of the selected operational definitions of born globals in relation to the presented theoretical definitions.

Two research questions are posed in this study:
1) will it be possible to identify born globals in a randomly selected sample of Polish companies operating on international markets, irrespective of the level of restrictiveness of the applied definition?;

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[22] D. Crick, The Internationalization of..., *op. cit.*, p. 458.
[23] K. Przybylska, Born global – nowa generacja małych polskich przedsiębiorstw (Born globals – new generation of Polish companies), „Gospodarka Narodowa", 2010, No. 7–8, p. 72.

2) do companies meeting the conditions described in particular definitions actually correspond to the characteristics of born globals resulting from theoretical definitions?

The analysis is based on a sample of data collected in the course of survey "Dilemmas of Growth of Polish Companies" financed with the aid of the statutory funds by the Dean of the Collegium of Management and Finance at the Warsaw School of Economics[24]. The data were collected in 2010 by Centrum Badań Marketingowych INDICATOR Sp. z o.o. (the Centre of Marketing Research INDICATOR), which applied the method of computer assisted telephone interviews (CATI).

The survey concerning the dilemmas of the growth of Polish companies was conducted with a sample of 121 medium-sized Polish companies (employing from 50 to 249 people). They were randomly chosen companies based in Poland and operating on foreign markets, excluding financial institutions.

For the purpose of the present study the sample was limited only to these companies with a majority of Polish capital and only those established after 1987, as from that moment on, Polish companies had the opportunity to operate abroad freely. Before, in Poland there had been a state monopoly on foreign trade operations[25]. As a result of the introduction of additional restrictions, 47 companies remained in the sample.

4. Results

In order to answer the research questions, the identification of born globals was conducted according to parameters determined by four formerly chosen definitions. The analysis of companies in the sample from the perspective of meeting the criteria determined in the four selected definitions allowed for the distinction of 15 companies each of whom meets the criteria determined by at least one of the aforementioned definitions. This way four groups of companies were identified and next each group was analysed from the perspective of adjustment to the theoretical definitions by B. M. Oviatt and P. P. McDougall (1994) and by G. A. Knight (1997). The list of companies and their characteristics are presented in Table 2.

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[24] More on the survey itself and its results, see: M. Jarosiński, Stan zaawansowania internacjonalizacji polskich przedsiębiorstw (Advancement of internationalisation of Polish companies), „Organizacja i Kierowanie", 2011, No. 1 (144), pp. 41–50.

[25] The limitation of the state monopoly on foreign trade was gradual and was completed after the amendment of the Constitution of the Polish People's Republic at the end of December 1989. The analysis of regulations on foreign trade from the 1980s allows the author to assume that at the beginning of 1988 companies in many industries were quite free to make decisions with regard to selling their products abroad.

Table 2. Characteristics of the examined companies

Company name	Year of establishment	Year of internatio nalisation	Time from establishment to internationalisation (in years)	Share of foreign sales in total sales (in %)	Number of foreign markets served	Number of continents served
A	1994	1996	3	30	n/a	1
B	1995	1995	1	31–40%	5	1
C	1989	1989	1	40	6	1
D	1989	1990	2	40	1	1
E	2003	2003	1	55	1	1
F	1989	1990	2	60	1	1
G	1999	1999	1	65	3	1
H	1993	1993	1	70	7	1
I	1990	1992	3	79	1	1
J	1992	1992	1	80	1	1
K	1993	1993	1	81–90%	at least 7	5
L	1990	1990	1	90	17	4
M	1990	1990	1	90	7	1
N	1993	1993	1	99	2	1
O	1990	1990	1	91–100%	5	1

Source: Own material based on research.

The aforementioned four groups of companies identified according to each of the selected definitions in increasing order of restrictiveness are presented and characterised below.

5. The definition of T. K. Madsen, E. Rasmussen and P. Servais

According to the definition of T. K. Madsen et al. (2000) a born global is a company which was founded after 1976, generates foreign sales revenue at the level of 25% or more and launched export within 3 years from establishment[26]. These conditions were met by 15 companies, i.e. 32% of the examined sample. These are the companies marked with letters A to O in Table 2.

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[26] T. K. Madsen, E. Rasmussen, P. Servais, Differences and Similarities..., *op. cit.*, p. 250.

The companies varied in age. The oldest company was 21, and the youngest 7 years old. The average age of company was 17.4, the median of 18. Three companies were established in 1989 and four in 1990. Only 1 company was established after 2000. The majority of companies undertook internationalisation very soon: 11 companies already within the first year of operations, 2 within the second year and 2 within the third year. On the average a company operated on 3.8 markets (the median of 3). Only one company operated on more than 10 markets. As many as 5 companies operated only on 1 market! Thirteen companies operated only on the European markets. Only 2 companies operated not only in Europe but also in a few different regions.

The example of five companies which despite high foreign revenues (from 40 to 80%) after a considerable time of operations abroad (from 7 to 22 years) are present only on one foreign market proves that using the two most common criteria of distinguishing born globals (entering a foreign market within 3 years and foreign sales of above 25%) one may distinguish some companies that are not on the path to fast internationalisation. Thus, more restrictive criteria would be better.

6. The definition of S. Kandasaami

According to the definition of S. Kandasaami (1998) born globals are companies operating at least in 5 countries and selling abroad at least 40% of their output, with the first transaction on a foreign market concluded within the first two years of operations[27]. In his definition S. Kandasaami does not specify whether she means 5 countries in all or 5 countries besides the country of origin of the company. The latter is assumed in the present study. The conditions specified in this way were met by 6 companies, i.e. 13% of the examined sample. These companies are marked with letters: C, H, K, L, M and O in Table 2.

The companies were of similar age. The oldest company was 21, and the youngest 17 years old. The average company age was 19.2 years and the median of 20 years. One company was established in 1989, and 3 companies in 1990. All companies undertook internationalisation in the first year of operations. On the average a company operated on 7 markets (the median was also 7). As before, one company operated on 17 markets. Four companies operated only on the European market. As before, 2 companies operated outside Europe.

The analysis of characteristics of the companies in this group indicates a considerably higher level of internationalisation of the analysed companies than in the previous case, i.e. companies identified by the definition by T. K. Madsen et al. (2000).

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[27] S. Kandasaami, Internationalisation of Small-..., *op. cit.*, pp. 4–5.

7. The definition of J. Larimo and J. Pulkkinen

According to the definition of J. Larimo and J. Pulkkinen (2002) a born global is a company that was established after 1990, launched export within 3 years from establishment, with export sales exceeding 50% of the total sales[28]. The conditions defined in this way were met by only 6 companies, i.e. 13% of the examined sample. These are the companies marked with the letters: E, G, H, J, K and N in Table 2.

The companies varied in age. The oldest was 18, the youngest 7 years old. The average age was 14.5 years, the median of 17 years. Only 1 company was established after 2000. All companies undertook internationalisation within the first year of operations. On the average a company operated on 2.3 markets (the median of 2). None of the companies operated on more than 7 markets! Five companies operated only on European markets. Only 1 company operated outside Europe.

In this group, as in the group identified by means of the criteria included in the definition of T. K. Madsen et al. (2000) there were companies of a low level of development from the perspective of internationalisation: two operating on only one foreign market and one operating on two foreign markets. Thus, it seems that the criteria assumed by J. Larimo and J. Pulkkinen are not sufficient.

8. The definition of M. Gabrielsson, V. Sasi and J. Darling

According to the definition of M. Gabrielsson et al. (2004) a born global is a company that within a maximum 15 years from establishment not only entered a market abroad but also on another continent and whose more than half of foreign sales is generated outside its home continent[29].

In this case, it was discovered that in the examined sample there are only 5 companies meeting the condition of internationalisation within 15 years and operating on more than one continent. It was, however, discovered that 3 companies did not achieve the required level of revenue from outside their home continent. It is worth adding that three companies entered a foreign market as late as in the 11th, 12th and 14th year of their operations and were active only on 2 continents.

The remaining two companies unfortunately did not submit sufficient data on their revenue from different continents so that it could not be assessed whether or not they met the criterion of a minimum of 50% of revenues from outside

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[28] J. Larimo, J. Pulkkinen, Global Orientation, Competitive..., *op. cit.*, p. 12.
[29] M. Gabrielsson, V. Sasi, J. Darling, Finance Strategies of..., *op. cit.*, p. 592.

their home continent. However, as they both operate on 3 continents outside Europe (in Australia, Asia, South America) and at the same time either of them generates nearly 90% of sales on foreign markets, there is a chance that they may meet the condition determined in the definition, which unfortunately cannot be confirmed. It should be noted that both companies had already entered a foreign market already in the first year of operations, they therefore, had enough time to widely expand their international operations. All of it indicates that these companies (marked with the letters K and L) may be regarded as born globals following the definition of M. Gabrielsson et al. Thus, in this case born globals constitute only 4% of the examined companies.

9. Discussion

The results of the analysis presented above based on the sample of 47 medium-sized companies with the majority of Polish capital, established after 1987 allow for the distinction of 4 groups of born globals with the criteria determined in the 4 selected definitions. These groups include from 2 to 15 companies depending on the definition, see Table 3.

Table 3. List of born globals according to different definitions

Company name	T. K. Madsen, E. Rasmussen and P. Servais	S. Kandasaami	J. Larimo and J. Pulkkinen	M. Gabrielsson, V. Sasi and J. Darling	ND*
A	√				1
B	√				1
C	√	√			2
D	√				1
E	√		√		2
F	√				1
G	√		√		2
H	√	√	√		3
I	√				1
J	√		√		2
K	√	√	√	√	4
L	√	√		√	3
M	√	√			2
N	√		√		2
O	√	√			2

* ND – The number of definitions whose criteria are met by the company.

Source: own material.

As mentioned before, the analysis was conducted in such a way as to apply increasingly more restrictive criteria. Hence, the analysis of data, according to the definition of T. K. Madsen et al. allowed for the distinction of the largest group of companies (15). Narrowing the criteria of selection of companies to the next groups (according to more restrictive criteria) led to the distinction of only a few companies in every case. However, it turned out that, as expected, some companies met the criteria included in more than one definition. There were altogether 10 companies (66%) of this kind, with 3 companies that met simultaneously criteria determined in 3 definitions, a one company by all 4 definitions. It allows for the conclusion that in Poland there are born globals irrespective of how they are defined operationally, which is an answer to the first research question[30].

The analysis of the characteristics of the companies identified in the author's research as born globals, according to four definitions of a different level of restrictiveness allowed for a simultaneous assessment of the quality of applied operational definitions, and consequently the answer to the second research question. As indicated at the beginning of the article, the researchers generally agree that born globals are the companies that nearly from their inception seek to generate the best possible results of their operations in many countries. The requirement for a born global to operate in many countries is explicitly stated in the definition of B. M. Oviatt and P. P. McDougall (1994). The definition of G. A. Knight (1997) deals with the sales of products on international markets, which allows for the assumption that, as in the definition of B. M. Oviatt and P. P. McDougall, it refers to operations in many countries. In this connection, there is a question of what, in the light of these definitions, the characteristics of the four distinguished groups of companies look like.

The first group, distinguished by means of the definition of T. K. Madsen et al., as well as the third group, distinguished by means of the definition of J. Larimo and J. Pulkkinen, include companies that operate exclusively on a single market. In the first case there are as many as 36% of them and in the latter 33%, so it may be said that about 1/3 of companies in each of these groups are companies that operate on the average about 17 years and although they undertook internationalisation at a very early stage (on the average within the 2nd year of operations), they did not enter more than one foreign market! It contradicts decisively the idea expressed in the theoretical definitions quoted at the beginning of the article. Thus a conclusion may be drawn that the operational definitions

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[30] It is worth noting that earlier born globals in Poland were identified by W. Nowiński (2008), R. Morawczyński (2008), T. Kraśnicka et al. (2008), K. Przybylska (2010), W. Nowiński and W. Nowara (2010, 2011). See more on the subject in: M. Jarosiński, *Urodzeni globaliści w...* (Born globals in...) *op. cit.*, pp. 19–20.

of more restrictive criteria are better, such as the definition of S. Kandasaami or M. Gabrielsson et al.

10. Summary

The survey conducted on the sample of the randomly selected 47 medium-sized companies based in Poland with the majority of Polish capital established after 1987 operating on foreign markets allows the author to state that there are born globals in Poland irrespective of how they are defined operationally. Unfortunately, on a closer examination of the identified companies, it appears that some of them, although they meet the criteria determined in the operational definition of born globals, their characteristics do not fit the theoretical definitions.

It should be emphasized that these statements refer only to the surveyed companies and due to the small size of the sample, these conclusions cannot be spread to cover the whole population of companies. That is why, a similar survey is worth repeating on a much larger sample of companies, resigning from applying the definition of T. K. Madsen et al. with regard to its limited ability to distinguish companies corresponding to the characteristics of born globals.

The author's research allowed also for drawing additional conclusions. Firstly, the strictness of criteria specified in the definitions determines the characteristics of companies identified on their basis. Secondly, the operational definitions of stricter criteria allow for the distinction of companies with characteristics closer to the theoretical definitions of born globals.

Hence, the future research of born globals should be concerned with the application of operational definition closer to the theoretical definitions of born globals. In this respect, the definition of S. Kandasaami (1998) seems already suitable, as it excludes the superficial involvement in internationalisation. Also, the definition of K. Przybylska (2010) seems to be a good definition to be used in research.

It would be best to apply in the future research such a definition of born globals that could be approved of by all researchers of this phenomenon. It would allow for the comparison of research results and drawing far reaching conclusions due to it.

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Emotional Intelligence and Leadership styles

1. The Role of Leadership

In a fast changing world, leaders are faced with significant challenges that require extraordinary insight and skill. Continuous and dynamic change has replaced years of a somewhat predictable and stable operating environment. Immense competition, a shifting and increasingly global world economy, new technologies, new markets and an increasingly diverse workforce are only a few of the many challenges that leaders now face. Few people are formally trained to take on leadership. The job typically goes to those with motivation and the leadership competencies required to be marginally effective. Just as employees and managers find it useful to have job descriptions to define the responsibilities and accountabilities for positions, it is helpful to establish the functions of a leader.

