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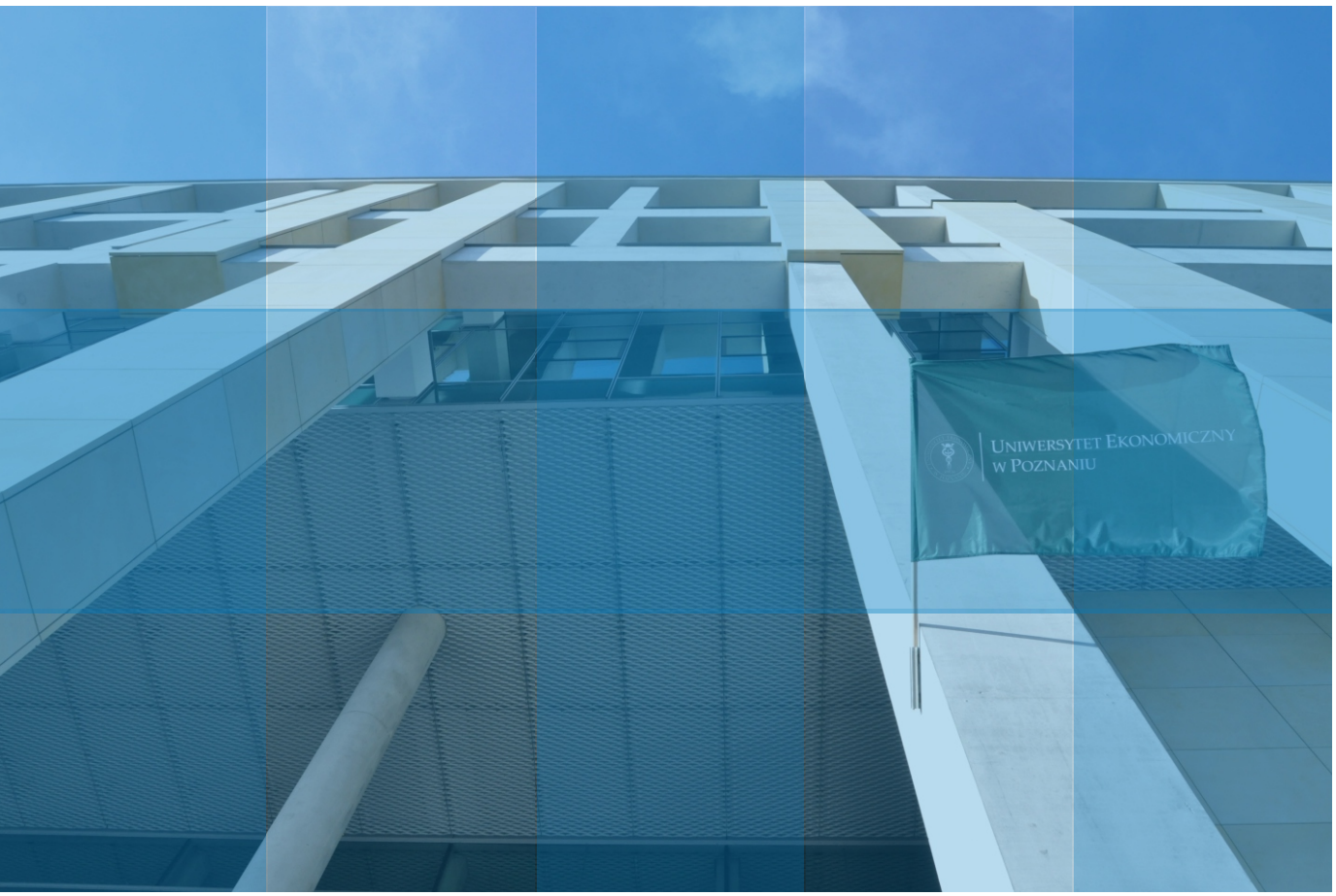

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CONTENTS

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PREFACE

Dear Readers,

We are pleased to present the next issue of the Research Papers in Economics and Finance published by the University of Economics and Business in Poznan, Poland. We have selected five articles from different parts of Europe.

This issue opens with a great paper, which received excellent reviews, written by **Hubert Witczak**, entitled ***"The systemic-praxeological approach to the methodology of primary scientific activity of the management science system"***. According to the author, methodology is a subsystem of the core of primary scientific activity of Msc (the scientific methodology of management science) comprising the components of scientific practice focused around the scientific method (methods). Its objective domain extends beyond the cognitive function (C), encompassing value assignment (A), determination of post-diagnosis scientific action (R), decisions about scientific models (N) and implementation of scientific models (I) – CARNI system. The main factors defining and providing focus to the methodology system are scientific problems, aims and methods. From this perspective, according to the author, scientific reasoning and inference are not separate scientific methods, but rather necessary ingredients of any scientific method, and therefore – scientific methodology. The relationship between the scientific methodology of management science (Msc) and practice is threefold: 1) MSc follows practice; 2) MSc precedes practice; 3) mixed.

The second paper entitled ***"International mobility of students in modern conditions of transformation in the global market of services (regional aspect)"*** has been written by two authors: **Olena Bulatova and Oleg Zaikovsky** from the Mariupol State University in Ukraine. In this paper the authors identify the waves and substantiate the factors of international student mobility in the context of the transformation of the global market of educational services. In the development of international student mobility, three main waves have been identified, the development of which is due to geopolitical and geoeconomic factors of influence. With the development of international student mobility, the institutional drivers of this process have been transformed from research and finance to innovation. The leaders in attracting foreign students are highly developed countries. The change in the number of foreign students is unequal among the leading countries. The main directions of foreign student flows are formed from China. Changes in American migration policy, as well as Brexit have significantly affected the reduction of foreign students in the leading countries – the United States and the United Kingdom.

The next paper concerns ***"The Belt and Road Initiative as a tool for promoting EU-China trade. Poland's case"***. This paper has been written by **Alina Szypulewska-Porczyńska** from the Warsaw School of Economics, Poland. The author examined the nature of the main barriers affecting mutual trade and the composition of Poland-China trade. According to the author, in the light of the significant increase in non-tariff barriers on EU manufacturing products exported to

China and the railway transport infrastructure performance in Poland, priority should be given to efforts to reduce trade barriers. The BRI could become an effective tool for improving the business environment for EU exporters. By contrast, the BRI project is more suitable for China and the EU as a whole than for Poland in terms of commodity structure of bilateral trade.

The fourth paper has been created by three authors: **Volodymyr Tkachenko** from The London Academy of Science and Business, England, **Iryna Tkachenk**o from the Academy of the State Penitentiary Service, Ukraine and **Polina Puzyrova** from the Kyiv National University of Technologies and Design, Ukraine. It concerns ***"Fundamentals of financial and economic security management of Ukrainian enterprises"***. The financial and economic security of an enterprise is a complex system that includes a certain set of internal characteristics aimed to ensure the efficiency of corporate resources use in each direction of activity. According to the authors, the content and structure of the financial and economic security system depend on the specifics and nature of the activity of the enterprise, its potential, the markets that it operates, as well as its management. The financial and economic security system of an enterprise must be comprehensive and independent from similar systems of economic entities.

The whole issue ends with a great paper entitled ***"Examining market concentration levels of available global financial commodity products"*** which has been written by **Subhakara Valluri** from the Institute of Economics of the Polish Academy of Sciences, Poland. The author found disparities in the commodity product offerings in various financial markets across the world along with their market concentration levels. The study showed that the ratio of commodity products available in exchanges is not consistent across various regions of the world. During the analysed period between 2012 and 2016, Asia noted tremendous growth in terms of commodity contracts trade volume, followed by Europe. North America showed moderate constant growth as the market had been well-developed before Asia and Europe. Although Africa and Turkey showed a good growth rate, still these countries need further development in order to catch up with the total number of traded contracts. Surprisingly, Latin America depicted a negative growth rate.

Yours faithfully,

dr hab. Piotr Lis, prof. UEP – Editor in Chief

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RESEARCH PAPERS
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The systemic-praxeological approach to the methodology of primary scientific activity of the management science system

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ABSTRACT

The scientific methodology of management science (MSc) is consistent in terms of direction with the overall methodology of sciences. Still, it continues to pose significant challenges. One such challenge is the problem of system characteristics of MSc methodology at the highest level of scientific practice, i.e. praxeology and systems theory. There are also the problems of MSc synthesis, i.e. the definition of its universal scope, in the light of its increasing diversity and specialisation of domains. This paper aims to elaborate on the achievements to date in management science on the grounds of the systemic-praxeological approach, scientific synthesis of methodology, with a particular focus on the role of reasoning and inference.
My assertion is that methodology is a subsystem of the core of primary scientific activity of MSc, comprising the components of scientific practice focused around the scientific method (methods). Its objective domain extends beyond the cognitive function (C), also encompassing value assignment (A), determination of post-diagnosis scientific action (R), decisions about scientific models (N) and implementation of scientific models (I) –CARNI system. The scientific methodology of MSc is specifically a product of scientific problems as well as the goals, principles and methods used to solve them, forming an exceedingly complex system. Scientific reasoning and inference are not stand-alone scientific methods – they are ingredients of every scientific method. What sets the scientific method apart is the capability of a given scientific manner to solve a given scientific problem.

Keywords: Action system; scientific functions of the MSc system; scientific methodology system of MSc; dialectics, paradox and chaos of the MSc methodology system.

1. Introduction

The current approach to the scientific methodology of MSc is debatable when it comes to scientific synthesis, understood as the universal, systemic-praxeological scope of its domain (material, objective and spacetime-oriented scope), process and outcomes. The functional foundation for shaping the MSc system is primary scientific practice (activity), including its methodology. Here, we are dealing with at least three hierarchical levels: the "MSc system", "primary scientific activity" and "methodology of primary scientific activity".

My assertion is that there exists a problem with scientific synthesis of MSc methodology, with no less than several particularly complex aspects (the problem of this paper), of which the first two are at the highest level of generalisation. First, there is the difficulty of establishing the nature of the system characteristics of MSc from the praxeological point of view. Problem number two is whether we accept the theorem about the universal principles of synthesis of the MSc system, including its methodology. The third problem, at a somewhat lower level, refers to the difficulty of determining the role of reasoning and inference within the structure of

the MSc methodology system.

For the most complete synthesis, it is best to combine two approaches: praxeological and systemic, and this is the vantage point of this paper. Praxeological – because its domain is "action" as a universal category; and systemic – because categorical, generic and scientific system characteristics provide a complete description of actions and their systems, including scientific activities and within them: scientific methodology.

The aim of this paper is to try and achieve progress in solving the cognitive problem of synthesising the MSc methodology system on the grounds of systems theory and praxeology. I am venturing a partial diagnosis – only detection and categorical exploration – of the domain in question. The specific objective of this paper is comprised of three endeavours: 1) to describe MSc as an action system in the praxeological sense; 2) to determine the nature of the MSc scientific methodology subsystem; and 3) to place scientific reasoning and inference within this subsystem. The present considerations will cover action systems (AS – material scope), MSc scientific methodology (objective scope), in a universal spacetime, at the categorical level. The cognitive problem of MSc synthesis is defined so deliberately because of the particular complexity of the scientific domain, exceeding the premise (including size) of this paper, and because of addressing questions of a fundamental nature, i.e. at the level of concepts and definitions.

The key hypothesis of this paper can be summarised in the following assertion: progress in achieving the universal synthesis of the methodology system of the primary scientific activity in MSc is possible if we apply the praxeological and systemic approach in combination. MSc is a specific action system, having categorical, generic and scientific characteristics of a system. The scientific method is a holistic method for solving a given scientific problem, and that requires reasoning and inference, which are not stand-alone scientific methods as such (unless some scientific problems in MSc are limited to reasoning and inference).

When defining the assumptions for his study (doctrine of the study), the author is entitled to make an arbitrary choice of research methods on grounds extending from volition to testing their usefulness to solve the scientific problem (in a continuum extending from extreme volition to extreme testing). It is essential that he provide reasons for his approach to the choice of methodology. For instance, a volitional choice may be justified by the length limit of the publication and lack of literature on the subject in question. Hypothetico-deductive reasoning is well known in scientific methodology. Papers addressing reasoning and inference are classified under methods in logic and as scientific methods (more broadly), but they are mainly limited to studies on deduction, induction and abduction. MSc literature (M. Lisiński) suggests that there are scientific methods based on reasoning and inference, which is doubtful. The literature treats science, including MSc, mainly as a cognitive activity, and only Ł. Sułkowski additionally allows for value assignment and other functions of science.

A holistic treatment of the scientific method, as a systemic solution to a given scientific problem comprises several scientific methods, including the diagnostic, prognostic and mixed models (prognostic-diagnostic and diagnostic--prognostic). To solve the scientific problems addressed in this paper, as outlined above, the most appropriate approach is prognostic--diagnostic, rather than diagnostic or diagnostic-prognostic. This is because the diagnostic premises of the primary scientific activity are weak (the current body of knowledge in the field of MSc synthesis), and the "gap" between the current status of MSc and propositions for scientific synthesis cannot be filled using diagnostic methods. The diagnosis, in the form of an overview, is conducted exclusively with regard to the body of knowledge in the relevant domain, aiming to define the scientific problem of this paper. Only then do I go on to shape an outline of the concept solving the scientific problem, using hypothetico-deductive reasoning on the grounds of heuristics.

The paper is of a preliminary nature, so naturally it does not exhaust the subject. Following a brief discussion of the current body of knowledge in the domain under analysis, I present an introduction to the systemic-praxeological synthesis of the MSc methodology concept. The paper is made up of three parts: an introduction, the main body (with five subsections), followed by conclusions and a list of sources.

2. Status of MSc in the relevant domain

My brief diagnosis of the status of MSc in the domain of methodology is based on representative statements from papers written by selected authors (Czakon 2015; Sułkowski 2005; Sułkowski 2012; Sułkowski 2014; Sułkowski 2016; Lisiński 2013 a & b; Lisiński 2016; Lisiński 2018). The papers referred to above have the advantage of reflecting the current global body of knowledge in the relevant domain, with the added value of the Polish perspecti-

ve. Nevertheless, what emerges is an image of MSc that is not fully systemic, and not fully praxeological, not fully consistent with the foundations of MSc synthesis.

Taking into account the categorical requirements of systemic-praxeological synthesis (see subsections below), I suggest the following validation approach to detecting and exploring the current body of knowledge in the domain of MSc methodology.

1) There are no studies dedicated specifically to MSc synthesis, and those that address the subject at all, do so in passing or in a preliminary manner. Hence the list of literature (sources) at the end of this paper. The problem of scientific synthesis is also multidimensional, both in terms of science as a sphere of human activity and individual sciences. This is not a problem that is new or overlooked, but theorems in this domain are fuzzy and practically devoid of scientific value [with the sole exception of O.E. Wilson's 2002 work, which is not so much analytical as postulative]. Meanwhile, a synthesis of science/sciences entails questions like: a) accumulation of knowledge (a simple sum or a new structure of knowledge?); b) opposition: overall body of knowledge vs. specialist knowledge; c) approval/purification of the knowledge system (problems of falsification and verification of knowledge; paradigms and research programmes) and so on. The current body of knowledge in this domain cannot be accepted indiscriminately. I am trying to suggest a preliminary outline of systemic-praxeological synthesis of MSc at the level of concepts and definitions.

2) The system characteristics of MSc are interpreted so freely that it is impossible to present their synthesis. This is also partly due to a certain atrophy of research based on systems theory and praxeology, following its heyday in the first three quarters of the 20th century. The present paper is an attempt at elaborating on MSc as an action system, referring to categorical system characteristics (applicable to any system) and generic system characteristics (applicable to action systems only).

3) The domain of MSc gives rise to various doubts, starting from the sphere of semiotics, but diverse scientific discourse permits: a) separation of MSc from science; b) the pragmatic and apragmatic nature of MSc; c) operation between the simultaneously existing extremes in terms of forms of practice and theorems. Such a position is more of a statement of possibility than a normative ruling, which I am in favour of.

4) There is a serious difficulty with accepting the full-cycle nature of MSc [such a position is argued in Sułkowski 2005: management as a neo-positivist science, praxeological, assigning value (axiological) and radical (pragmatic) science]. Consequently, outcomes in MSc are limited to scientific theorems, while scientific facts are ignored. I am in favour of the full cycle, which I understand as a systemic-praxeological scope: material/objective, of problems, spacetime and results.

5) The system characteristics of MSc methodology are notably discussed by M. Lisiński. I try to elaborate on his ideas and express them in fully systemic and praxeological terms, in reference to the action system. However, Lisiński does not differentiate inference, reasoning and theorem-proving from methods of scientific problem solving, which is debatable. In this paper, such a differentiation is made to try and resolve this debate.

6) I do not share the opinion that there is no single methodology of MSc (Sułkowski 2005). One does exist, but it is dialectic, paradoxical and chaotic, just as the MSc system – a generic category of action systems.