2. Leadership is a Process

In the past, there have been many classification systems developed to define the dimensions of leadership. One such classification system is the scheme proposed by Bass[1]. He suggested that some definitions view leadership as the *focus of group processes*. From this perspective the leader is at the center of group change and activity, and embodies the will of the group. Despite the many ways that leadership has been conceptualized, several components can be identified as central to leadership. They are:
- leadership is a process,
- leadership involves influence,
- leadership occurs within a group context,
- leadership involves goal attainment,
- leadership is related to the personal traits of the leader.

Leadership is characterized by the traits of the leader and these traits are connected with emotional intelligence.

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[1] Bass & Stogdill, Handbook of Leadership, 3rd Edition, Free Press, New York 1990, p. 11–20.

3. Emotional Intelligence in Business

The concept of emotional intelligence is an umbrella term that encompasses a broad collection of individual skills, competencies and dispositions, usually referred to as soft skills or inter-personal skills that are outside the traditional areas of specific knowledge, general intelligence, and technical or professional skills. Most of the authors on the topic agree that in order to be a well-adjusted, fully-functioning leader (or member of society, family member, spouse, employee, etc.), one must possess both traditional intelligence (IQ) and emotional intelligence quotient (dubbed EQ). This view fits well with the commonly held notion that it takes more than just brains to succeed in life – one must also be able to develop and maintain healthy interpersonal relationships.

Intelligent Quotient (IQ) is important. All organisations need people who are able to develop the right products and services. However, intellect alone is not enough. Research has shown that IQ does not guarantee success for individuals and that those who combine high IQ and high emotional intelligence are the most likely to succeed. Hence, there is a limit to what organisations can achieve without emotionally intelligent behaviour from all their people.

In a highly competitive marketplace, it is often not the product that will differentiate a company's success, but how it builds and develops relationships with its customers. The personal approach, which depends upon the human touch, relies on a high level of emotional intelligence. To put it very simply, your emotions are your most fundamental resource. You have them so as to guard your basic needs. When one of your needs is being threatened, your emotional energy signals to you.

The good news is that emotional intelligence can be nurtured, developed, and augmented. In contrast, IQ cannot be learned. You increase your emotional intelligence by learning and practising the skills and capabilities that make up emotional intelligence. These include self-awareness, emotional management, and self-motivation among others.

4. FIRO and Leadership Styles

In 1958, Will Schutz at Harvard University published his book on FIRO (Fundamental Interpersonal Relations Orientation). In this he said that every human being has three interpersonal needs. They are – inclusion, control and affection[2]. For each of these interpersonal needs there are three subdivisions.

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[2] W. Schutz, FIRO A Three Dimensional Theory of Interpersonal Behaviour (3rd edition), WSA Inc., Muir Beach 1998, p. 36.

Thus, people can be categorized into nine types based on interpersonal needs. In Table 1, the correspondence between the dominant leadership styles as developed by me and the FIRO subdivision is given.

Table 1. FIRO Types and Leadership

FIRO Types	FIRO-Subdivisions	Leadership styles
INCLUSION	Undersocial	Strategic leadership
	Social	Transactional leadership
	Oversocial	Visionary leadership
CONTROL	Autocrat	Charismatic leadership
	Abdicrat	Empowering leadership
	Democrat	Moral leadership
AFFECTION	Over-personal	Servant-leadership
	Personal	Entrepreneurial leadership
	Under-personal	Innovative leadership

The FIRO styles are connected with Emotional intelligence and the personality traits of the individual leader. These are given below:

5. Characteristics of Each of the Nine Leadership Styles

5.1. Leadership style 1: Strategic leadership

A strategic model of organizational performance includes the competitive position of a firm within an industry and to be competitive the leadership has a major role through strategic leadership. Strategic management can be defined as a series of steps in which organizational members analyse the current situation, decide on strategies, put those strategies into action, and evaluate, modify or change strategies as needed. It entails all of the basic managerial functions – planning, organizing, leading, and controlling. People with a dominant strategic style are thinking types who are excited by knowledge and expertise.

5.2. Leadership style 2: Transactional leaders

Transactional leadership is based on the concept of exchange between leaders and followers. The leader provides followers with resources and rewards in exchange for motivation, productivity, and effective task accomplishment[3]. Transactional

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[3] A. Nahavandi, The Art and Science of Leadership, Prentice Hall International, London 1997, p. 190.

leadership teaches leaders to provide contingent reward to reinforce appropriate behaviour and to discourage inappropriate behaviour. Transactional leaders are responsible and reliable. They make sure that the existing system is well-maintained. Normally, they look into all the details and make sure nothing goes wrong. They are highly logical and also fair-minded. In situations of conflict, they refer to rules and procedures. The rules and standardized operations work fine as long as today is just like yesterday. But when crises arise that do not precisely fit the rules, the system breaks down.

5.3. Leadership style 3: Visionary leaders

Visionary structures work best when the business calls for:
- flexibility,
- rapid change,
- high professionalism with little supervision,
- interdependent experts,
- cross-disciplinary ideas,
- innovation,
- complexity,
- advance planning,
- optimism about the future.

During these times of change, visionary leaders emerge with the following characteristics[4].

1) they are appropriate for the organization and for the times;
2) they set standards of excellence and reflect high ideals;
3) they clarify purpose and direction;
4) they inspire enthusiasm and encourage commitment;
5) they are well articulated and easily understood;
6) they reflect the uniqueness of the organization, its distinctive competence;
7) they are ambitious.

5.4. Leadership style 4: Charismatic leadership

Charismatic leaders are defined as leaders who have profound emotional effect on their followers. They are perceived not as simple bosses, but rather as role models and heroes who are larger than life. The issue of charismatic leadership surfaces when certain individuals emerge as leaders in either leaderless groups or to replace an appointed leader. Almost all the charismatic revolutionary leaders of

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[4] W. Bennis, Visionary Leadership, Jossey-Bass Publishers, San Francisco 1992, p. 29.

the world achieved their place without being formally designated. Distinguishing attributes of charismatic leadership are given as follows[5]:

Table 2. Charismatic leaders

Characteristic	Description of A Charismatic leader
Power base	They exhibit strong personal power
Leader-follower relationship	Transforms people to share the radical changes that they advocate
Articulation	Inspirational articulation of future vision and motivation to lead
Trustworthiness	Passionate advocacy by incurring great personal risk and cost
Likableness	Shared perspective and idealized vision makes them an honorable hero worthy of identification and imitation
Future goals	Idealized vision that is highly discrepant from status quo

5.5. Leadership style 5: Empowering leadership

Empowering leadership has its roots in the Japanese style of management, the quality circle efforts of the 1970s, and the psychological concept of self-efficacy. The underlying theme of empowerment is the giving away and sharing of power with those who need it to perform their job functions. Such power sharing provides people with a belief in their abilities and their sense of effectiveness[6]. Empowering leaders are participative decision- makers. The essence of participative style is the participation of many persons in decision-making. One expression of the participative style is democracy, in which representatives of the people, rather than a dictator, make decisions. Another expression is the participation of subordinates in decision-making. The most common form of this participation is group decision-making in which the head acts not as a boss but coordinates and facilitates decision-making by the group as a whole. This sort of decision-making is based on free and frank discussion, sharing of information and views, generation of many alternatives, and the gradual emergence of a consensus view to which everyone feels at least some commitment because it has emerged participatively.

5.6. Leadership style 6: Moral leadership

Moral leadership is based on the reality that we can not violate these natural laws with impunity. Whether or not we believe in them, they have been proven effective throughout centuries of human history. Individuals are more effective

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[5] A. Nahavandi, The Art and Science of Leadership, Prentice Hall International, London 1997, p. 184.
[6] A. Nahavandi, The Art and Science of Leadership, Prentice Hall International, London 1997, p. 89.

and organizations more empowered when they are guided and governed by these proven principles. They are not easy, quick-fix solutions to personal and interpersonal problems. Rather, they are foundational principles that when applied consistently become behavioral habits enabling fundamental transformations of individuals, relationships, and organizations. Moral principles, unlike values, are objective and external. They operate in obedience to natural laws, regardless of conditions. People with dominant Moral Leadership Style are guided by ethical values.

5.7. Leadership style 7: The servant leadership

Servant leadership is a concept developed by Robert Greenleaf and is given in his book 'On Becoming a Servant-Leader'[7]. A servant-leader is one who is a servant first. It begins with the natural feeling that one wants to serve. Then conscious choice causes one to aspire to lead. The difference manifests itself in the care taken by the servant—first to make sure that other people's highest-priority needs are being served. They exceed the expectations of their customers.

5.8. Leadership style 8: Entrepreneurial leadership

Much of modern management theory in the recent past is about trying to teach people to be entrepreneurial. The 'just-in-time management', which squeezes out savings by delivering components and materials precisely when they are needed instead of warehousing them, puts a high premium on planning and teamwork. Entrepreneurial leaders naturally manage by objectives as enunciated by Peter Drucker[8]. By building in plentiful and measurable feedback, they constantly read just along the way with the goal always in mind.

5.9. Leadership style 9: Innovative leadership

Innovative leaders are typically passionate and impulsive. They hold on to a strong personal vision and they are unwilling to compromise their vision. They lead with vigour and high energy when there is something to achieve which they consider important. When they confront an everyday problem, they may look high and low for an elegant answer and in the process come up with some of the possible innovative solutions in the following areas:
- new markets,
- new product ideas,
- new manufacturing approaches,

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[7] R. Greenleaf, Spirituality as Leadership, Greenleaf Center for Servant Leadership, Indianapolis 1988.
[8] P. Drucker, Management: Tasks, Responsibilities, Practices, Harper and Row, New York 1974, p. 430.

- new customer segments,
- new selling methods,
- new strategic directions,
- new services,
- new ways to sell old products,
- new adaptations,
- new performance compensation packages.

6. Conclusion

Using FIRO styles, I have linked Leadership styles and Emotional Intelligence.The dominant Emotional traits of a Leader and indicators of the dominant Leadership Style of that person. Awareness of one's own dominant leadership style can be a source of transformation because each style is in a way a limitation. On the other hand, awareness of other people's dominant leadership styles empowers a person to adapt and get the best from the other.

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The Impact of Tax Issues on the Financing Effectiveness of Capital Groups Using Cash Pooling Services

1. Introduction

The phenomenon of globalisation with its complex structure makes an increasing number of companies operate on the international scale and develop their structures at the same time. At present, large corporate organisations play a more significant role in all economies. Group related entities are also being established within the Polish economy. They do business both in Poland and abroad.

It is worth emphasizing that the behaviour of some group related companies may vary, even considerably, from other group related entities operating on the market. The conclusion is that there are multilateral relations among such entities, and also a different implementation of strategies and transactions. In order to make a comprehensive analysis of evaluation of group related entities, it should be conducted not only at the level of a group entity but also at the level of the group as a whole since due to numerous relations among entities a change of the situation in one entity which is a corporate group member may naturally result in the change of the situation in the whole group.

The demand for financial instruments thanks to which it is possible to coordinate and control group related entities grows proportionately with the growth of these groups. The improvement of the operation of group related entities is possible thanks to, for instance, the appropriate management of financial liquidity. The number of entities belonging to one group and the scope of their business relations determines the demand for financial instruments, which do not only lead to the simplification of management of the whole group but also allow the synergy effect to work. There is a linear dependence: the demand for these financial instruments grows proportionately to the growth in the number of entities within the group and the development of their business relations.

The desire to reduce costs related with the internal financing of group related entities and the maximum use of their own reserves creates the demand for financial instruments through which this goal is attained. Within cash management

systems which are to ensure the optimal financial liquidity in a given company, banks offer a product called a cash pooling service.

The prospects for the development of cash pooling services in Poland may be limited due to the lack of appropriate regulations on these services as well as certain interpretation difficulties. It is necessary to eliminate companies' doubts in relation to the tax consequences of these services, as thanks to its application the level of competitiveness of Polish companies will grow. Explicit guidelines on the application of cash pooling services will contribute to the improved effectiveness of capital groups management.

The present article outlines a specific nature of capital groups and discusses effective ways of financing them, including cash pooling, and also indicates a possible impact of the lack of tax regulations in this area.

The article has the following structure: the first section is devoted to the legal regulations which enable the development of group related entities with a particular interest in capital groups, the effective methods of financing and the advantages derived from the optimisation of interest cost within cash pooling. The second section of the article shows cash pooling interpretation difficulties from the tax perspective. The conclusions are presented in the summary.

2. Current legal regulations in Poland on corporate group related entities and capital groups goals

Legal regulations are a crucial issue with regard to the formation and operation of corporate groups as well as cash pooling services. In Europe, the establishment principles of corporate groups are defined by the Council Ordinance (European Economic Community) No. 696/93. According to the ordinance a corporate group is defined as follows: "An enterprise group is an association of enterprises bound together by legal and/or financial links. A group of enterprises can have more decision-making centres than just one, especially for policy on production, sales and profits. It may centralise certain aspects of financial management and taxation. It constitutes an economic entity which is empowered to make decisions, particularly concerning the units which it comprises"[1].

Taking the Polish business law into consideration, we will not find any complex regulations which would define the mode of establishment and principles of operation of corporate groups. There are only general legal regulations on their formation and operation.

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[1] Council Regulation (EEC) No. 696/93 of 15 March 1993 on the statistical units for the observation and analysis of the production system in the Community (Journal of Laws No. 76 of 30 March 1993, p. 1), STATISTICAL UNITS OF THE PRODUCTION SYSTEM IN THE COMMUNITY, SECTION 3.C.