3. MSc as an action system

Science is a category of human activity, separate in a given domain from pre-scientific and non-scientific activity. Nowadays, it is present nearly in every domain, developing as a distinct and singular sector of activity. MSc is a category of AS (fig. 1), because each scientific activity has an acting entity –at the least, a human individual. Below, I am describing the MSc system, but using the example of AS as a category, which means that MSc components must be put into the respective subcategories. For instance, **the portfolio of *scientific* processes, actions and activities,** which result in ***scientific*** **products and services**, i.e. scientific theorems (opinions) and facts. At the heart of the AS are elements included in **the core of the AS**. First of all, it comprises **the portfolio of processes, actions and activities**, which produce results in the form of **products and services**, dedicated to specific **customers and their needs**. Of course, it is assumed here that we are discussing ASs involved in socially acceptable activity. The processes engaged in by any AS may be inferred from the AS life cycle. They include "AS shaping" processes: 1) *AS creation*; 2) *AS existence*; 3) *AS decline*; 4) *AS changes*. In turn, the "AS existence" processes may be subdivided into: a) *fundamental processes*; b) *auxiliary processes*; c) *management processes*; d) *economic processes*; e) *communication processes*.

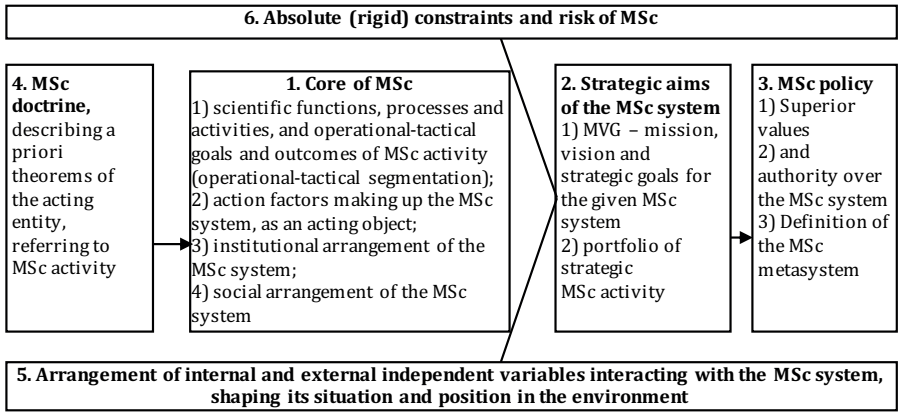

Figure 1. MSc as an action system
Source: own work

Of these, the most important are fundamental processes, which enable the given AS to interact with the environment. The last category, "processes of interaction between AS and the environment", comprises: 1) complex *exchange processes*, including transactions; 2) complex *co-existence processes*, including competition; 3) complex *self-organisation processes* aimed at achieving active longevity in the environment. The second category of the core is made up of **action ingredients** which, integrated into a single whole, form the management system as an **acting object**. The most important action ingredients are:

1) acting entities (managerial and executive), so far exclusively human individuals;
2) objects of action, relevant to the goals and conditions;
3) operational goals of action;
4) impacts (component activities; functions; processes) targeted at selected objects, sometimes of a very complex structure (real and transcendental), for instance including the principles of reasoning and inference and language of communication;
5) use of appropriate methods to act, in other words, an appropriate composition of constituent impacts to ensure successful action;
6) use of appropriate intermediaries between the acting entity and object of action, that is broadly understood instruments of action (machines, appliances, tools);
7) use of adequate resources (matter, energy and information), including financial and capital resources;
8) conducting activity in a given spacetime (space and time), starting from the location to the use of time and space;
9) achieving specific operational outcomes of action (products and services, real and transcendental).

Action ingredients may be also put together into a whole by aggregating subsets. As a consequence, we can identify such categories as *technologies, or techniques of action*, linking impacts primarily to methods, instruments. The third category of the core is the **institutional arrangement of the AS**. Its essence is *regime* and *dynamic and static organisational structure of the AS*. Their role is to determine congruence, including particularly the rights and obligations of the AS and its component parts. All of the AS core is infiltrated by **an arrangement of social variables**, such as culture, emotions, interests, faith, hope, trust, etc. They permeate the entire AS, at various levels and in different structures, forming the complex social fabric of the AS.

The second set of subsystems within each AS includes its **aims (blocks 2 and 3)**. The arrowhead of the "AS core" contains operational and tactical aims, preceded by strategic (block 2) and political (3) aims. Strategic aims position the AS, its activity and results (AS domain) in the wider context of the environment and change, and constitute values governing the AS domain. Political aims represent the ultimate justification of the highest order, determining the superior values of the AS and the principles defining the authority over the AS and its relations with the environment.

The **AS management doctrine** constitutes another subsystem. It includes sets of theorems selected a priori (i.e. prior to taking action) by the entities managing the AS concerning the object of management: a) nature of the AS; b)

its relations with the environment; c) and the principles of managing the AS. They reflect the beliefs of these entities on the subject and constitute a virtual external framework for the AS, which these entities can refer to when justifying attitudes, practices and – generally speaking – the principles for managing the AS.

The next block 5 describes the **internal and external independent variables impacting on** the action system. Internal variables emerge from the structure and interactions within the AS. External variables, in turn, represent the arrangement of the AS environment. By projecting the internal potential of the AS onto the potential of the AS environment, it is possible to explore and shape the situation (position) of the AS within the environment.

The final block (6) contains the **absolute (rigid) constraints and risk of the action system**. Absolute (insurmountable) constraints define the limits of the freedom of organisational behaviour. Their absolute nature may be objective and/or subjective. This category also includes risk levels unacceptable to these entities.

Table 1: Categorical and generic system characteristics of MSc

MSc – categorical system characteristics / Generic singularity of MSc	A comprehensive set, including the human individual	Amechanistic; probabilistic	Relational; ordered; coherent	Interactions with the environment	Functional
Open-ended					
Fuzzy					
Hybrid					
Variable					
Autopoietic					
In statu nascendi					
Evolutionary and teleological					

Source: own work.

It is crucial to observe that all ingredients and subsystems of the MSc system are interdependent and integrated. However, the level of interdependence and integration (levels of integration: Witczak 2008) extends from amorphous (addition), through coordination, coalition, union, federation, to holition (acting machines are non-existent). This stems from the categorical and generic characteristics of the MSc system (tab. 1). As a consequence of the systemic, categorical and generic characteristics, it is necessary to shape MSc, including its methodology, following the principles of dialectics, paradox and chaos. To expect that they will always comply with the science requirements of natural sciences is completely unreasonable. Such requirements can only be fulfilled locally, or in other words –idiographically.

4. Selected elements of the systemic-praxeological doctrine of MSc

Management science is part of science in the general sense. As such, it serves a number of functions in the social division of labour, among which the key role is played by primary scientific practice (activity). The statements above lend themselves to the conclusion that nearly everything can be studied for the purposes of systemic-praxeological synthesis. The domain of MSc and its methodology, apart from some transcendence, is not limited. In other words, the characteristics of scientific methodology are commensurate with the qualities of AS, qualities of systems as categories, and qualities of scientific methodological activity. The baseline material scope of MSc is the practice of management systems of any AS, with MSc potentially serving an auxiliary function (tab. 2).

Table 2: Primary functions of MSc in shaping systems (AS, SAS, CS, SS)

Shaping systems / Primary functions of MSc	System creation	System existence	System change	System decline	Synthesis of functions of science
Scientific activity– primary scientific functions CARNI	Primary scientific activity encompasses all phases of system shaping. Of course, to perform them, the MSc system also develops the other functions: supporting MSc, managing MSc, et al.				Refers to the synthesis of each MSc function (row-wise) throughout the system-shaping cycle
Organising, checking and improving theorems about management systems	Proposed forms of shaping scientific theorems and facts come from scientific and non-scientific sources, including practice. The task for MSc is to collect, check, organise and improve them according to scientific principles.				
Lifelong learning, including at the higher level (university education)	Here, MSc serves the function of science understood as "learning". According to doctrine, specialised professional management skills can and must be learnt.				
Implementation of scientific outcomes in practice (applied science, implementing scientific facts)	MSc is closely linked to practice, and together they shape how various systems are run (managed). Here, MSc serves not only to implement, but also to improve management performance.				
Supporting practice (e.g. various forms of advisory services)	Management practitioners must solve various managerial problems, some of them incidental, non-standard and exceeding their ability (complexity). MSc supports practice in this area.				
Raising awareness and educating the public about MSc	The cognitive potential of societies in terms of management is a necessary precondition for every member of society to be able to cope with managing systems, including themselves.				
Meta-management of MSc	Here, the domain of MSc is MSc itself in any spacetime. As a result, MSc manages itself (quality of an autonomous system).				
Synthesis of system shaping	Applies to the synthesis of each stage of system shaping (column-wise) for all functions of MSc				Total synthesis of MSc functions

Notes: SAS – acting supersystems (e.g. organisations of enterprises); CS – civilisation systems (a non-simple sum of natural systems and ASs); SS –systems of the cosmos.
Source: own work.

I would differentiate MSc from ME – management education. The latter is a component of the former, due to its educational functions (tab. 2). All functions draw on the primary scientific practice, the main function of MSc, whose domain is the practice of the management system. It has different scientific goals than that of supporting practice: scientific theorems and facts (pragmatic MSc – tab. 2). Another domain of MSc is the science itself, when it deals with meta-management of itself (tab. 2) – this being the apragmatic domain. Each of these functions has a separate domain, also in the cycle of shaping a given AS (header of tab. 2). Hence, each of these domains requires its singular methodological system. This fact contributes to the particular dialectic, paradoxical and chaotic complexity of MSc methodology. The subsystem of the core of primary scientific activity (CARNI) is elaborated on in table 3. Cognition (C) is the traditional, classical function of science in general, including MSc, with the goal of producing cognitive scientific theorems in different forms (laws, rules, principles, recommendations and scientific references) shaping the overall structure of data, information, knowledge and scientific wisdom. Verification and falsification of their scientific strength shapes cognitive scientific paradigms.

The assignment of value of an object (A) explored at a particular level leads to its evaluation and measurement of value on a continuum stretching from "good" to "bad", in any given domain of scientific evaluation. MSc cannot evade value assignment in any form, despite the obvious difficulties in this scope. The reason is as simple as can be: value is the essence of goals and autonomous aims of any action, and therefore of any AS (fig. 1). They are therefore the source of the "drive" of any AS, including MSc. The processes shaping the approach to scientific action (R) are undertaken following the diagnosis (conclusion of C and A) of a given domain, determining whether and on what terms

any further primary scientific activity is to be continued in the given domain. It also requires a scientific elaboration in MSc, as no further scientific action can be carried out according to pre-scientific or non-scientific rules. The next primary function is deciding on scientific models of a pre-examined object (CAR) in a given domain (normative models – N). Such an approach is the source of the diagnostic scientific method of the full cycle of the primary scientific activity (CARNI). It culminates in processes implementing (I) scientific models, i.e. materialising scientific facts – introducing scientific models into reality (MSc as an applied science). Columns 2 through 5 identify the remaining ingredients of the core of the MSc subsystem, and column 5 – subsystem synthesis. Please note the subsystem "3. Other auxiliary scientific activities and their ingredients" (col. 2), where, for instance, within the framework of "MSc management" we can shape "MSc models" – e.g. research plans and programmes.

Table 3: Core structure of MSc founded on the processes of primary scientific activity

Categories of basic scientific processes	Scientific objects serving those processes (made up of process components)	Scientific institutions conducting these processes	Social setting of the core of basic processes of MSc	Operational scientific outcomes of basic processes	Row synthesis – subsystems of individual basic scientific processes
1. (C)ognitive processes 2. (A)xiological processes 3. Processes shaping the approach to scientific action (R) 4. (N)ormative processes of scientific model development 5. Processes (I) mplementing scientific theorems	CARNI 1. Scientific goals and problems 2. Methodology of scientific inquiry 3. Other auxiliary scientific activities and their ingredients 4. Scientific resources 5. People – researchers 6. Object of inquiry	CARNI regime, dynamic and static organisational structure	CARNI values, interests, emotions, culture (et al.)	CARNI theorems and scientific facts about managing civilisation systems	Synthesis of scientific cognitive processes and their outcomes
Synthesis of basic processes of the core of MSc	Synthesis of scientific objects of the core of MSc	Synthesis of institutionalisation of the core of MSc	Synthesis of the social setting of the core of MSc	Synthesis of scientific outcomes of the core of MSc	Total synthesis of the core of the MSc subsystem

Source: own work.

5. MSc scientific methodology subsystem

The nature of the primary scientific activity (CARNI) as a whole is hybrid. Cognition (C) differs fundamentally from value assignment (A), as does determination of post-diagnostic action (R), development of models (N), and their implementation (I). The move from the original domain to its exploration, just like the move from N to I takes the form of an interstage crossing. As a result, the activity as a whole also has the systemic-praxeological characteristics as discussed here. For this reason, a scientific inquiry in a given domain may comprise: 1) only a single subsystem of exploration and cognition (C); 2) a subset of subsystems, e.g. CAR; 3) a full-process system (CARNI). Research may employ, for instance, a comprehensive diagnostic method for solving a chosen scientific problem (CARNI), or a prognostic method (CAN), wherein after defining the scientific problem (CA) we move straight to shaping the scientific model (N), disregarding the diagnostic sources of that model, and relying exclusively on a heuristic and/or volitional approach. Unquestionably, such scientific activity must provide for internal and external corroboration of the process and outcomes of scientific inquiry (logical and positive verification and falsification). The hybrid nature mentioned above also extends to scientific processes at a lower level, e.g. in cognition (C), we can differentiate detection, exploration, classification and explanation, which involve distinct methodologies. The scientific methodology subsystem (fig. 2) is part of the MSc system. Its main constituent is the subsystem of the core of MSc methodology (operational methodology subsystem), shaped roughly following primary scientific processes (CARNI). The scientific methodology of MSc carries a significant stigma of constructivism, subjectivity and extra-rationality. The

science requirements of MSc methodology are determined by the scientific expert community, taking into account the cumulative nature of the methodological CARNI of pragmatic and apragmatic MSc. The core of MSc methodology is engaged in mutual interactions with other subsystems, as a result of which the methodology system as a whole has a particularly complex structure and orientation. For instance, purists and advocates of the monopoly of science methodology may press for the use of the doctrine of that methodology in MSc, as a focus for the whole MSc methodology system. Likewise, those putting emphasis on constraints and risk will focus the system around orthodoxy, and proponents of aims – a teleologically oriented system of MSc scientific methodology (predominance of blocks 2 and 3 in fig. 2). The highest level of the system is occupied by strategic and political aims of MSc scientific methodology, also encompassing the arrangement of MSc scientific methodology, e.g. as the methodological policy of MSc. To provide another example, the structure of the MSc scientific methodology system may be focused around forms of practising science, e.g. such as schools, directions and trends in methodology. This is the way to form a particularly complex network-hierarchical structure of the MSc scientific methodology system, whose foundations, at the lowest level, contain the operational-tactical core in the form of the scientific method.

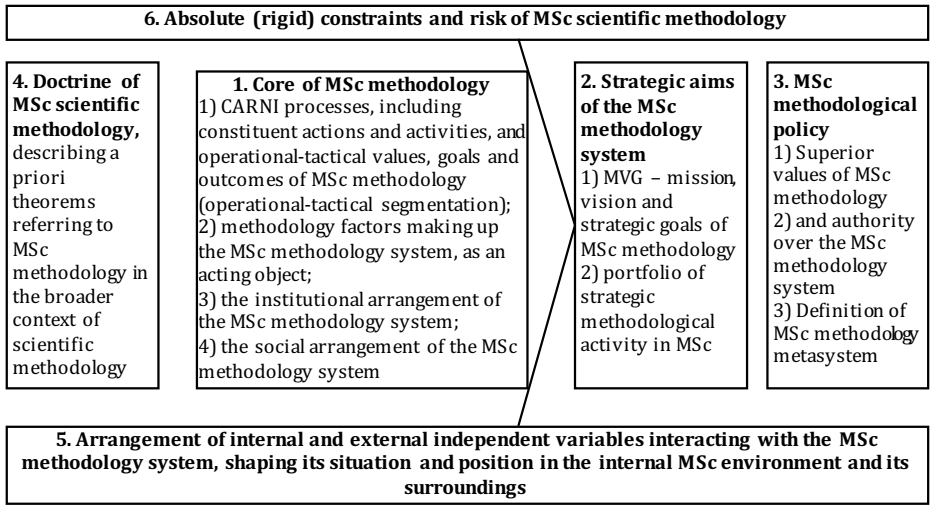

Figure 2. MSc methodology subsystem within the MSc action system
Source: own work

The *scientific method* is:
1) conscious, derived from a priori foundations, adapted to circumstances (situation; constraints and risk), scientifically justified, reproducible, systematically applied and standardised,
2) arrangement of activities and selected components of the given primary scientific process,
3) in such a way as to directly serve a merit-oriented and accepted internally by the scientific acting entity, methodologically and materially efficient solution of the scientific problem (scientific theorems and facts) and achievement of the scientific goal.