The Code of Commercial Partnerships and Companies defines a commercial company as dominant[2] when[3]:

  a) "it controls, directly or indirectly, the majority of the votes at the general meeting of shareholders or general assembly, also as pledgee or user, or on the management board of another capital company (a dependent company), also under agreements with other parties, or

  b) it is entitled to appoint or dismiss a majority of the members of the management board of another capital company (a dependent company) or a cooperative (a dependent cooperative), also under agreements with other parties,

  c) it has the power to appoint or recall a majority of members of the supervisory board of another company (dependent company) or cooperative (dependent cooperative), also under agreements with other persons; or

  d) members of its management board constitute more than half of the members of the management board of another capital company (dependent company) or cooperative (dependent cooperative); or;

  e) it holds, directly or indirectly, a majority of votes in the dependent partnership or in the general meeting of the dependent cooperative, also under agreements with other persons; or

  f) it has a decisive influence on the activity of the dependent company or dependent cooperative".

The law on accounting[4] and the Ordinance of the Minister of Finance on the detailed principles of consolidated financial reports made by capital groups[5] (excluding banks or insurance and reinsurance companies) impose the requirement of making consolidated financial reports by capital groups according to the specified principles. The legislator indicates that the dominant company is obliged to conduct accounting activities within the capital group. It is worth mentioning that consolidated financial reports should be made in such a way as

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[2] Accounting Act (Journal of Laws No. 76 of 2002, item 694 as later amended) in art. 3 §1.37 determines a dominant company as a company having control of co-control over another company, in particular (art. 3 §1.37b) authorised to manage financial and operational policy of another (dependent) company independently or through assigned persons or entities on the basis of agreement with others authorised to vote, possessing according to the statutes or partnership agreement the majority of total number of votes in the decision making body.

[3] Act of 15 September 2000, Code of Partnerships and Companies (Journal of Laws No. 94, item 1037 as later amended), art. 4, §1.

[4] Accounting Law of 29 September1994 (uniform text Journal of laws No. 152 of 2009 item 1223, as later amended), art. 55.

[5] Ordinance of the Finance Minister of 25 September 2009 on detailed principles of consolidated financial reporting of capital groups, excluding banks and insurance or reinsurance companies (Journal of Laws No. 167 of 2009, item 1327).

if a given capital group were a single business unit. Furthermore, the accounting law defines basic notions like capital group, related, dominant, dependent, co-dependent entities etc.

Business combinations are also regulated by the International Financial Reporting Standards[6]. Since 2005 they have been effective in the territory of the European Union. According to this standard, the business combination means a combination of separate business entities or undertakings into one reporting unit. A reporting unit is a single entity or group consisting of a dominant entity and all its subsidiaries. Furthermore, the IFRS defines financial reporting principles in association with business combinations. It indicates that the combination should be settled through the method purchasing, i.e. the acquiring entity encompasses all assets, liabilities and conditional liabilities of the acquired entity according to the fair value on the day of acquisition as well as the goodwill of the company. Moreover, it is assumed that the goodwill of the acquired company within the business combination is not amortised.

The Act on Competition and Consumer Protection[7] considers the principles of concentration and ways of counteracting the monopolist position. According to this Act, the capital group consists of all entrepreneurs, who are subject to direct or indirect control exercised by one entrepreneur.

The regulations concerning the forming of the so-called tax capital group are regulated by the law on income tax concerning legal persons[8]. It presents some limitations on the formation of tax groups, namely: they may be formed by limited liability companies or joint stock companies based on the Polish territory and meeting explicitly defined conditions.

Complex organisational forms of diversified operations have their peculiar characteristics, specific structure and different operations, but first of all they are subject to different rules than singles companies[9]. The market of these structures grew in the 1970s and 90s. The growing liberalisation of the financial system, the development of outsourcing processes and the necessity of possessing flexible structures reacting dynamically to market changes constitute the set of effects in favour of processes limiting the number and role of capital groups[10].

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[6] IFRS No. 3 "Business Combinations".

[7] Act of 16 February 2007 on Competition and Consumer protection (Journal of Laws No. 50, item 331, as later amended), Art. 4.

[8] Act of 15 February 1992 on Income Tax from Legal Persons (Journal of Laws of 2000 No. 54, item 654, as later amended), Art. 1a.

[9] M. Aluchna, Kierunki rozwoju polskich grup kapitałowych (Development trends of Polish capital groups). Perspektywa Międzynarodowa (International perspective), Oficyna Wydawnicza SGH, Warsaw 2010, p. 9.

[10] M. Aluchna, Grupy kapitałowe w dobie globalizacji (Capital groups in the era of globalisation), in: Gospodarka Polski: system funkcjonowania i zarządzania w dobie globalizacji i internacjonalizacji

The goals of forming and establishing a capital group may vary. However, the basic ones are:
- typically investment goal perceived as the return on the invested capital,
- strategic goal,
- operational goal.

It should be stressed that the choice of the goal when establishing a capital group is crucial for it as later it affects its organisation as well as the significance and effectiveness of allocation of resources within this group.

Investment goals oriented capital groups are an example of structures where active management policy inside the group is rare.

Strategic goals oriented groups are the ones in which the management board of the parent company sets only general goals, without direct operational coordination of activities of the companies forming the group. In such a situation active allocation of resources is difficult but not impossible. The major areas of resource allocation in a capital groups are[11]:
- financial flows (internal financing),
- allocation of non-financial tangible resources (e.g. sharing fixed assets, leasing, franchising),
- using non-material assets (first of all human resources but also intangible assets).

Operational goals oriented capital groups are an example of structures in which the management board wishes to have an impact on the operations of its subsidiaries. It is crucial then to appropriately manage monetary flows and coordinate resources.

Internal resources flow in a capital group is of utmost significance due to:
- cost optimisation,
- improved efficiency of operational activity,
- easier, more effective and cheaper access to resources.

Within the internal flow of resources there may be problems with the effective organisation of such a flow, for instance in the form of:
- communication and coordination problems,
- problems of resource identification of inside the company,

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procesów ekonomicznych (Poland's economy:system of functioning and management in the era of globalisation and internationalisation of economic processes), ed. R. Bartkowiak, J. Ostaszewski, Oficyna wydawnicza SGH, Warszawa 2009, pp. 161–170.

[11] W. Ratymirski, Zarządzanie zapasami i wewnętrzny przepływ kapitału – efektywne poszukiwanie źródeł wewnątrz firmy (Stock management and internal capital flow – effective search for resources within the company), conference materials: Przepływy pieniężne w grupie kapitałowej (Monetary flows in a capital group), Warsaw 14–15 June 2011.

- financial problems;
- legal problems;
- diversified management ambitions in subsidiaries.

3. Effective types of financing within a capital group and selected cash resource management methods

Effective types of financing in capital groups are presented in Figure 1. The financial instruments are divided into own and third-party instruments.

Figure 1. The financial instruments of a capital group
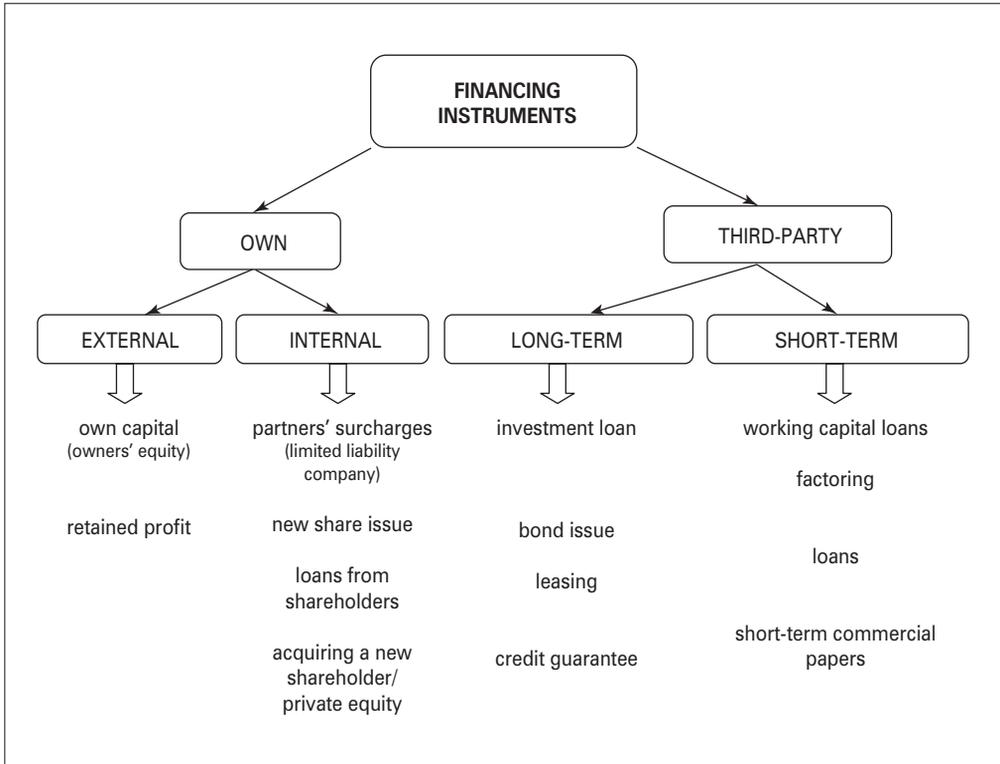
Source: own material on the basis of: G. Ochędzan, Efektywne finansowanie w grupie kapitałowej Effective financing in a capital group), Conference materials: Przepływy pieniężne w grupie kapitałowej (Monetary flows in a capital group), Warsaw 14–15 June 2011.

A capital group's own external financing instruments include:
- own capital (owners' equity),
- retained profit.

On the other hand, a capital group's own internal financing instruments are:
- shareholders' surpluses (limited liability companies),
- shares issue,
- loans from shareholders,
- acquiring new shareholders/private equity.

Third-party external financing instruments of a capital group include:
- investment loans,
- shares issue,
- leasing,
- credit guarantee.

And, the third-party internal financial instrument of a capital group include:
- working capital loans,
- factoring,
- loans,
- short-term commercial papers.

The sources mentioned above have both advantages and disadvantages.

Undoubtedly, long-term capital in the form of share issue, as well as the control by the present shareholders in the case of a majority stake are the key share issue advantages. A disadvantage in this case is a higher cost of capital or lower value of profit share on the part of current shareholders as well as the lower influence of current shareholders on the company.

The advantages of bond issue include for instance:
- retaining control over the company,
- opportunity to decide about the conditions and time of repayment,
- rise in the market value of the company,
- lower operational costs, i.e. the lack of close control by bondholders in comparison with bank loans.

And, the disadvantages of the bond issue include:
- necessity of repayment due to the third-party type of financing,
- the practice shows that under Polish conditions bond issue is as a rule more expensive than a bank loan.

The advantages of a bank loan as a source of financing are:
- a cheaper source of financing with borrowed capital in comparison with the bond issue capital,
- legitimising the company for partners, suppliers, insurers etc.,
- economies of scale with regard to cooperation, i.e. through the cooperation with banks in the area of numerous products, e.g. loans, foreign exchange and cash management generate additional savings.

The disadvantages of bank loan financing include:
- necessity of undergoing a credit procedure which does not have to be successful,
- necessity of possessing a considerable collateral (sometimes up to 150% of the loan value),
- lack of opportunity to choose the conditions (covenants, breach of agreement etc.).

Commercial papers are regarded to be an effective financing instrument due to a low capital cost, short preparation time and the possibility of rolling over the papers that are to be repaid into a new issue. On the other hand, there is a disadvantage: as they are available only for large companies with an extremely good credit rating.

In order to effectively manage cash, it is necessary to consider two aspects[12] firstly:
- a minimised level of current cash with the simultaneous maximisation of benefits resulting from its possession,
- a quick flow of cash in the company.

The increased speed inflow of cash resources to the company may be achieved through the issue of sales documents on time and the choice of appropriate forms of payment as, for example, money order[13]. Another stimulus to accelerate the inflow may result from the settlement of time and mode of transferring cash from customers by the company employees, e.g. transferring cash takings and cheques to banks for settlement. It is worth stressing that the efficiency of the bank in which the company allocates its funds is of considerable significance.

The planning of short-term corporate demand for funds should be preceded, for example, by calculations of the speed of receivables inflow and liabilities settlement.

A preliminary estimate is a tool to conduct fund planning. It includes the schedule of receivables inflow, and also the projection of delays or expenses like the purchase of fixed assets, rents, wages, tax charges, credit instalments etc.). Such a preliminary estimate may be made in quarterly, monthly or daily cycles. It should be indicated that the estimate presents a cash flow forecast posing different risk like changes in sales or receivables payment delays. In order to obtain a more reliable view, it is advisable to apply, if possible, the Monte Carlo simulation[14].

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[12] M. Sierpińska, D. Wędzki, Zarządzanie płynnością finansową w przedsiębiorstwie (Corporate financial liquidity management), PWN, Warsaw 2002, p. 222.

[13] J. Grzywacz, Bankowość elektroniczna w działalności przedsiębiorstwa (Electronic corporate banking), Oficyna Wydawnicza SGH, Warsaw 2004, p. 69.

[14] G. Michalski, Płynność finansowa małych i średnich przedsiębiorstw (SME financial liquidity), PWN, Warsaw 2005, p. 196.

Other economic models like the Baumol, Miller-Orr or Stone models also determine the optimal level of corporate cash resources, but they are not applied on a large scale in real terms[15].

The maximisation of advantages resulting from the possession of cash includes:

- minimisation of cash levels in a given company,
- maintenance of a certain amount of cash on a bank account,
- use of the system of deposits offered by banks (overnight deposits earn higher interests than the interest rate on current accounts),
- investment in the so-called liquid commercial papers (treasury or commercial bills).

These activities eliminate the effects of the loss of the real value of money due to inflation.

Large companies with well-developed structures may have difficulties connected with the effective use of funds. Transferring cash among the accounts of capital groups should serve the effective use of funds within the corporation and the minimising of both transactional and external financing costs.