The scientific problem and its domain, including the category, is the key determinant of the scientific method and, consequently, also methodology: method is a comprehensive approach to solving a scientific problem, irrespective of its category. Method, above all else, co-determines the other ingredients of operational scientific activity, decides the choice of specific scientific tools, etc. There can certainly be a feedback mechanism at play: sometimes the choice of the scientific approach, available tools or other scientific factors, decides on the manner of scientific activity, etc. Nevertheless, as I am trying to demonstrate here, the scientific method is merely one of the ingredients of the methodology subsystem within the primary scientific activity subsystem.

Methodology (also meta-methodology) of a given action (here: scientific action) is the arrangement of selected action ingredients, focused around action method (methods), including: 1) language (definitions; semiotics); 2)

doctrines and approaches (choice of doctrines) to the action, its course and arrangement; laws, principles, rules of conduct in the course of action; 3) logic – principles of reasoning and inference; 4) methods – constituent actions and their arrangement (dynamic organisation + procedures) – including process categories discussed in subsection two above, together with corroboration of the process and outcomes of scientific activity; 5) outcomes of scientific activity: a) from the point of view of effectiveness in problem-solving (also in connection with the consequences of activity) and action tasks; b) in the context of other activity ingredients, especially instruments (instruments in a predominant role, serving as a focus for other ingredients, are typical of technology and techniques); c) with shaping outcomes into systems of scientific theorems and facts, including forms of theorems and their approval (paradigms); 6) instruments of action understood broadly, due to their strong and immediate interaction with the manner (method), from the point of view of performance; 7) relation of (scientific) activity in space and time; 8) mutual interactions between the core of methodology subsystem and the subsystems of surroundings [a) the internal environment (here: MSc) and its relation to the external environment, b) rigid constraints and risk]. Such mutual interactions result not only in placing focus on certain methodology subsystems (e.g. teleological) or methodological policy and strategy of MSc, but also impact on its scientific nature, e.g. by requiring a particularly elaborate use in MSc of triangulation and scientific replication.

6. Reasoning and inference in MSc methodology

In the proposed perspective, methodology, including method, is an ingredient of any type of action, including autonomous reasoning and/or inference. The fundamental differentiating criterion is the role of methodology in the entirety of the given action, regarded as an acting object. The second criterion is how methodology is situated within the principles of solving scientific problems. The "reasoning method" can be applied to any manner of solving a given problem, but then it constitutes only an ingredient of the manner, referring to reasoning itself.

On the other hand, we can only talk about the "scientific reasoning method" when the overall manner of solving a given problem meets science criteria. In MSc, the objects of application of scientific methods, meeting the general science criteria as well as the specific MSc science criteria, are scientific problems. Seen as reasoning/inference (logic) is used in any scientific activity, MSc methodology will fulfil the science criteria, as long as the reasoning/inference used in the given methodology/method of management and MSc meets science criteria (particularly those of logic).

Inference is part of reasoning, one that addresses the problems of reasoning, including but not limited to the problem of drawing conclusions (inference output) from adopted arguments (inference inputs) and/or vice versa (inferring arguments from consequences/conclusions). Its material scope in the given domain is the very process of inferring conclusions based on arguments, and/or vice versa, that is the process of formulating resultant theorems (conclusive opinions derived from reasoning in the given domain). The field (domain) of methodology/method of reasoning/inference is restricted to that process. On the other hand, the sphere of a positively corroborated scientific methodology/method of MSc is broader. Apart from the sphere of reasoning/inference, it encompasses the other variables of the given process/system and of solving a scientific problem in MSc. The same applies to primary scientific activity.

In this context, please note that method is just one of many ingredients of the "system", whether related to inference or action. Therefore, it is better to use the concept of the "system", for instance in respect of "inference", "problem-solving", "action", etc. If we want to solve a given problem, we must adopt specific a priori assumptions (doctrine), goals (aims), use a specific operational system (core), and allow for constraints and context. All these elements/subsystems/systems are inter-related, which entails a necessity for ongoing mutual adjustment and harmonisation.

Science discovers (things hitherto concealed) and invents (creates something which did not exist before), but it may also have a mixed function. At the same time, science shapes, or in other words creates, maintains the existence, causes the decline and changes the given object (system). It opens up scientific problems (of a singular or complex nature); solves or records progress in solving existing scientific problems; changes existing approaches and solutions to scientific problems and concludes scientific problems.

With such an approach, any method, e.g. deductive, is just one of a number of inference methods. It is not a method for "conducting a given action", or a method for solving problems of action, including management and MSc, other than the part of action within them:

"inference". The same applies to "scientific activity": methods of reasoning are just one of the ingredients of the overall solving of any scientific problems, including scientific methods. In this context, it is immaterial which method we choose for problem-solving – in each one we must apply methods of inference, for without it problem-solving would be impossible. In other words, inference methods are at a lower level (internally) than problem-solving methods - inference methods are part of methods of action, action in which they are applied and used. In principle, the scientific method may not be reduced to the inference method, but the inference method is a necessary and ubiquitous component of the scientific method.

For the reasons mentioned above, problem--solving methods and inference methods are interdependent. For instance, if we use the purely prognostic method for problem solving, then we use hypothetico-deductive or axiomatico-deductive inference method. The mutual relations discussed here also result from the nature and structure of the material scope of scientific inquiry. The world has a dual wave/particle nature. At the macroscopic level, which is specifically apt when it comes to management, corpuscularity (particulate nature) prevails. Adopting a definition of the corpuscle, which is a relative notion, is the reference point in research. At the level of systems, corpuscles may be individual categories (singletons), such as elements (E), properties (P), relationships (R) and systems (S=EWR). The situation changes, however, when we try to give the scientific treatment to multi-element, distributive and/or collective sets. Scientific theorems and facts referring to single-element sets can be reached using different paths (methods) than in the case of multiple-element sets. When our starting point is a single empirical object, the classical cognitive procedure (partial from the point of view of CARNI) is an inductive scientific method of sorts. Starting from theorems about a singleton (or a multi-element set, but clearly defined as a unit under study), we move on to theorems about a multi-element set. The move entails an attempt to extrapolate the singleton theorem onto the other type of set. This approach is consistent with inductive reasoning, but the similarity is due to the characteristics of the sets under study. Deductive reasoning is limited to testing the veracity and reliability of the relationships between an argument and a consequence, irrespective of the nature of the object under study, including virtual categories, too. It needs to be added that primary scientific activity does not always involve the exploration of real domains, in many cases domains are of a purely virtual nature, or mixed. Scientific inquiry may be targeted at model constructs of various nature, in which case the manner of reasoning plays a significant, sometimes crucial, role. Nevertheless, processes like shaping such models and simulating their functioning, examination of the consequences of such functioning may involve the application of diverse procedures of transformation, substitution, elimination, etc., making up the method for solving the given scientific problem of modelling. Even then, however, reasoning is only a logical component of the method.

7. Conclusions

MSc, as a social science, operates in a domain different from that of natural sciences. Its development reflects the characteristics of its domain and scope. The material scope of MSc encompasses any action, because only such action must be managed. The objective scope of MSc is founded on all processes of primary scientific activity (CARNI). The contemporary role of MSc emerges in a sinusoid-like manner (in terms of performance and scientific power) from its historic development, current aims, assumptions and circumstances, as well as the heuristic-creative prognostic approach. Such development of MSc is multidimensional in a spherical arrangement, dialectic, paradoxical and chaotic, as well as natural, and shall never be different. Synthetic examples of: dialectics (new evolutionary-creationist theorems emerge from the juxtaposition and friction between opposite extremes); paradox (cumulative and non-cumulative science; specialising and synthesising; etc.), chaos (methodology: stage--specific and interstage; turbulent and stable; attractor and non-attractor); sphericity (diversity, polymorphism). The scientific methodology of MSc is its pragmatic and apragmatic, systemic "toolbox", referring fundamentally to management system practice. The synthesis of the MSc scientific methodology system emerges from the selected ingredients of primary scientific activity, with characteristics corresponding to the discussed determinants. The main factors defining and providing focus to the methodology system are scientific problems, aims and methods. From this perspective, scientific reasoning and inference (logic) are not separate scientific methods, but rather necessary ingredients of any scientific method, and therefore – scientific methodology. The relationship between MSc and practice is threefold: 1) MSc follows practice; 2) MSc precedes practice; 3) mixed.

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International mobility of students in modern conditions of transformation in the global market of services (regional aspect)

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ABSTRACT

Modern global processes are stated to have significantly influenced transformations in the higher education system. On the other hand, internationalisation of higher education has become a key factor in the development of global processes. Accordingly, it becomes necessary to determine the specific nature of the internationalisation processes of higher education in different countries, as well as the involvement thereof in the processes of academic mobility at establishing the educational space transformation under the conditions of globalization, at grounding the changing place and role of universities as higher education internationalisation contribute to enhancing the convergence of national educational systems, providing a significant influence on the level of competitiveness of national economies. The authors define the peculiarities of attracting countries to mobility processes and systematise the waves of international student mobility, taking into account the geopolitical and geo-economic factors of positive and negative influence of institutional drivers. Furthermore, dynamic shifts in international student mobility are calculated and the regional distribution of foreign students by educational level is determined. The purpose of the article is to identify the waves and substantiate the factors of international student mobility in the context of the transformation of the global market of educational services.