Company managers, including group related entities, face a serious task. They should acquire the financing sources that allow them to maintain their financial liquidity. The evaluation of the liquidity of a given company should not focus only on the risk management system but also on the current or long-term financial situation of the company. It should begin with the diagnosis of the present state and finish with the presentation of changes in its operational conditions. In the period of crisis, the difficulties with financial liquidity may be observed on a large scale. Then, frequent payment delays, which may be deliberate, causes an overstrained payment discipline. The maintenance of an adequate level of financial liquidity determines the effective operation of a given company or group related entities and their credibility. It is worth noting that the adequate level does not mean the highest level possible but the optimal level. The effective operation of a given company or group related entities may be threatened not only with a too high level financial liquidity but also a too low level of it. The first situation may indicate the ineffective use of resources reflected in the possession of an excessive amount of cash. However, in the period of crisis, in such a situation the company possessing funds in its account may consider the acquisition of competitors and in this way develop its operation and implement its strategic goals. In the latter situation the financial liquidity deficit

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[15] G. Michalski, Wartość płynności w bieżącym zarządzaniu finansami (Value of liquidity in current finance management), Wydawnictwo CeDeWu, Warsaw 2004, p. 150.

generates costs of its own maintenance, which may be reflected, for example, in credit interest or may cause a loss of advantages, e.g. interest on deposits from bank allocated free funds.

4. The advantages of interest cost optimisation in a capital group applying cash pooling

Cash pooling, an instrument offered to companies, is aimed at the effective use of money accumulated on different bank accounts. As a rule, this instrument is used in capital groups. The major idea is to balance the accounts of group related companies into one central account. These actions are conducted in order to minimise the interest costs. Within the cash pooling system, funds are available to all the entities belonging to the capital group in order to improve their liquidity, which, in turn, affects the financial liquidity of the whole group.

Table 1 presents the mechanism of cash pooling.

Table 1. Example of the cash pooling service mechanism

Firm	Account balance	Annual interest	Interest per day*	Cash pooling application interest per day*
X	+400 000	1	+10.96	--
Y	−800 000	10	−219.18	--
Z	+200 000	1	+5.48	--
Total	**−200 000**	**--**	**−202.74**	**−54.79**

* interest calculated for 365 days in the year.

Source: own materials.

If the capital group used cash pooling, it would save 147.95, as within the cash pooling solution, interest in calculated on the global balance. Thus, the interest on 200,000 would amount to 54.79. Without the application of cash pooling the company would be charged with the amount of 202.74 due to the interest paid on the negative account balance.

The literature distinguishes two types of cash pooling:
• real cash pooling (zero-balancing cash pooling);
• and unreal cash pooling (notional cash pooling).

The notional cash pooling agreement requires a central account that is run virtually, hence even if balances in individual accounts of group members may be negative or positive, no money transfers are made. Interest to be received or paid is calculated on the so-called collective group balance.

The zero-balancing cash pooling agreement assumes a real cash flow. On the central account, cash flows between the members of a given capital group are registered. At the end of the day all balances are joined and transferred to the consolidated account. The surplus on this account covers negative balances. On the next morning contrary transfers are made, which means the return to the previous day's balances. The bank calculates the interest on the consolidated account global balance and transfers or charges funds on account of interest.

It is worth mentioning that irrespective of the kind of cash pooling agreement, the agreement should include the following issues:
- principles of the level of global balance interest (negative and positive),
- principles of the calculated interest division,
- money surplus investment,
- remuneration of the entity responsible for the cash pooling organisation, i.e. pool leader (the bank or one of the capital group related entities).

The most significant cash pooling advantage is the minimisation of credit financing costs at the global level due to the utilisation of the group's own funds with the simultaneous optimisation of the global financial position[16]. The exemplified optimisation of interest costs and incomes (Table 2) is a key advantage of cash pooling. Furthermore, the financing of fund deficits is more costly in the case of using credits or commercial papers. The application of cash pooling allows the company to possess lower precautionary fund resources thanks to easier deficit covering transactions.

The whole capital group common policy results in the situation in which entities do not have to make everyday individual decisions on the allocation of positive balances or covering negative balances. They do not need to have units responsible for money market analysis. Such a common policy conducted by a pool leader translates into the achievement of economies of scale in the form of, for example, the opportunity to negotiate the interest with the bank. It should be stressed that in the case of transaction involving transnational companies, the uniform financial policy translates into the reduction of currency risk.

5. Tax interpretations of cash pooling agreements

The development of cash pooling services in Poland is difficult due to the lack of explicit and transparent legal regulations. Cash pooling is an unnamed agreement in the civil law, and that is why the regulations of the Civil Code are applied. In

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[16] H. Zawal-Kubiak, Cash pooling – skutki w podatku dochodowym (Cash pooling. Impact on income tax), Przegląd Podatkowy (Tax Review) No. 2/2004, p. 14

the Polish tax law, there are no regulations concerning this agreement, either. The issue of consolidation is subject to banking law[17], according to which: "in the agreement concluded by companies forming a tax capital group… funds deposited in bank accounts and credits or loans, for which consolidated interest has been determined, bear no interest".

The civil and legal transactions tax Act (PCC)[18] includes a closed catalogue of transactions subject to PCC. Cash pooling is not enumeratively mentioned in this act. Thus, it cannot be levied with tax on civil and legal transactions. Despite this, entrepreneurs are afraid that the cash pooling agreement may be treated as a loan, which, in turn, is subject to tax (tax rate of 2%)[19]. There are some arguments which argue in favour of the idea that cash pooling should not be treated as a loan:

- in the case of the notional cash pooling agreement there is no physical transfer of funds, and it this operation that is a prerequisite for the transaction to be regarded as a loan,
- in the case of the zero-balancing cash pooling there is a physical transfer of funds, however, at the end of the day it is possible to indicate the entities possessing positive and negative balances, which, in turn, does not mean that it is possible to determine the parties to the agreement, i.e. one of the prerequisites to treat the transaction as a loan. It is should be stressed that the stance of the Ministry of Finance is different as "such an agreement may include in its content objectively significant elements of a loan agreement, whose parties are individual companies"[20], which indicates that it may be subject to taxation on the basis of the law regarding the tax on civil and legal transactions. However, it should be added that according to this Act the Ministry of Finance, in certain cases, may exempt the agreement from taxation.

There are some examples of treasury institutions opinions on the structures of cash pooling with respect to taxes on civil and legal transactions:

- "cash pooling construction, as a way to manage free funds of participating entities, despite including certain elements of a loan agreement, does not possess the crucial features. (…) There are no grounds to qualify

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[17] Act of 29 August 1997, Banking Law, (Journal of laws of 2002 No. 72, item 665) and Amendment of 1 April 2004 (Journal of Laws of 2004 No. 91, item 870 as later amended), Art. 93a.

[18] Act of 9 September 2000 on Tax on Civil and Legal Transactions (text Journal of Laws of 2005 No. 41, item 399, as later amended), Art. 1.

[19] G. Brycki, Lepiej nie igrać z fiskusem (You'd better not play with the taxman), „Rzeczpospolita", No. 27(6710) of 2 February 2004, p. B5.

[20] E. Mucha, Reply of the Undersecretary of State in the Ministry of Finance – authorised by the Minister – to repeated interpellation No. 6005 by MP Ryszard Nowak given on 2 July 2004.

these transactions as loans although these agreements include elements of crediting of some companies by others. In this connection, a cash pooling agreement is not subject to tax on account of the law of civil and legal transactions"[21],

- "conducted by entities belonging to a Group of Companies, via a bank, service activities of complex financial liquidity management are recognised as loans according to Art. 16 Section 7b. of the aforementioned Act (...) thus, in this case restrictions with regard to the qualification of interest to tax deductible costs is not applicable"[22],
- "(...) cash pooling agreement (...) will not be (...) subject to tax on civil and legal transactions"[23].

Interpretation problems can also be seen with regard to the Act on Income Tax of Legal Persons[24]. While analysing the effects of cash pooling it appears that the company gains certain interest income and incurs certain interest costs as well as bank charges which, with no doubts affect the tax base. Consolidated accounts are calculated according to the cash method, i.e. from the tax perspective interest income become effective at the moment of its acceptance by a cash pooling participant, whereas interest costs may be recognised as tax deductible cost on the day of its transfer from the account. It is crucial to describe transfers between the consolidated account and participants' own accounts in such a way as to give no rise to doubts with regards to transfers made only to levelling the accounts and the real transfers of interest.

There are also some doubts about the so-called thin capitalisation. Capitalisation is insufficient when the statutory limits of credit indebtedness to related entities are exceeded by a subsidiary. The legislator, in the Act on income tax of legal persons, exempted from tax deductible costs "interest on credits and loans granted to the company by its shareholder possessing at least 25% of the shares, if the volume of indebtedness to this co-owner exceeds threefold the share capital, the exemption does not concern the whole all the interest but is calculated proportionally"[25]. Thus, there is a question to be asked. Should these limits include flows between the consolidated account and individual accounts of related entities? The same arguments are to be used as those in favour of the exemption of cash pooling from the tax on civil and legal transactions. The

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[21] Interpretation: Kujawsko-Pomorski Treasury Office, 17 September 2004, ZD/436-3/04.
[22] Interpretation: Świętokrzyski Treasury Office, 29 May 2006, RO/436-2/06.
[23] Interpretation: The first Masovian Treasury Office in Warsaw, 17 February 2006, 1471/DC/436/59/05/HB.
[24] Act of 15 February 1992 on Income Tax from Legal Persons (Journal of Laws of 2000 No. 54, item 654 as later amended).
[25] Ibidem, Art. 16, §1. 60–61.

difficulties that arise in the process of determining the parties to the possible loan translate into the failure to find out by the Treasury authorities any possible breaches of restrictions concerning insufficient capitalisation[26].

The issue to interpret is the situation in which the cash pooling agreement is entered into by both domestic and foreign entities. According to the law on income tax from legal persons, "interest gained on the Polish territory by entities based outside the territory of the Republic of Poland is levied with lump-sum tax of 20% of revenue[27]. These regulations were introduced in order to avoid a double taxation. However, there is a possibility for a lower rate to be applied or to be entirely exempted from tax. It appears to be a safe solution to obtain the so-called residence certificate from all the foreign entities which are parties to the cash pooling agreement and then make use of the rate based on the agreement on the avoidance of double taxation[28].

Treasury offices may object to the agreements on the basis of which funds are managed in the capital groups. If these institutions regard cash pooling transaction as non-market operations, in particular with regard to the issue of the level of interest balance, the principles of interest payment or the amount of commission for the pool leader (especially if it is an entity from the same capital group), according to the law on income tax of legal persons[29] market estimates should be made and overdue tax stated.

It is important that companies concluding transactions with capital related entities are obliged to record tax documentation. According to the law on tax of legal persons[30], the documentation is required when the value a transaction exceeds the limit of 30,000 euros from financial services. The interpretation of the Ministry of Finance says that there is an obligation to document transactions within cash pooling between related entities.

The opinion of a Treasury office about the cash pooling structures with regard to income tax from legal persons is as follows:

when the Company, as a negative owner, pays interest via bank in favour of positive owners, the interest will constitute a tax deductible income at the moment of actual payment made by the Company, i.e. current account being debited by the bank; their treatment is identical to bank credit interest (...) payment for bank services made by the Company on the basis of the agreement (single initial

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[26] H. Zawal-Kubiak, Cash pooling..., *op. cit.*, p. 17.

[27] Act of 15 February 1992 on Income Tax of Legal Persons (Journal od Laws of 2000 No. 54, item 654 as later amended), Art. 21.

[28] H. Zawal-Kubiak, Cash pooling..., *op. cit.*, s. 18.

[29] Act of 15 February 1992 on Income Tax from Legal Persons (Journal of Laws of 2000 No. 54, item 654 as later amended), Art. 11.

[30] *Ibidem*, Art. 9a.

payment and monthly payment) may be treated as tax deductible cost connected with the company operation[31].

Certain doubts may also appear with regard to regulations included in the law on tax on goods and services[32]. Due to the fact that cash pooling is considered to be a complex financial service rendered by banks in favour of companies from a given capital group, which makes the service exempt from tax on goods and services. Furthermore, companies belonging to a capital group do not render direct services to each other, and that is why they do not possess the status of a taxpayer on account of goods and services. The participation itself in cash pooling structures does mean rendering services. An actual and legal activity conducted by an individual account holder does not constitute a goal in itself; it is to render a complex service by the bank.

The opinion of a Treasury office on cash pooling structures with regard to tax on goods and services is as follows:

- "(...) taking into account (...) characteristic features of cash pooling, it should be stated that in this case the bank plays the role of a service provider. Thus, the entity which registers turnover on account of rendering a cash pooling service is the bank, not the company. Assuming that the service does not mean service imported by the Company, it does not consider it in the VAT-7 (or VAT-7K) declaration[33]".

In order to eliminate tax doubts caused by cash pooling, it is advisable to apply to the Treasury office for the interpretation of this issue. Such an interpretation helps avoid all consequences resulting from the reclassification of a cash pooling agreement as a loan. The lack of top-down regulations of cash pooling tax issues makes banks offering this service acquire knowledge from financial advisers and the Ministry of Finance in order to follow lucid rules.

6. Summary

Both cash and its equivalents are an indispensable aspect of operation of any company. Money stored in the bank or in the safe earns a low rate of return; that is why this resource management uses different tools aimed at the determination of an optimal level of cash. Large multi-division companies, including capital

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[31] Interpretation: Małopolski Treasury Office, 2006-02-24, DP1/423-87/05/16258/06.

[32] Act of 11 March 2004 on Tax on Goods and Services (Journal of Laws of 2011 No. 177 item 1054, as later amended), Art. 43.

[33] Interpretation: The Second Masovian Treasury Office in Warsaw, 2006-05-09, 1472/RPP1/443-256/06/ MK.

groups, may apply cash pooling services which has an effective impact on fund management bringing a large amount of profit.

Financial liquidity means first of all that transactions are conducted easily. Capital groups due to their complex structure should have effective financing and fund management. This study indicates a wide variety of available instruments that improve the financing of capital groups.