Keywords: geoeconomics, internationalisation, higher education, mobility, students.

1. Introduction

Although internationalisation of higher education is a relatively new phenomenon in the modern world economy, the relevance of this issue has led to the emergence of a significant number of studies. Internationalisation has become not only an integral part of the continuous process of changes in higher education, the processes of internationalisation of higher education have basically become an important determinant of the development and reform of higher education. Internationalisation of education is beneficial both to universities and to national economies as a whole.

The analysis of scientific sources allows us to take up the position that the processes of internationalisation and globalization are interconnected and intertwined. Integration is a new stage of internationalisation, and its highest degree of manifestation is globalisation (Wood, 2007). Internationalisation is a dynamic process, not a specific combination or set of isolated events that characterise the relevant phenomena (for example, integration may be considered both as a phenomenon and as a process) (Knight, Wit, 2018). The main aspects of internationalisation of higher education include (Scott, 1998, pp.117-119) the development of flows of students and administrative staff, the expansion of cooperation between universities in different countries, and, as a result, the development of flows not only of people, but also of ideas. In determining the essence of internationalisation of the higher world, it is essential to take into account the international component, which concerns not only all the components of the educational sphere, but also the place and role that education plays in the development of society as a whole. Defining the definition of internationalisation at the national, sectoral and institutional level, it is necessary to focus

on the goals and functions of higher education in the context of the integration process in the international, intercultural or global dimension (Knight, 2003, p.2).

Defining processes in the educational sphere that involve crossing borders: knowledge, mobility (Teichler, 2017, 182). On the other hand, internationalisation processes determine the general focus of changes and purposeful activities in the direction of greater "internationality". Chatlani (2018) draws attention to the global transformations that are taking place in the world's economy, affect the nature of university development and determine future trends in the internationalisation of higher education in the future. It should be noted that along with the spread and deepening of the processes of internationalisation of higher education, its globalisation, discussions related to skepticism about the internationalisation of higher education (Rhoades, 2017), the development of academic nationalism, protectionism are also actively developing (Wende, 2017).

Internationalisation contributes to the development of multilateral relations, as the processes of internationalisation from the micro to macro context develop (Heriansyah, 2014). Considering the impact of globalisation, modern universities are actively implementing their own strategies for the development of internationalisation (Rosyidah, N., Matin and Rosyidi, U. 2020), stealing relevant agreements at both regional and international levels (Jibeen, Khan, 2015).

Previous research by the authors (Bulatova, Zaikovsky, 2019) has shown that in the context of global transformations of the modern world, international cooperation has become an important indicator of the development of education, and universities themselves are becoming global institutions, with constantly increasing influence on the formation of competitive advantages of the national socio-economic system.

Internationalisation of education covers various forms of international cooperation, which are related not only to the traditional academic mobility of both applicants for higher education and teaching staff, but also to the development of new forms of institutional mobility associated with the formation and implementation of joint educational projects, the expansion of integration mobility, which is associated with the introduction of international educational standards that ensure educational integration and the creation of joint educational spaces. Along with the development of modern information technologies, opportunities for developing joint distance learning programs and courses have significantly expanded, and new forms of e-mobility (mass open online courses) are spreading. Finally, various forms of strategic educational alliances, associations and partnerships that are actively created between universities and countries and expand new forms of institutional partnership in the global economy play an important role in the internationalisation of higher education. The information above gives grounds to consider the internationalization of higher education from two aspects:

- *internal* (provides for the introduction of an international component in all areas of University activity) and
- *external* (related to the introduction of an international component in all areas of university activity, which involves crossing national borders).

Thus, recent research, defining the essence of internationalisation of higher education, focuses on the integration process in the international dimension, which is associated with training, research activities and other functions of educational institutions. However, as it turned out in practice, globalisation has influenced the development of the processes of internationalisation of higher education so substantially that now the latter has become an important factor in the development of global processes. Accordingly, it is necessary to determine the features of internationalisation processes not only at the national level. Thus, it is of great significance and relevance to determine the specific nature of the higher education internationalisation processes in different countries, as well as the involvement thereof in the academic mobility processes, etc.

2. Modern transformations in the global market of educational services

Modern global processes have significantly influenced the transformation of the higher education system, which is confirmed by the following: promotion and expansion of academic mobility, development of new forms of mobility (institutional, electronic), formation of international campuses, development of international scientific cooperation and deepening of global competition for talents, which together contribute to the development of the world knowledge economy. The global gross enrollment rate for higher education in the world economy as a whole increased from 14% in 1993 up to 38% in 2017 (the average for the same period increased from 55% in 1993 up to 77% in 2017) (World Economic Situation and Prospects, 2019). Argentina, Brazil, China, India, Indonesia, the Russian Federation, Saudi

Arabia, South Africa, and other countries have had the main impact on global growth in higher education coverage over the past decade. In 2005, almost every sixth person in the world aged 25-34 with higher education was from the United States. Since 2013, China has taken the first position (17%), followed by the United States and India accounting for 14% each. Maintaining this trend will ensure the dominance of China and India among the G20 countries in terms of young people aged 25-34 with higher education. The forecast expectations for 2030 are 300 million people, while the European Union and the United States together make up less than a quarter (OECD, 2015).

In the wake of the gradual expansion of the knowledge economy expectations (Global Trends in Higher Education and geographic perspectives, 2017, Education Indicators Focus, 2015) regarding education provision, it is estimated that the level of primary education coverage of population in the whole world economy will be 91%. More than a half of the world's population (55%) will have secondary / higher education, and the knowledge gap between the developed and developing countries will be reduced. The number of young people with higher education (25-34 years) in the OECD and G20 countries will continue to grow. The increase will be mainly provided by countries such as China and India, the contribution of which to the formation of labour force with higher education in mathematics, technology and natural sciences until 2030 is estimated to be 60% of the total labour force of the G20 countries.

The growth of the middle class increases the demand for quality education. Early in 2017, the middle class of the world's economy constituted about 3.2 billion people (Kharas, 2017, pp. 11-15). About 140 million people join the middle class every year – which means that by 2020, half of the world's population will be in the middle class. While the growth of the middle class is slow in developed countries, in developing countries this growth increases every year, and especially in China and India, where the quantitative assessment of the middle class is 350 million and 380 million respectively. As a result, by 2030, people of Asian origin will account for 2/3 of the world's middle class. In developed countries, middle-class consumption is growing from 0.5 up to 1% annually, meanwhile in developing countries, consumption is growing much faster – from 6 to 10%. The growth in the consumption of the middle class is becoming a relevant driver of development and growth. This will require an appropriate response from higher education schools, which should satisfy more demanding consumers of educational services. In addition, the increase in life expectancy, the development of medical technologies will affect the increase in the number of non-traditional students of older age, and thus, the demand for new retraining programs, re-education, professional development, etc., will increase every year.

The increasing interdependence and interconnectedness of the world's countries requires appropriate skills from the workforce, which are increasingly important in the global context. Markets are becoming more globalised, and as a result, education received abroad contributes to getting closer to these markets.

3. International student mobility: regional shifts

The number of international students is growing annually in the world, given indicators of academic mobility, as shown in Figure 1. According to UNESCO, in 1990 the number of international students was 1.3 million, in 2000 – about 2 million, and in 2017 their number was just over 5 million.