The cash pooling service is an effective method of cash resource management. The opportunity to transfer cash resources between capital groups accounts contributes not only to the effective use of resources within the corporation but also to the minimisation of both transactional costs and costs of external financing. The cash pooling technique within the common policy leads to the optimisation of the costs and interest incomes, economies of scale and also in the case of transactions between transnational entities the reduction of currency risk.

Tax regulations are not uniform, which limits the development prospects of cash pooling services. It should be stressed that companies can apply to their Treasury offices in order to obtain their interpretation. The acquisition of such a document explains doubts with regard to the cash pooling agreement. In practice, it may be observed that banks offering this product make use of tax advisers' opinions to create lucid rules. The problem connected with legal and tax regulations points to the area in which some activities should be undertaken to improve the implementation of the effective service of cash resource management, i.e. cash pooling.

In conclusion, it is my opinion that the statement is legitimate that companies collapse as a rule due to the loss of liquidity; and the application of cash pooling as an effective method of fund management affects the improvement of efficiency of fund management and the performance of the company.

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An Enterprise: The Integrated Approach. Several remarks on the emergence and development of a new scientific discipline

1. Introduction

The article is primarily aimed at the presentation of selected remarks – observations, doubts, questions and conclusions – that accompany the increasingly frequent isolation of a business enterprise as a distinct area or even discipline of scientific cognition. The assumption to go with the presentation is that the current substantive and general cognitive (research and didactic) as well as methodological (workshop, didactic) determinants of our knowledge of an enterprise have reached the advancement which justifies the perception of this field of knowledge as the one capable of developing in the future to become a relatively independent, autonomous scientific discipline.

Making an assumption on the growing level of epistemological identity of an enterprise cognisance as well as on increasing attempts to formulate sets of universal contents concerning enterprise, the title remarks will be well organised in the mutually complementary sections including:
- determinants of the emergence and development of a new scientific discipline based on the integrated, interdisciplinary approach to a business enterprise,
- the position of an emerging scientific discipline dealing with an enterprise, its relations within the system of economics based sciences,
- most frequently raised contents and issues determining the substantive scope of the emerging scientific discipline.

Irrespective of further remarks, it is worth mentioning that they do not exhaust the problem, nor do they claim the right to ultimate settlements. They are only to introduce a possible, undoubtedly necessary discussion which could involve not only the academic environment but also representatives of numerous practitioners related to a modern enterprise.

2. Determinants of the creation and development of a new discipline

The process of inception and accumulation of knowledge connected with enterprise is, naturally and comprehensibly, closely connected with the transformations and evolution of the enterprise itself, which is in its very nature a historical and social category[1]. From this perspective, in a sort of "first instance," numerous determinants of the emerging new scientific discipline should be perceived and analysed. In order to reduce the number of remarks and highlight the most current and significant issues, it is worth analysing closely at least two complementary groups of determinants.

The first group of determinants of the inception and development of the new discipline is connected with the unprecedented growth in the complexity of socio-economic matter that have come into effect in the few last decades. It is omnipresent and concerns not only enterprises. The nature of the problems determining this complexity gave rise to the necessity of a multifaceted, interdisciplinary approach in order to at least partially and temporarily mitigate the exponentially growing risk or even uncertainty resulting from this complexity. The formula of an integrated, interdisciplinary approach to the general foundations of enterprise as well as the detailed methods and rules shaping its operation and development has become a peculiar imperative. It determines not only the corporate management practices or sources of compulsory flexibility but also forms the basis of scientific approach and cognisance of an enterprise.[2] Interdisciplinary approach:

- is naturally eclectic, but used in a suitable way creates also new possibilities of cognition, and does not deserve exclusively critical assessment,
- enables new conclusions and creative development of the researched matter exactly on the basis of a broader formula of the isolated field of knowledge integrating various perspectives,
- remains methodologically not as rigorously obligatory as the more formalised theoretical perspective leading to numerous theories which are built on the basis of individual disciplines, frequently of different coherence level, hardly coping with the complex reality[3].

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[1] See more: Przedsiębiorstwo, wartość, zarządzanie (Enterprise, value, management), ed. C. Suszyński, PWE, Warsaw 2007.

[2] On flexibility of modern companies, see more: Zarządzanie przedsiębiorstwem w turbulentnym otoczeniu (Corporate management in turbulent environment), ed. R. Krupski, PWE, Warsaw 2005.

[3] With regard to the enterprise itself A. Noga presents 27 theories of this kind – see more: A. Noga, Teorie przedsiębiorstwa (Theories of the firm), PWE, Warsaw 2009.

Even very complicated enterprise models which enable the development of its different theories, but built on the basis of one scientific discipline, e.g. economic, financial or organisational model[4], even if still retaining their demonstrative nature, they are not sufficient to provide description, and in particular to comprehend the phenomena and processes that actually determine the complexity of modern enterprises. In this situation, it was natural and necessary to combine on common ground the accomplishments of other, infrequently seemingly distant disciplines from the area of enterprise – from cybernetics to anthropology. Only such a treatment makes it possible to thoroughly demonstrate a multifaceted corporate structure of enterprise, to understand complicated corporate dynamics, and to introduce possible rules and accurate development. Thus, what remains significant is the interdisciplinary reasoning as a stimulus to expand and refine the emerging new discipline that tends to explore and describe an enterprise in accordance with the scientific approach principles.

The second group of determinants of the inception and development of this new discipline is connected with the current erosion of the paradigms of scientific cognition applied so-far[5]. Important cognitive limitations and transitions resulting from them in relation to enterprises are evident for instance in the following interrelated sections:

- cognition formula – long dominating analytical concluding on the whole enterprise on the basis of its detailed examination and moulding its parts (induction, *pars pro toto* technique) is replaced by, what is closer to the complex reality, the synthetic comprehension of the whole as a deduction condition, not infrequently simply intuitive treatment (construction, use) of corporate constituents,
- the whole and parts (units, elements, resources, operation) composing the enterprise – from this perspective it stops being perceived as a simple arithmetic sum subject to traditional allocation optimisation, and becomes a phenomenon requiring a multifaceted treatment in the process of generating additional, infrequently specific effects (synergy),
- departure point – key importance in cognition and operation of enterprise shifted from structural issues to the process and process approach to its operation, with a special role of the final user as a link of ultimate

[4] More thorough analysis of this kind of models is to be found, in: T. Gruszecki, Współczesne teorie przedsiębiorstwa (Modern theories of the firm), Wydawnictwo Naukowe PWN, Warsaw 2002.
[5] T. S. Kuhn, Dwa bieguny. Tradycja i nowatorstwo w badaniach naukowych (Polar opposites. Tradition and innovation is scientific research), PIW, Warsaw 1985. See also: Ł. Sułkowski, Epistemologia w naukach o zarządzaniu (Epistemology in management sciences), PWE, Warsaw 2005.

verification not in terms of simple utility but broadly understood value provided by the enterprise.

- enterprise borders – in place of an explicitly structurally isolated entity of distinct, even physically defined borders there appears a creature of blurred scope tending to shift them further inside the current corporate environment, to engage partners on the plane of modern process solution (coopetition) and ephemeral form (networked enterprise, the virtualisation process)[6].

As a result of the aforementioned and derivative phenomena and processes, there is a growing need for a new paradigm of an enterprise, closer to its present day nature than that stuck in the area of the truth of the time of Taylor, Fayol or Weber. It is another strong determinant of the development of a new scientific discipline to research a contemporary enterprise, which while remaining a pre-paradigmatic discipline, has a unique chance to coin its own identity based on the contribution to the formulation of a new corporate paradigm.

3. An enterprise: The integrated approach – its position and relations within a broader system of economics-based sciences

The allocation of the emerging discipline within a broader system of scientific cognition is neither simple nor explicit. On the one hand, we have to do with the growing fragmentation of many areas and disciplines, the isolation of others, narrower cognition areas, and simultaneously deeper specificity of the object of interest and the related specialisation in practice. These phenomena reflect an objective process of knowledge growth and the methods of its application. The tendency to isolate the knowledge in the area of business management only confirms the modern trends. On the other hand, a far reaching arbitrariness is to be noted, partly formal nature of applied divisions and classifications, including those based on economics, resulting from totally different, sometimes simple administrative needs, e.g. the qualification of research work for a scientific degree. In this situation, accurate allocation of another discipline exploring an enterprise is as difficult as prospectively significant, especially considering its preliminary stage of development.

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[6] J. Cygler, Kooperencja przedsiębiorstw. Czynniki sektorowe i korporacyjne (Corporate coopetition, Sectoral and corporate factors), SGH, Warszawa 2009; M. Werner, M. Witzel, Zarządzanie organizacją wirtualną Virtual organisation management), Oficyna Ekonomiczna, Krakow 2005.

When attempting to allocate the place the new discipline of science, it seems useful to consider the following sequence of ascertainments[7]:

- apparently, enterprise is the most common form of socio-economic organisation,
- the scope of operation and the nature of enterprise as a social organisation indicate the legitimacy of allocation of the emerging discipline first of all in the area of sciences treating business organisation as a basic object of interest,
- sciences treating business organisation as a basic object of interest are sciences based on economics; however, it is impossible to ignore sciences based beyond economics (e.g. sociology), partly focusing also on enterprise,
- sciences based on economics are first of all economics themselves, in particular microeconomics as a fragment of theory of economics dealing with regularities of operation of individuals and enterprises; and management sciences, especially in the area concerning business organisation management,
- economics and management sciences determine the basic area of interest of the new discipline based on the integrated approach to an enterprise,
- the new discipline is allocated to a large extent at the junction of microeconomics and business organisations management,
- an enterprise: the integrated approach may be perceived in the aforementioned context also as a sub-discipline of the organisation science.

Disregarding the doubtless disputability as well as more thorough justification of the aforementioned proposal to inscribe the new discipline exploring an enterprise in a broader context of scientific cognition, two important circumstances are to be quoted.

First, in the vital interest of this science, its further development and refinement, it should not aspire, as prompted by the ambition of researchers, to be prematurely isolated from other fields and disciplines based on economics. It is advisable for the contents, goals and methods to possibly at length, symbiotically penetrate one another.

Second, in this approach there appears a chance to inscribe a considerably more mature scientific discipline in an integrated system of the knowledge of socio-economic processes. The possible creation of such a meta-system in the future appears to be a target formula of comprehensive cognition of these processes, no matter how difficult to attain it may prove to be.

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[7] The presented ascertainments are based on the divisions and classifications included in the study: S. Sudoł, Nauki o zarządzaniu. Węzłowe problemy i kontrowersje (Management sciences. Crucial problems and controversies), Wydawnictwo „Dom Organizatora", Toruń 2007.

4. Most frequently raised contents within the emerging discipline

The basic observation on the most frequently raised problems and issues determining the substantive scope of the new discipline based on the integrated approach to an enterprise leads to the statement that there is a great diversity of presented contents. It is difficult to explicitly comment on; often underlying the subjectivity of authors or groups and research environments working on the selected problems of enterprise. There are still no legible and universal criteria to enable to the qualification of given contents within the scope of the emerging discipline, thus to crystallise its cognitive and methodological core. Apparently, such a situation may be perceived in a dual mode. On the one hand, it is natural in the case of an emerging discipline, whose openness and inaccurately defined character combined with the complexity of the matter simply encourages the broad treatment of its scope, and even to a certain extent justifies these efforts (creation of dominium). On the other hand, the determination of a more explicit and distinctive field of the premature discipline, not limiting anything as far its extension is concerned, enables faster advancement, specialisation, development of its own unique research methods, etc. (building the identity of a scientific discipline).

In order to determine of the proper research area of the emerging discipline, it may be useful to apply a simple action consisting in the comparative analysis of contents presented to students within the domestic written studies – textbooks to study the integrated, interdisciplinary approach to an enterprise.

Preliminary important conclusions resulting from the analysis of the presented contents are shown below[8].

1) formulating the substantive scope of the new discipline should be made by numerous research teams (exclusively team written studies). It explicitly indicates a broad cognitive context, but at the same time also signals the problem of the integration of these contents to the form of a relatively homogeneous matter specific to a given discipline;

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[8]   For comparison, three domestic studies were selected for reasons quoted below:
1) Podstawy nauki o przedsiębiorstwie (Introduction tobusiness enterprise science), ed. J. Lichtarski, ed. IV, AE Wrocław, 2001 – one of the oldest, pioneer studies in this area, prepared by the Wrocław research environment;
2) Nauka o przedsiębiorstwie. Wybrane zagadnienia (Business enterprise science. Selected issues), ed. I. Lichniak, SGH, Warsaw 2009 – the only study on the topic published at our university;
3) Podstawy nauki o organizacji. Przedsiębiorstwo jako organizacja gospodarcza (Introduction to the science of organisation. Enterprise as business organisation, ed. S. Marek, M. Białosiewicz, PWE, Warsaw 2011 – the latest publication in the area prepared by the research workers of Szczecin University.

2) general cognitive and theoretical contents are prevailing decisively, although there are individual attempts to verify them empirically (reference to self-designed research) as well as normative contents formulating proposals and recommendations for enterprises;

3) most common, repetitive issues of the emerging discipline, likely to become its core, appear to be:
   - goals and objectives of an enterprise,
   - legal and organisational forms,
   - enterprise resources and their significance (internal sources of innovations and competitive advantage),
   - enterprise's environment and cooperation with its participants (external sources of innovations and competitive advantage),
   - market context of corporate activity with a strongly exposed aspect of internationalisation and globalisation;

4) issues to a certain extent common; however appearing in a different substantive configuration and of a diversified level of intensity and advancement: possible development of the core of the discipline:
   - outcome of an enterprise activity (mainly financial results),
   - enterprise structures and functions,
   - issues of growth and development (life cycle, mergers and takeovers) as well as corporate crises (bankruptcies) – shown from the perspective of management, especially strategic management,
   - technological aspects of the operation and development of enterprise (communication technologies as an attribute of modern enterprise),
   - limited attempts to outline the image of the enterprise of the future.

5. Conclusion

The aforementioned contents and formulations can hardly be regarded representative of all the interdisciplinary research based on the idea of an integrated approach to an enterprise. Analysing other related sources one can find such important topics not mentioned above, like entrepreneur and entrepreneurship, or ethical aspects of the firm's activity. Nevertheless, they preliminarily depict both the scope of contents ascribed to the emerging discipline and their general theoretical nature. The latter deserves some final attention as it illustrates the dilemma of the further development of the new science. The tendencies and directions of this development so far clearly indicate a considerable contribution of the subject matter from the area of broadly perceived management, e.g., decision making,

market activities, into the contents of a new discipline. Management science is an empirical discipline, in which the majority of generalisations, proposals of new corporate tools and operation rules as well as the whole concepts are introduced on the basis of observation and research of the business reality. In this respect, practice is a primary and major source of inspiration, and at the same time an ultimate instance to verify the truthfulness and accuracy of theoretical statements. Thus, it should be claimed that the extension and growth of contents specific to management sciences co-creates a new field of research, and contributes to the development of an integrated approach to a modern enterprise[9].

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[9]   See more: C. Suszyński, Ewolucja kategorii przedsiębiorstwa w procesie rozwoju nauk o zarządzaniu (Evolution of the category of enterprise in the process of development of management sciences) in: Osiągnięcia i perspektywy nauk o zarządzaniu (Accomplishments and prospects of management sciences), ed. S. Lachiewicz, B. Nogalski, Oficyna a Wolters Kluwers business, Warsaw 2010, pp. 30–51.

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Analysis of the Mortgage Portfolio in Poland and Europe in the period 2002–2009

1. Introduction

The mortgage portfolio (MP) in Poland is among of the most dynamically developing ones in Europe. In the course of two years (2007–2009), despite the crisis within the banking sector, the MP value in the non-financial sector amounted to 84 percentage points[1]. In December 2009 the housing loan portfolio value in the non-financial sector grew by 11 percentage points, in comparison with December 2008, up to a volume of 216 billion zlotys, which accounted for about 35%[2] of assets of the Polish banking sector. The share of cooperative banks in the housing loan portfolio is inconsiderable and at the end of 2009 amounted to only 1%. Such a large interest in housing loans among the Polish society results mainly from two factors:

- overcrowding of the present housing properties[3],
- decline in real interest rates in the long-term[4].

The mortgage market is controlled by universal banks as only 1% of housing loans derive from specialist mortgage banks[5]. Three banks: PKO Bank Polski S.A., Bank Millennium and Bre Bank control 35% of the market. In 2006, 50% of the market was in the portfolio of PKO Bank Polski, PEKAO S.A. and Millennium[6].

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[1] Calculation based on the data of the Financial Supervision Authority in: Rapport o sytuacji finansowej banków w 2009 roku (Report on the financial situation of banks in 2009), Warsaw 2010.

[2] Own calculations based on the data of the Banking Supervision Authority included in: Sytuacja finansowa banków Synteza (Bank financial situation. Synthesis), Warsaw, May 2006.

[3] According to the General Census of Population and Households of 2002, 66% of people live in dwellings, in which there more than 1 person per room (own calculations). Another census is planned in 2011 according to the European Union and Eurostat procedures.

[4] In 2000 average weighted interest of mortgage credits amounted to 15%, whereas in the middle of 2006 only 5–6% (own calculations based on the current bank offers and C. R. Merrill, E. Kozłowski, J. Łaszek, Poland: housing finance at the millennium, The Urban Institute, Washington, February 2000; Pawłowicz L., Najważniejsze będą kredyty na mieszkania (Housing loans will be crucial), Rzeczpospolita, 1 August 2006.

[5] Data from the Foundation for Mortgage Credit, 2006.

[6] Financial Supervision Authority, Finansowanie nieruchomości przez banki. Stan na koniec 2006 (Property financing by banks. End of the year 2006) and Finansowanie nieruchomości przez banki. Stan na koniec 2008 (Property financing by banks. End of the year 2008); available at www.knf.gov.pl as of 13 August 2010.

Table 1 shows the data characterising the housing loan portfolio in Poland in the years 2002-2009.

Tabela 1. Mortgage market in Poland in the years 2002–2009

	2002	2003	2004	2005	2006	2007	2008	2009
Macroeconomic market data in millions of zlotys								
GDP	769 400	842 120	922 157	967 700	1 027 697	1 176 737	1 275 432	1 344 000
non-financial sector MP* value	27 233	38 247	42 794	57 938	86 913	148 763	228 174	250 223
including GD** MP value	19 607	28 982	34 985	49 476	76 546	115 492	183 139	204 233
Housing loan market indicators								
relation of MP value to GDP	3.54%	4.54%	4.64%	5.99%	8.42%	12.6%	17.8%	18.6%
dynamics of non-financial sector MP value	129%	140%	112%	135%	149%	171%	153%	109%
dynamics of households MP value	142%	148%	121%	141%	155%	150%	158%	111%

* MP – mortgage portfolio.
** GD – households
(SZ) GUS Preliminary estimates at the end of 2007

Source: own materials based on: Sytuacja Finansowa Banków. Synteza (Bank financial situation. Synthesis), in the years 2002–2007 available at www.nbp.pl as of 28 August 2007; Financial Supervison Authority Raport o sytuacji banków w 2009 (Report on bank situation in 2009) Warsaw, 2010; Central Statistical Office, Roczne mierniki gospodarcze (Annual economic measures), available at www.stat. gov.pl as of 12 August 2010.

2. Mortgage portfolio growth indicators in the European Union countries

The mortgage portfolio for households is one of the largest categories of assets in the Polish banking sector loan portfolio. In March 2010 its value amounted to 218.9 billion zlotys, which accounted for 53.3% of the households portfolio value and over 35% of loans granted within all the non-financial sector. According to the data of the National Bank of Poland and KNF the dynamics of the growth in housing loans is very high. Within a period of 8 years, the portfolio value increased nearly tenfold from 27 to 250 billion zlotys. Housing loans are the instruments used primarily by households. The share of households in the total of housing loans in the non-financial sector rose from 71% in 2002 to 81% in

2009[7]. However, the Polish housing loan market is still among the underdeveloped markets in Europe in relation to GDP. The average of 27 EU countries amounted to 50%[8] in 2008, and in Poland below 13% in 2009[9].

Figure 1. The relation of the mortgage portfolio value to GDP in European countries in 2008 and 2009
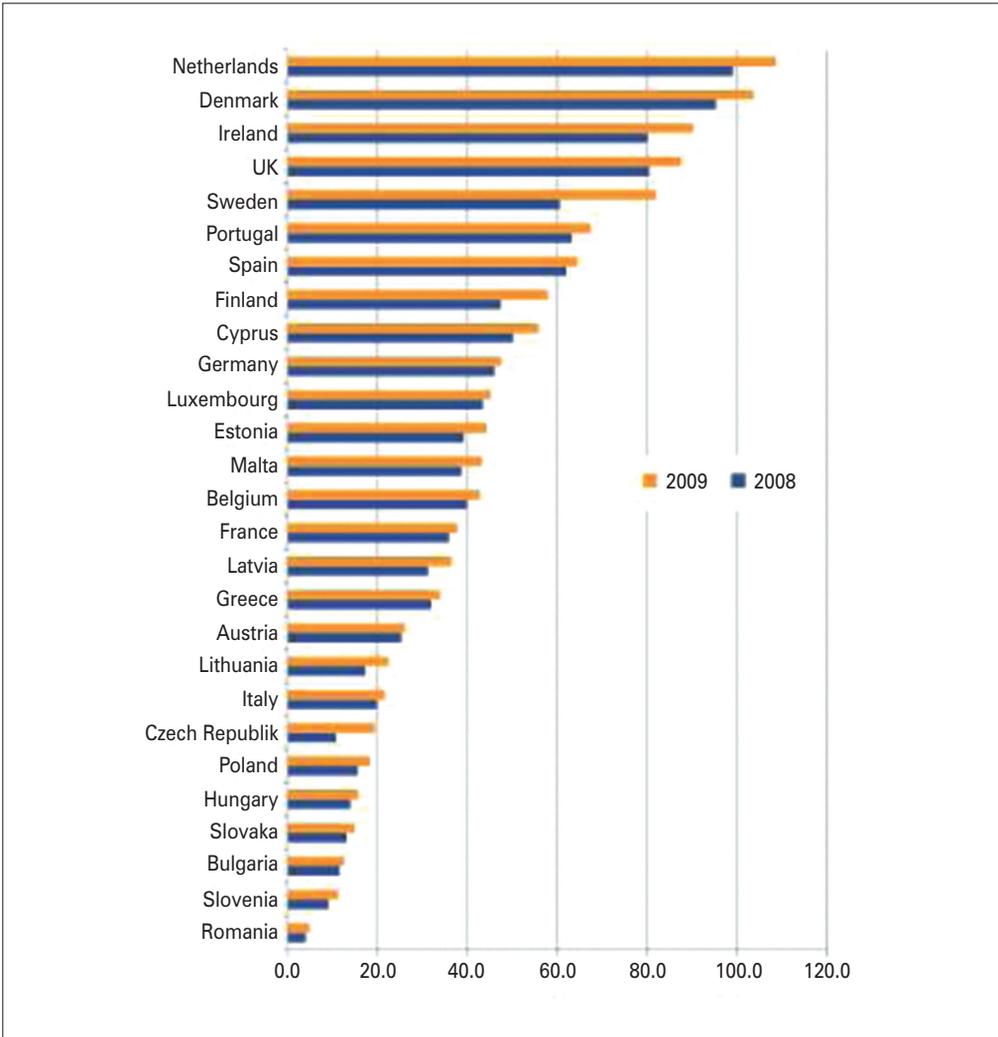
Source: European Mortgage Federation, Eurostat.

7 NBP (National Bank of Poland) data.

8 European Mortgage Federation data, available at http://www.hypo.org/content/default.asp?PageID=202 as of 3 September 2010.

9 Own calculations based on NBP and GUS data.

The difference between the NBP and EMF data concerning Poland results from the fact that the EMF considers only mortgage backed housing loans. In the data presented in Table 1.1. the portfolio includes mortgage loans and building-housing loans. The EU new member countries (apart from Latvia and Estonia) have this indicator a few times lower than the average in the EU and Eurozone. The highest indicator is in Holland, Denmark, Great Britain and Germany. In Germany and Denmark refinancing of such a large portfolio is conducted by the issue of mortgage bonds. On the British and Dutch markets there are parallel techniques of mortgage assets securitisation resulting in the issue of mortgage backed securities (MBS).

When analysing the Polish portfolio of residential mortgage loans, it is necessary to make a comparison with the EU new member countries. This comparison is even more legitimate than the reference to the indicators in the well developed markets, where the instruments of housing mortgage loans have been used for several dozen years now. The rate of growth in the portfolio value in the new member countries is diversified. The analysis shows that in the period of 7 years since 2002 the relation of the MP value to GDP has risen most in Latvia and Estonia. In the Czech Republic a fivefold growth took place in 2008, which was the year characterised by the lack of liquidity in the banking sector. It may be perceived as a postponed demand for the real property due to the insufficient availability of mortgage credit instruments before.

Table 2. The relation of the mortgage portfolio value to GDP in selected new European Union member countries in the years 2002–2009 (in %)

	2002	2003	2004	2005	2006	2007	2008	2009
Czech Rep.	1.9	3	4.2	6	4.1	9.8	11	19
Estonia	7.6	11.2	16.0	23.7	32.7	36.3	39.2	44
Hungary	4.5	8	9.2	10.4	11.4	12.4	14	17
Latvia	4.1	7.6	11.4	19.3	28.9	33.7	33.7	38
Slovenia	0.8	1.1	3	5	6.6	8	9.1	10
Lithuania	2.2	4.1	6.9	11	12.6	17.5	17.3	22

Source: own material based on: European Mortgage Federation "Hypostat 2009", available at www. hypo.org as of 23 May 2011.

Referring the market development to the experience of the countries of "old" and "new" Europe and considering:
- a small saturation of the market with housing loans,
- an unsatisfied demand for housing property,
- a low standard of the present propertyavailable,

the forecasts made by London Economics seem well grounded. According to the author, the key factor accelerating the demand for dwellings, and consequently housing loans, is at present overcrowded housing property. Poland recognises a dwelling as overcrowded when there are more than two people[10] per chamber[11]. In the European Union overcrowding is defined in a different way. It is classed as a dwelling with more than one person per room[12]. Taking into consideration a chamber and not a room additionally and artificially understates the overcrowding and overstates the standard of living in dwellings. If the number of people living in a room is analysed, Polish data look dramatically poor in comparison with the rest of Europe. The European Union data in Table 3.4. refers to households earning below 60% of the average in the country. Taking into account the fact that the data refer to the least wealthy part of the European community, and the whole of the Polish community, the indicators are disproportionately low and reflect the unsatisfied housing needs, and consequently the demand for housing loans that would allow people to meet these needs.

Tabela 3. Percentage of people living in overcrowded dwellings in 2002 in the EU[13] and Poland*

EU 15	16
Belgium	6
Denmark	4
Germany	14
Greece	23
Spain	19
France	16
Ireland	15
Italy	37
Luxemburg	22
Holland	3

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[10] Cf. Central Statistical Office, Zasoby i warunki mieszkaniowe (Housing resources and conditions), in: Raport z wyników Powszechnego Spisu Ludności i Mieszkań z 2002 roku (Report from the General Census of population and Households of 2002), Warsaw 2004.

[11] A chamber is a room of more than 4 square metres, separated from others with solid walls up to the ceiling with daylight available. Chambers are rooms and kitchens that meet these criteria. Others like halls or dressing rooms are regarded as auxiliary rooms.

[12] Eurostat Share of households living in overcrowded houses, available at http://epp.eurostat. ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=wel comeref&open=/C/C5/C53&language=en&product=Yearlies_new_population&root=Yearlies_new_ population&scrollto=0 as of 28 August 2008.