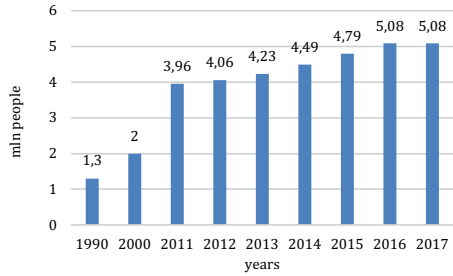

Figure 1. Dynamics of the number of international students in the world, million people
Source: own research

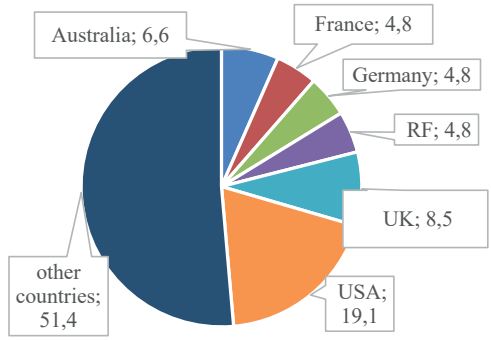

Figure 2. Main countries for attracting foreign students in %
Source: own research

International student mobility is actively developing in favour of the OECD countries. Almost half of the total number of foreign students in 2017, selected the curriculum and were enrolled in such countries as the USA (971,4 thousand students or 19.1% of the total), the UK (432,0 thousand or 8.5%), Australia (335,5 thousand or 6.6%), France (245,3 thousand people or 4.8%), Germany (244.6 thousand people or 4.8%) and the Russian Federation (343,8 thousand people or 4.8%) (Figure 2). Among European countries, flows of academic mobility from the South to the North are linked to the impact of the Euro crisis. Special attention should be paid to academic mobility of the most populous countries of the world – China and India, which is associated with the return of ethnic diasporas to their historical homeland. Thus, the change in the number of foreign students is extremely uneven among countries that occupy the leading positions in the market of educational services. The main directions of flows of students, doctoral students and researchers are flows from Asia, directed to the United States (the largest flows), to Europe, and so on.

As the level of education increases, the number of foreign students in both absolute and relative dimensions increase (Figure 3). For example, in OECD countries, the share of foreign students in the total number of undergraduate students (which is 3.52 billion students) is 4% (OECD (2018), p.220). Luxemburg (27%), Austria (18%), New Zealand (16%), Australia and the United Kingdom (14% each), Canada and Switzerland (10% each) show the highest level of student enrollment in undergraduate programs. The percentage of foreign students enrolled in master's programs is already 12%, and in some countries it is still much higher – in Luxembourg (73%), Australia (46%), the UK (36%), Switzerland (29%), New Zealand (26%), Austria, Belgium (20% each). Among post-graduate students who master educational and research programs in the OECD countries, in fact, one in four is a foreign applicant, and in some countries their share exceeds 40%, among them Belgium, France, Luxembourg, the Netherlands, New Zealand, Sweden, Switzerland, the United Kingdom. In the United States, among the leading countries in attracting foreign students, the share of the latter almost coincides with the general indicators for OECD countries, although they are the largest in terms of the number of students in absolute terms, which is 0.97 billion foreign students. The attractiveness of educational programs also increases with each new level: 4% of foreign students study in the bachelor's programs, one in ten in the master's programs, and 40% in the doctoral program. It should be noted that students from the United States prefer British universities (one in five American students enroll in educational programs at universities in this country).

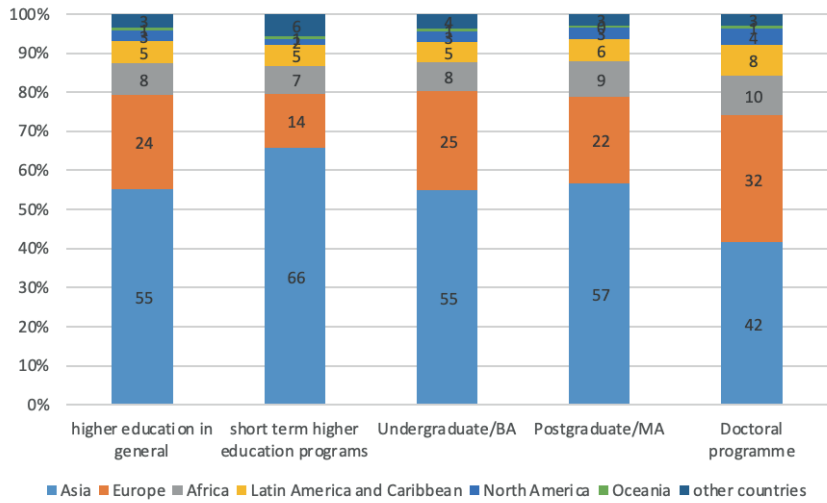

Figure 3. Regional distribution of foreign students by level of education (2016, in %)
Source: own research

Among foreign students who have come to study at OECD higher education institutions, the largest number is represented by students from Asian countries – 55% of the total number of foreign students' study at the bachelor's programs, 57% at the master's programs and 42% at the doctoral programs. First and foremost, these are Chinese students, whose number at all levels of higher education is 0.86 billion in the OECD countries. 2/3 of Asian students are from universities in three countries – the United States (38%), Australia (15%) and the United Kingdom (11%). Students from developing countries prefer universities from such developed countries that have certain historical, cultural and linguistic ties (including former metropolis countries). Thus, about 75% of students from African countries choose to study at universities in France (35%), the UK (12%) and Germany (7%), among Latin American students in OECD countries, 12% choose to study in Spain, and students from the former Soviet republics tend to study in the Russian Federation, where Azerbaijan (6%), Belarus (6%), Kazakhstan (28%), Turkmenistan (7%), Ukraine (9%) and Uzbekistan (8%) are represented in the structure of foreign students (OECD (2018), 221). It should be noted that the language factor is one of the key ones when it comes to choosing the country of study for foreign students. Undoubtedly, English-language higher education programs have an advantage. This explains why four countries – the United States, the UK, Canada and Australia account for more than half of foreign students.

A quarter of international students in OECD countries are from European countries (0.845 billion people). This high level of mobility has made it possible, first of all, to develop the European higher education space, which has a high level of academic mobility (1.6 billion students according to 2016 data). 4/5 of European students choose to obtain higher education diploma in another European country, the leaders of which are France and Germany, the main host countries for foreign students.

In summary, we should highlight the positive and negative consequences of the expansion of international academic. The increase in the number of foreign students is positively perceived by the countries to which they come to study, as they expand the demand in the domestic market, provide additional foreign exchange earnings and develop the national labour market. Attracting foreign researchers contributes to the development of innovation in national economies. At the same time, attention should be paid to the negative effects of expanding international mobility.

There are risks of transforming universities into global markets, where the disproportionate privileges of foreign students in relation to local students arise, and hence the problems of xenophobia and discrimination. In this case, the internationalisation of higher education acquires the characteristics of an elite project, which strengthens sentiments against the use of English for teaching and learning; against the use of the university rating system and other forms of manifestation of "academic capitalism", which intensifies discussions on academic protectionism. Another potential risk of internationalisation is brain drain (a particularly crucial issue for developing countries.

4. Waves of International Student Mobility

In the development of international student mobility, three waves can be identified which are determined by the corresponding trends and factors affecting student mobility (Choudaha, 2017). They are systematised in Table.1.

The development of the first wave of international student mobility in the world was primarily determined by the rapid development of information and communication technologies,

Table 1: Waves of International Student Mobility

Waves	Period	Geopolitical and Geo-economic Factors of Influence	Students Demand	Institutional Drivers
First wave	1996-2006	development of information and communication technologies, dissemination of the Internet, terrorist attacks on the United States, increased global demand for highly skilled labour force	financial support	research
Second wave	2006-2013	financial and economic crisis	academic support	finance
Third wave	2013-2020	China's economic slowdown, Brexit, D. Trump's policy	career support	innovations

Source: own research.

the deepening of international competition in the scientific and technical fields, and, as a result, the increasing demand for highly trained labour force. This was facilitated by the processes of increasing funding for research in the leading countries, which actively attracted talented young people. Attracting talented international students is recognised as a strategic benchmark for the United States, which will provide economic advantages. The deepening of cooperation between European countries in the field of education, the adoption of the Great Charter of Universities, the Bologna Declaration and the definition of the fundamental principles of the European educational and scientific space (university autonomy, unity of science and education, freedom of research, education and training, etc.) have positively influenced the expansion of students' academic mobility. Of about 2 billion foreign students, 22.7% studied in the United States, among European countries; the leaders were the United Kingdom (10.6% of the total number of foreign students), France (6.5%), and about 5% of students studied in Australia. In addition to these countries, Germany, Japan, Belgium, South Africa, Spain and Canada are among the top ten countries that accounted for more than half of foreign students (over 1.3 billion). The main countries supplying students during this period were China, South Korea, Greece, Japan, India, Malaysia, Germany, Turkey, France and the United States.

The first wave of mobility is characterised by high motivation of foreign students themselves, a significant part of whom chose Master's and Doctoral programs at research universities, which already required from students to have a high training level, so their training level was in line with academic expectations. High motivation of foreign students was influenced by the corresponding state policy of these students' countries of origin. Thus, China's strong economic growth, development of the middle class, political stability, government incentives for Chinese students who return to their homeland, improved quality of life, support for professional self-realization, ideas of national patriotism, and a sense of a common national goal contributed to an increase in the number of returning Chinese students (Kellogg, 2012, p. 15). Due to the return of highly qualified specialists trained abroad, numerous high-tech companies emerged in China, contributing to the progress of development of the Chinese economy.