[13] Data concerning the European Union countries presented in the Table refer to the households earning below 60% of the average in the country.

continued Table 3

Austria	10
Portugal	23
Finland	10
Sweden	6
Great Britain	5
Poland**	66

* data adjusted to European standards concerning overcrowding based on the General Census of Dwellings and Population of 2002.
** from 1–2 persons per room (30.5%), from 2–3 persons per room (23.3%), from 3 persons per room without running water (12,2%).

Source: own material based on: Eurostat, Share of households living in overcrowded houses, available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-40-01-319 of 5 August 2010; Główny Urząd Statystyczny, Zasoby i warunki mieszkaniowe (Housing Resources and Conditions), in: Raport z wyników Powszechnego Spisu Ludności i Mieszkań z 2002 roku (Report from the General Census of Population and Households), Warsaw 2004.

3. Mortgage loans denominated in foreign currencies in the years 2002–2009

Since 2000 there has been a continuous rise in the value of mortagages originated in foreign currencies. At the end of 2009, 63%[14] of the mortgages was denominated in foreign currencies, mainly the Swiss franc (CHF)[15]. Two years later the share amounted to 48%[16]. In 2008 the rise in foreign currency loans over the previous year amounted to 100%. It should be noted that this kind of rise resulted to a large extent from a low exchange rate of the Polish zloty used for the calculation of the loan portfolio. In 2008 the zloty depreciated by about 24–40% against other currencies (EUR, CHF or USD). The priority given by customers to the Swiss franc loans is due to lower interest rates, e.g. an average annual housing loan interest rate in 2009 granted in the Polish zloty amounted to 6–9%, while in the case of the Swiss franc 3–5%[17].

The analysis of the foreign currency residential mortgages indicates that the dynamics of these loans is much higher than those denominated in the

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[14] Own calculations based on NBP and KNF.

[15] Banking Supervision Authority, Finansowanie nieruchomości w Polsce. Stan na czerwiec 2006 (Property financing in Poland. June 2006), Warsaw, November 2006.

[16] Financial Supervision Authority, Finansowanie nieruchomości przez banki w Polsce. Stan na koniec 2008 roku (Financing property by banks in Poland, End of the year 2008), available at www.knf.gov.pl as of 13 August 2010.

[17] Own calculation based on present bank offers in the field of foreign currency and zloty housing loans, European Mortgage Federation, "Hypostat 2008", available at www.hypo.org as of 13 September 2010.

Polish zloty. If the forecast of the Mortgage Credit Foundation is accepted and if it is assumed that the share of foreign currency morgages in the portfolio of non-financial sector housing loans is at the constant level of 50%, already in 2010 the value of the currency portfolio will amount to 60 billion zlotys, i.e. as much as the whole housing loan portfolio at the end of 2005[18]. The comparison of data proves that the practice on the Polish market is more similar to the practices on the Estonian, Latvian and Lithuanian markets than the practices on the West European markets. Only in Austria, wealthier customers can take out foreign currency mortgages.

Table 4. Foreign currency mortgages in the years 2002–2009. End of the year situation

Macroeconomic market data in billions of zlotys	2002	2003	2004	2005	2006	2007	2008	2009
Households MP* value	27	38	42	50	78	117	194	216
Including foreign currency MP value	12	19	20	32	50	65	135	140
Share of foreign currency mortgages in total households mortgages	44%	50%	48%	64%	64%	56%	70%	65%

* MP – residential mortgage portfolio.

Source: own material based on: Sytuacja Finansowa Banków. Synteza za lata 2002–2007 (Bank financial situation. Synthesis 2002–2007) available at www.nbp.pl as of 30 March 2010; Financial Supervision Authority, Raport o sytuacji finansowej banków w 2009 roku (Report on the bank financial situation, 2009, available at www.knf.gov.pl as of 13 August 2010.

In Romania, Latvia and Estonia the share of foreign currency housing loans was even higher than in Poland. The major loan currency was, like in Poland, the Swiss franc, whereas in Austria the yen was dominating. In the Czech Republic and Slovakia the share of foreign currency loans remained low, 5.5% and 0.8% respectively, due to domestic currency credit subsidies and relatively low interest rates. In Latvia, in 2008 the share of foreign currency credits rose to 87%. The euro was the major currency.

Already in 2005 due to the forecasts of growth in the value of the mortgages portfolio and dominating market preferences, the Banking Supervision Authority and rating agencies, e.g. Fitch Ratings[19] began to worry about the security of the banking system in general, and in particular about customers' deposits in the

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[18] Own calculation based on the forecasts by the Mortgage Credit Foundation and the National Bank of Poland.

[19] Cf. Ch. Birney, M. Steinbarth, CEE housing Finance: Rapid Growth, but at What Risk?, Fitch Ratings, special report, November 2005.

situation of crisis on the property market or currency market. The anxiety on the part of regulators and agencies did not remain unconfirmed for long. From the perspective of a foreign currency debtor the worse scenario is the one in which the value of principal and interest instalments grows with the simultaneous decline in the mortgaged property value. It was quite common that the credit value calculated in the domestic currency considerably exceeded the value of the mortgaged property. In the USA the very decline in property prices, without any currency problems, resulted in the rapid rise in the number of bailiff auctions and difficulties in debt servicing. However, in the Central European countries this mechanism did not occur on such a large scale. It resulted mainly from the fact that households purchased property to satisfy their housing needs and not to invest in property, which was the case in the USA, Spain or Ireland. That is why, despite an unfavourable situation on the currency markets and on the housing market, they continued to service their debts.

Table 5. The share of foreign currency loans in residential mortgages in selected countries in the years 2002–2006 (in %)

	2002	2003	2004	09/2005	06/2006
Czech Rep.	4.8	4.7	5.7	5.5	n/a
Estonia	95.9	82.7	79.4	88.2	n/a
Hungary	1.7	1.3	8.2	18.3	40
Latvia	53.2	60.8	68.5	72.7	70
Poland	46.0	48.9	47.4	55.6	57
Austria	27.5	30.0	33.2	35.5	n/a
Bulgaria	n/a	15.9	24.0	29.4	18
Romania	n/a	n/a	89.2	91.9	n/a
Slovenia	0.1	0.1	3.2	14.5	n/a
Slovakia	n/a.	n/a	n/a	0.8	n/a
Malta	n/a	0.4	0.3	0.3	n/a

Source: own material based on: General Inspectorate of Banking Supervision, Wybrane charakterystyki kredytów walutowych (Selected characteritics of foreign currency credits), unpublished data, Warsaw 2006; Sytuacja Finansowa Banków. Synteza za lata 1999–2005 (Bank financial situation. Synthesis. 1999–2005) available www.nbp.pl as of 28 August 2008, European Mortgage Federation, Eurostat 2006 and 2008, available at www.hypo.org as of 13 August 2010.

From the bank perspective, foreign currency loan products bring both opportunities and threats. Due to the liquidity crisis, banks subsidised loans granted in the Swiss franc in 2006, when currency swaps were cheap and long-term refinancing available on the market. Until the time of the credit crunch there had been higher margins on foreign currency loans than on zloty loans,

which contributed to the creditor's higher interest income. In conclusion, the factors mentioned below are considered to be major threats.

1) No access to long-term Swiss franc liabilities. The longest renewable swaps, making foreign currencies accessible to banks, are not longer than one year. Furthermore, small banks find it more difficult to have their contracts renewed than large banks.

2) Lack of experience in managing of long term instruments bearing currency risk.

3) In case of client's default difficulties with mortgages disclosures.

4) Banks that do not offer foreign currency loans bear the risk generated in another part of the sector.

5) Debtors "unaware" or "disregarding" the currency risk pose a threat to the security of deposited funds in bank accounts, which are the major source of refinancing[20] of the mortgage portfolio.

In 2005 banks were shown four methods of reducing the currency risk within the MP. They were "hard" or "soft" regulations. There was a certain fear that due to indirect relative restrictions, foreign currency credit "sales" advertising campaigns could appear or that banks would face unfair competition. In this connection, some banks opted for the complete ban on foreign currency loans. Discussions with banks resulted in the following compromise solutions:

- setting a higher level of disposable income per family member,
- estimating creditworthiness according to interest rates on PLN loans,
- lower level of loan to value (LTV) indicator,
- improved customer education,
- change in examination procedures of customer creditworthiness,
- larger role and complexity of insurance products,
- creation of the system to subsidise the interest on the zloty housing loans,
- tax breaks on account of loans granted in the Polish zloty,
- granting foreign currency loans to customers paid in a foreign currency[21].

The discussion with the banks resulted in Recommendation S in March 2006, Recommendation SII in 2008 and Recommendation T in 2010, aimed at the reduction of currency risk on the part of banks and customers taking out foreign currency loans. They include numerous quality requirements, the most important of which are:

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[20] Wnioski ze Stałej Konferencji Ekonomicznej Związku Banków Polskich (Conclusions from the Permanent Conference of the Polish Banks Association), unpublished materials, Związek Banków Polskich, 21 December 2005.

[21] Ibid.

- creation of databases and using external databases concerning the credit history,
- systematic controlling of receivables quality,
- systematic controlling of insurance quality and value,
- precise description of responsibility for internal audit within the loan portfolio,
- obligation to conduct stress tests at least once a year,
- information standard tp make customers aware of the currency and interest rate risk[22],
- adjustment of asset and liabilities time structure of the loan portfolio,
- cost reduction on the part of customer due to the bank currency spread in the case of loans repaid in foreign currencies.

Besides quality regulation, it was planned in 2009 to introduce quantitative requirements for currency expositions for households, such as:

- additional capital requirement for all foreign currency loans[23],
- rigid concentration limit of currency credits with regard to bank own funds,
- determination of the maximum level of the LTV indicator[24].

However, "hard" regulations did not leave the phase of concept. The banks supporting the currency restrictions were, as a rule, the ones that did not offer foreign currency denominated loans, unless the customer earned in a foreign currency. PEKAO S.A. is an example of such a bank. The bank policy results from the inexperience of its shareholder UniCredito on the Italian market. In the 1990s, the Swiss franc mortgage loans gained an enormous popularity among Italian borrowers due to the same factor existing at present on the Polish market, i.e. lower interest. Unfavourable changes on the currency and interest rate markets in the following years caused a lower quality of the portfolio, debtors' repayment difficulties and even bankruptcy. In that time, the reputation of many Italian banks suffered, and their long-term credit policy became an object of analysis and criticism of the banking supervision. It should be added that financial instruments were offered to customers with incomes higher than the national average, unlike the practices on the Polish, Latvian or Estonian market[25]. On the other hand,

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[22] Banking Supervision Authority „Recommendation S", Recommendation 19 and 20, Warsaw 2006.

[23] According to M. Samcik, Banks reduced credit operation gradually, „Gazeta Wyborcza", 21 February 2006. BPH Bank President Józef Wancer claimed that increased capital requirements for foreign currency credits may mean the necessity for recapitalisation of the banking sector by about 17–20 bn zlotys. In the case of banks with the largest portfolios of these credits, it may be connected with the need to increase the capital by 50–100%.

[24] National Bank of Poland, Sytuacja Finansowa banków. Synteza 2005 (Bank financial situation. Synthesis), May 2006.

[25] Cf. Ch. Birney, M. Steinbarth, CEE housing Finance: Rapid Growth, but at What Risk?, Fitch Ratings, special report, November 2005.

Austrian banks did not experience any negative effects of strong involvement in currency loans. Supposedly, due to this they are more flexible in granting foreign currency loans on the Polish and Hungarian market than Italian banks[26].

4. Comparison of housing markets in Poland and Europe

Due to the lack of cross-sectional and comparable data in relation to 2009, the present chapter is based on the results of research included in Hypostat 2009 of the European Mortgage Federation. The dynamics of credit value declined year by year. The lack of liquidity of major creditors and uncertainty about prices on the property market caused the first regress in the portfolio value in the period of 10 years. Great Britain was the country to most significantly reduce its credit operations. The differences in the dynamics of the loan portfolio growth in the European Union countries resulted from:
- conditions on the property market on the supply side (housing market supply indicator),
- price level,
- interest rate level,
- local factors (for instance information about the rise in VAT within the housing industry in Germany).

The indicators of granted planning permissions, housing starts and housing properties put into operation per 1,000 inhabitants reflect the supply on the housing property market. In the boom period, in countries like Ireland or Spain within the duration of 10 years (1997–2006) the indicator of dwellings put in operation doubled, in Sweden the indicator of planning permissions granted quadrupled, and in Estonia there was a tenfold rise. The aggregated data for the whole Union in relation to 2007 and 2008 are not available.

Table 6. **The construction sector in the European Union (in millions)**[27]

	1997	**2008**
Number of planning permissions granted	1.76	2.43
Number of dwellings starts	1.25	2.18
Number of dwellings put into operation	1.47	1.60

Source: own material based on the data of the European Mortgage Federation.

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[26] Ibid.

[27] It should be noted that the rise in absolute values is due also to the new European Union entrants, on whose territories the housing property markets began to develop rapidly in the discussed period.

Despite such a rise in the Central European countries, the supply of new housing property remains at an incomparably lower level than in the "old Union". In the period of dynamic growth in the housing market in Europe (2002–2007) in the Union new member countries the average number of new dwellings put in operation did not exceed 3.8 per 1,000 inhabitants, whereas in the EU15 this indicator came up to 22.2 (Spain). The planning permission indicator is similar. In Central Europe it fluctuated from 2.2 in Lithuania to 4.9 in the Czech Republic. For comparison, in the EU it was between 3 in Belgium and 19.8 in Spain. It should be noted that the lowest indicators in the Union are observed in the countries with the most saturated housing property markets (Belgium, Holland, Great Britain or Scandinavian countries). On the other hand, in the countries that are "bridging the gap" (Spain or Ireland) the indicator dynamics is incomparably higher than the dynamics seen in the EU new member states. Paradoxically, the financial crisis created a chance for the Central European countries to catch up with the rest of Europe. People in these countries are making their way and have not had an opportunity to speculate on the property market on such a large scale as it was the case in Spain and Ireland. The demand for housing property not driven by speculation did not freeze so many developers' investments as in those countries. Consequently, demand indicators improved against the background of pre-crisis "tigers". In 2008 in Spain for the first time in the last 10 years the number of dwellings put into operation declined by 5% to the level of 615,000. In Ireland there has been a decline since 2006 and it amounts to nearly 50%, which means that only 52,000 dwellings were put into operation in 2008[28].

The rise in housing property value prices until 2007 depended to a large extent on the lack of adjustment between supply and demand as well as on the opportunity to take out cheap loans and make use of refinancing instruments. In the majority of European countries the biggest price rises occurred in the years 2006–2007 (Central European countries, Ireland or Belgium). In some other countries the rise was slower in comparison with 2005 (Denmark, Greece, Spain or France). In this period in Dublin the inflation of property prices amounted to 33%, and in major Polish cities reached even 50–60%. In Germany there was a slowdown trend of price decline on the secondary market, prevailing there for several years. On the other hand, on the primary market property prices began to grow. The reverse trend in Germany may be explained by the economic growth of 2.8% in 2006 and the aforementioned rise in VAT on property from 16% to 19%.

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[28] European Mortgage Federation, "Hypostat 2008", available at www.hypo.org as of 13 August 2010.

2008 brought a cooled down economic situation, payment hold-ups and credit finance limitation. In countries like Great Britain, Portugal, Spain and Ireland prices declined by 1%, 6,3%, 0,7%, 9% respectively. Central European countries had even more serious declines (for instance Estonia – 28%). In Poland the price decline was not so rapid due to the number of transactions which remained on the same level.

Another factor to affect the volume of the housing loan portfolio was the historically low interest rates and economic stability. Central banks successfully controlling the level of inflation created a sense of stability among investors on the capital market as well as on the property market. Debtors overwhelmed with the sense of stability willingly took out loans for the assets whose market price continued to rise. In the period of 2002–2006 in the majority of European countries credit interest declined. The biggest decline was observed in the countries that were the last to join the European Union (Slovenia, Bulgaria or Latvia). This was due to the stabilisation and higher economic growth potential. In the case of housing property the integration caused rapid appreciation, which, in turn, caused the limited availability of property for the society. Because the supply of property in short term is not flexible, one of the solutions to increase the availability is a stabilised interest rates policy aimed at their reduction. This kind of activity of monetary authorities can be actually seen in all the new members countries. Since 2007 due to the limited liquidity of the financial sector and mistrust towards the housing market, credit interest rose considerably.

The financial sector liquidity crisis resulted from the recession within the real sphere, i.e. the property market. A slowdown in the property price rise and sometimes even the decline should have raised the demand, and consequently the number of transactions on the markets. However, it did not occur. Property is an asset partly or entirely bought on credit, and in the years 2006–2008 bank credit policies became restrictive on account of limited liquidity and portfolio refinancing capacity. Indebtedness per person is diversified. It fluctuates from 1,000 euros (in Central European countries) to 40,000 euros (in Denmark). Such a large disproportion may be accounted for by the former membership of the eastern bloc, where there were no market mechanisms to finance property purchase through household indebtedness. In Poland the growing portfolio is being refinanced actually in 100% by deposits on bank accounts, which, as a matter of principle, are short-term. On the other hand, in Denmark for years there has been a model of capital based portfolio refinancing, i.e. debt securities issue. It is not possible to make up for the disproportions, which would not be advisable anyway. Foreign experiences show that high indebtedness becomes the source of instability of both the real and financial sphere. These experiences also allow for

the conclusion that only the combination of diversified methods of refinancing (deposit and capital methods) are able to guarantee market liquidity.

The development of housing property market depends to a large extent on the market mortgage loan financing. The number of transactions grows if the loan portfolio value is on the rise. A very small percentage of households are able to self-finance the purchase of a property. As a rule, the purchases or repairs of property are financed by households in all or partly by a mortgage loan. It should be noted that the expansive bank credit policy in the years 2002–2007 improved credit availability, and consequently it caused the increased demand and rise in prices on the housing market. However, every market is to a certain extent subject to the business cycle, in the course of which prices rise and fall. This is what happened on the property market. It is quite explicitly shown by the value of index S&P Case-Shiller Composite 10 CSXR in the years 1987–2011. Trends on the European market were identical. The years 2005–2007 saw top prices on the property market, the highest credit portfolio dynamics as well as the number of transactions.

Figure 2. Value of index S&P 10 CSXR in the years 1987–2011
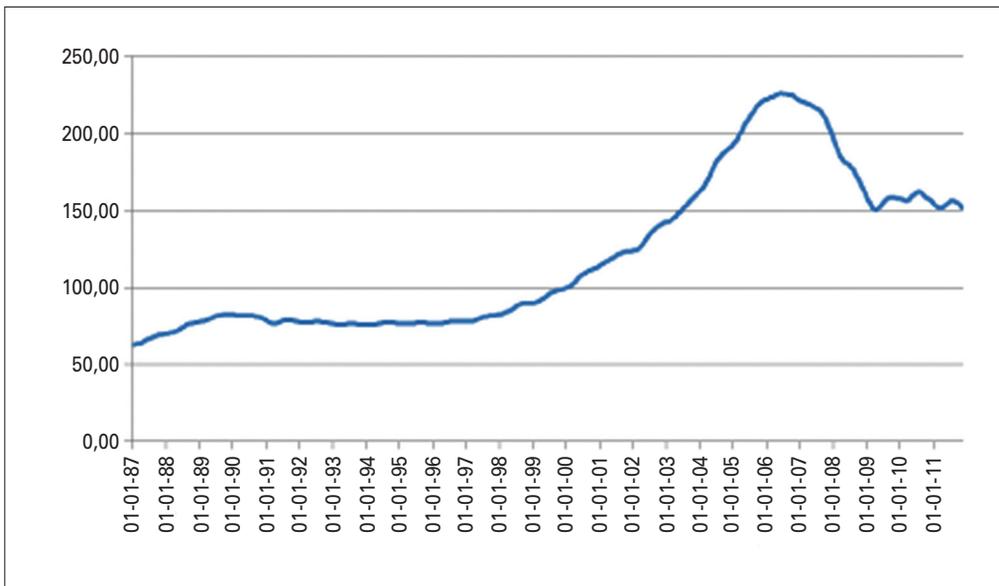
Source: Standard&Poors available at http://www.standardandpoors.com/indices/ of 4 February 2011.

Table 7. Mortgage portfolio and housing market in the European Union in the years 2004–2006

	Mortgage portfolio value in millions of euros; per person in thousands of euros		Number of transactions on the housing market		Change in house prices over the previous year	
	2006	**2009**	**2006**	**2009**	**2006**	**2009**
Belgium	10.83	13.56	116 563	112 791	12%	1.7%
Bulgaria	0.23	0.56	n/a	n/a	15%	–21.4%
Czech Rep.	0.79	2.49	n/a	n/a	0.1%	n/a
Denmark	40.9	42.0	69 558	40 713	16%	–7.5%
Germany	14.36	14.0	460 000	446 000	1%	–32.7%
Estonia	3.18	4.55	44 925	26 278	21%	–28%
Greece	5.14	7.15	172 897	94 801	9%	–3.6%
Spain	13.07	14.81	955 187	463 719	10%	–6.3%
France	9.17	11.46	n/a	n/a	10%	–4.4%
Ireland	29.3	33.18	114 593	25 097	14%	–18.5%
Italy	4.7	5.51	845 051	609 145	8,8%	n/a
Cyprus	7.11	13,04	n/a	n/a	10%	–8.0%
Latvia	2	3.04	n/a	n/a	n/a	n/a
Lithuania	0.8	1.8	n/a	n/a	n/a	n/a
Luxembourg	24.7	32	n/a	3 001 (for 2008)	3.5%	–2.1%
Hungary	1	1.55	109 058	81 997	4.9%	–6.5%
Malta	4.38	5.94	n/a	n/a	9.2%	–5.0%
Holland	33.6	36.53	209 767	127 532	5%	–6.5%
Austria	7.34	8.68	n/a	n/a	3%	3.0%
Poland	0.59	1.48	70 380	78 970	33%	–1.7%
Portugal	8.69	10.42	285 483	n/a	2%	–0.2%
Romania	0.1	0.27	682 000	352 000	n/a	n/a
Slovenia	0.98	1.95	n/a	4 900	15%	n/a
Slovakia	0.78	1.7	n/a	n/a	n/a	–3.4%
Finland	10.45	18.61	77 131	75 000	8%	–0.3%
Sweden	19.18	21.68	57 900	51 548	11.4%	0.2%
Great Britain	26.22	25.0	1 670 000	856 000	6%	–7.8%
EU 27	10.48	12.37	n/a	n/a	10.8%	–6.8

Source: own material based on Hypostat 2008, data of Royal Institution of Chartered Surveyors, GUS, EMF.

A rapid growth in the mortgage loan portfolio required intensified refinancing. On some markets (for instance the Polish market) it occurs due to

the growth in the deposit base. On other markets (Spanish, German, British and American) through refinancing on the capital market by means of instruments like covered bonds or mortgage backed securities. The growing deregulation of the financial market in progress since the 1980s has distorted the useful mechanisms of refinancing through the capital market. Banks focused on origination of loans and not on the monitoring or evaluation of credit risk. The moment they originated loans, they planned to resell them to the capital market investors. It should be noted, however, that the mechanism of refinancing the mortgage portfolio through the capital market is a useful mechanism resulting in a higher liquidity of banks, and consequently in meeting the credit needs of a higher number of households. Unfortunately, its distortion and deregulation led to predatory mortgage origination and the inflation of property prices to the levels having, at times, nothing in common with its real value.

5. Summary

It is difficult to judge whether in 10 years the Polish market will be where the German, Danish or Dutch markets are at the moment. Further market development is to a large extent dependent on the alternative method of portfolio refinancing. Crisis experiences of West European markets and the USA may allow Poland to avoid repeating the mistakes in the course of the construction of the mortgage loan portfolio. It may be stated that the last decade was a period of house prices growth, lowering interest rates and stable inflation. Such a situation favoured the growth in portfolio value in developing countries. The Polish market may face a more difficult challenge of meeting housing needs through debt instruments in hard times for the financial and insurance sector. It is possible that the solutions worked out so far will require considerable modifications. So that mortgage products, being secure for banks and satisfactory for customers, could raise mortgage indebtedness of the society up to satisfactory but still safe level.

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Summary

Paweł Dziewulski, Łukasz Woźny

On Constructive Methods for Equilibrium Modelling on Dynamic Oligopolistic Markets under Uncertainty

This is a survey article on equilibria in dynamic oligopolistic markets under uncertainty. Our discussion focuses on constructive aspects of methods proposed in the literature for the analysis of equilibria in such markets. Specifically, we present results concerning numerical properties of methods of equilibrium calculation in the models with and without strategic interactions, including cases of the finite or infinite number of players. The study concludes with a summary to indicate the future research areas and selected thematic literature.

Mirosław Jarosiński

The Early Internationalisation of Polish Companies. Research results

Early internationalisation has been arousing interest of researchers all over the world for the past 20 years. Although everybody approves the theoretical definitions of this phenomenon formulated at the beginning of the 1990s, there is no consensus on the operational definitions. A review of 40 publications in English on born globals revealed a considerable diversity of opinions in this area. The analysis of Polish literature also indicates differences in opinions among Polish researchers. The identification of born globals among randomly selected Polish companies operating on international markets, made by means of four operational definitions of varied degree of restrictiveness allowed for the distinction, in each case, a group of companies meeting the criteria determined by the definitions. Unfortunately, it appeared that the characteristics of some companies identified in this way did not meet the requirements set in theoretical definitions.

Elwira Maślanka

The Impact of Tax Issues on the Financing Effectiveness of Capital Groups Using *Cash Pooling* Services

The development of capital groups causes the increase of the demand of effective cash assets control and management which are at the disposal of capital group. The purpose of the article is to present a specific of capital groups and to provide effective types of financing, including the use of *cash pooling* service, as well as to present how does the lack of tax regulations impact in this regard. The author's intention is to outline a brief characteristic of capital groups and to show the effective ways of financing, including the use of *cash pooling* service and also to provide some constraints on its development because of doubts in tax matters. The analysis proves that *cash pooling* service improves the efficiency of financial management in the enterprise, however there is a concern that its further development may be at risk.

Cezary Suszyński

An Enterprise: The Integrated Approach. Several remarks on the emergence and development of a new scientific discipline

The article presents primary remarks on the emergence and development of a new scientific discipline – "an enterprise science" – dealing with an enterprise on the basis of the interdisciplinary, integrated approach to an enterprise. Assuming such tendency the major premises and determinants of the emergence are discussed, followed by presentation of the position and relations of the new discipline within the broader system of economics based sciences. Next, the substantive scope of the new discipline is analysed, taking into account most frequently raised, repetitive contents of three domestic textbooks dedicated to the interdisciplinary approach to an enterprise. The final conclusion underlines a considerable input to the scope and nature of an emerging "enterprise science" from contemporary management sciences.

Aleksandra Staniszewska

Analysis of the Mortgage Portfolio in Poland and Europe in the period 2002–2009

This article analyses the housing loan portfolio in Poland in the period of boom (2002–2006) and bust (2007–2009). The article focuses on this subject because mortgage instruments are a tool used to satisfy the housing and consumption needs. The development and availability of these instruments, to a large extent, determine the standard of living of the society and the wealth of households.

This article consists of three sections. The first section analyses the portfolio of housing loans in commercial banks with reference to their volume and dynamics. The second part discusses the problem of the growing value of loans denominated in foreign currencies in Poland and other Central European countries. The last section presents the comparison of Poland with other European countries on account of the property prices, number of transactions and loan portfolio volume.