Among the geopolitical factors affecting academic mobility, which also determined the nature of the first wave, we should separately highlight the terrorist attacks on the United States in September 2001, which caused an increase in the level of terrorist threats in the world affecting visa restrictions as well as training of foreigners.

During the second wave, students' academic mobility was expanded due to a significant impact of the financial and economic crisis, as a result of which financing of the educational field was significantly changed in the countries of the world economy which were the leading centers of foreign students' training. It is at this time that the place and role of foreign students are being reviewed, as in the short term they have become an important source of budget revenues (tuition fees, costs of domestic consumption by foreign students), which increases the impact on the countries' balance of payments. For foreign students, the cost of tuition is higher than for domestic students in Australia, Austria, Belgium, Canada, Denmark, Estonia, Ireland, the Netherlands, New Zealand, Russia, the United Kingdom, and the United States. France, Germany, Italy, Japan, Korea, Mexico and Spain used the same tuition rates for both domestic and foreign students (OECD, 2010, pp. 310-317).

In the long-term perspective, attracting foreign students may become an important source of highly skilled labour force. In many developing countries, studying abroad is beginning to be seen as an important alternative to the national educational system development support under the conditions of limited resources, which has a positive effect on the effectiveness of providing education to citizens. The majority of foreign students in this period are accepted by Australia, France, Germany, the United Kingdom and the United States, and the main countries that provide students are China and India.

The following main factors will determine the nature of the development of the third wave in the future:

- slowdown in the economic growth in China, the largest supplier of foreign students;
- exit of Great Britain from the European Union – the largest EU country by the number of foreign students;
- change in the political course of the United States associated with the election of D. Trump as President of the United States – the world's largest country, where one in five students is a foreign student.

The restrictive migration policy implemented by the Trump administration has significantly affected foreign demand for higher education in the United States and reduced the quantitative results of international student mobility. Thus, despite the fact that the total number of foreign students who receive edu-

cation at American universities remains the highest in the world, the number of new international students amounted to about 272 thousand people, which is 6.6% less than the previous year and 10% less than in the 2015-2016 academic year, when the largest number of foreign students joined American universities (Table 2) (Open Doors, 2018).

Table 2: Number of new international students enrolled in US universities

Educational program	Academic year							
	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Bachelor's course	84 543	90 903	102,069	109,486	112,765	119,262	115,841	108,539
Master`s course	89 505	92 211	100,129	108,519	121,637	126,516	124,888	117,960
Other programs	40 442	45 353	48 722	52 123	59 364	54 965	50 107	45 239
In total	214,490	228,467	250,920	270,128	293,766	300,743	290,836	271,738
Annual change, in %	5.7	6.5	9.8	7.7	8.8	2.4	-3.3	-6.6

Source: own research.

Among the factors that check the mobility of foreign students, visa procedures (delays, restrictions, etc.), which are associated with the changes in foreign policy implemented by the Trump administration make the most negative impact. The social and political environment in the United States, as well as the cost of education have a significant impact (Table 3). In turn, among the factors of positive influence one can distinguish strengthened career guidance, a university's profile abroad, interaction with students who have already been attracted to American universities.

The total number of foreign students studying at universities in the European Union in 2017 was 1.7 million, a significant number of whom (25.5%) were from universities in the UK. The majority of foreign students studied either for a bachelor's degree (45.6%) or for a master's degree (41.9%), while 9.3% studied for a doctorate. At present, Europe attracts 45% of all international students worldwide, but reducing the number of foreign students remains an urgent problem for EU countries.

According to expert estimates of the international company Hobsons (Redden, 2016), which conducted a survey among students of British universities on the eve of the Brexit referendum, 35% of foreign students who came to study at UK universities from non-EU countries, and 82% of students from EU countries found it less attractive to study at UK universities should the country leave the EU. The number of students from EU countries studying at the UK universities, which had been steadily increasing every year, began to decline after the announcement of Brexit. While the number of students increased by 7% in the 2016-2017 academic year, the number of students decreased by 3% in the 2018-2019 academic year, including 9% for postgraduate studies (Jack, 2019). It can be assumed that the situation will only become more complicated, since the UK will not be able to receive research grants under the Horizon 2020 program, the European research Council, or participate in the Erasmus+ program under the previous conditions after leaving the EU. In addition to uncertainty in relation to students from the EU countries, current anti-migration attitude in the implementation of Brexit also does not attract foreign students from other countries to study at British universities. They are likely to redirect their applications to universities in Canada, Australia, EU countries, where the learning environment is more certain and where there is no anti-migration attitude.

Table 3: Waves of International Student Mobility

Negative influence factors	In %	Positive influence factors	In %
Visa procedure	83	Strengthened career guidance	58
Social and political environment in the United States	60	University's increased profile abroad	48
Admission to universities in other countries	59	Interaction with the previously-enrolled students	47
Tuition fee	55	Deepening cooperation with recruitment agencies	26
The feeling of undesirability in the United States	49	Growth of scholarship programs for international students	24
Employment in the United States after graduation	44	Strengthened cooperation with foreign universities	23
Physical security in the United States	44	Government scholarship programs	21

Source: own research.

5. Conclusions

In the development of international student mobility, three main waves have been identified, the development of which is due to geopolitical and geoeconomic factors of influence. With the development of international student mobility, the institutional drivers of this process have been transformed from research and finance to innovation.

The leaders in attracting foreign students are highly developed countries – the United States, Britain, Australia, France, Germany and others. The change in the number of foreign students is unequal among the leading countries. The main directions of foreign student flows are formed from Asian countries (primarily from China). Changes in American migration policy, as well as disintegration processes in the European Union (Brexit) have significantly affected the reduction of foreign students in the leading countries – the United States and Britain.

Attracting foreign students is increasingly getting into focus of attention of governments and universities themselves. From a macroeconomic point of view, foreign students are an important factor in influencing the country's balance of payments through foreign exchange receipts, domestic consumption, etc.). Besides, they become an important source of the national labour market development (by attracting talented graduates from among foreign students who have mastered higher education programs and stayed in the country where they received higher education), national educational system (by attracting talented youth, academic staff), innovative development, and so on.

For countries of origin, students who have received higher education abroad also become an important source of development, provided that such students return to their home countries. And this is not just about new opportunities for high-tech development that the country receives, which brings back highly trained specialists with high-quality international education, since the latter contribute to the development of interstate relations and the integration of the national system into global networks.

The choice in favour of international education for future applicants of higher education is due to the following factors. First, in many countries, there are certain restrictions on obtaining higher education at the corresponding levels in the corresponding educational programs. On the one hand, wealthier students whose families are able to pay for education abroad choose such training, and on the other hand, some governments use appropriate programs to support training in certain majors and specialisations. Leading universities in the world that implement research projects on the global market are becoming more attractive for international students / doctoral students who consider their studies at such universities as appropriate investments, which will have a greater return in the future.

Further studies include the definition of the main components in the development and implementation of internationalisation strategies in higher education which should be developed by modern universities to attract foreign students, promote international competitiveness of universities, and ensure financial stability in modern conditions of global educational space transformation.

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The Belt and Road Initiative as a tool for promoting EU–China trade. Poland's case

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ABSTRACT

The aim of the study is to evaluate the potential role of the Belt and Road Initiative (BRI) for promoting EU – China trade, and especially Poland – China trade. We test two hypotheses: 1) Non-tariff barriers (NTBs), particularly related to railway transport, are significant for Poland – China trade, and 2) Poland – China trade fits railway transport well. Therefore, we start with a study of the significance of tariff and non-tariff barriers in mutual trade relations, including transport-related barriers. NTBs are mainly derived from the EU Market Access database, and as for transport-related barriers – the logistics performance index (LPI) is used. As the next step, we study the composition of bilateral trade in static and dynamic terms using the OECD TiVA database. In the light of the significant increase in NTBs on EU manufacturing products exported to China and the railway transport infrastructure performance in Poland, the BRI could become an effective tool for improving the business environment for EU exporters. By contrast, the BRI project is more suitable for China and the EU as a whole than for Poland in terms of commodity structure of bilateral trade.

Keywords: BRI, trade barriers, EU, Poland, China, trade in goods.

1. Context and methodology

As regards the EU – China relationship, trade in goods is the driving force in the Poland – China economic relations. Investment-related flows as well as cross-border e-commerce trade can cement the central role played by trade. Although it is almost 6 years since the BRI was launched, but it is still unclear whether Poland will be consigned to a 'corridor' status between China and Central and Western Europe (Schuhholz and Lehmacher, 2019).

The article seeks to identify factors influencing the BRI as a tool for promoting Poland's trade with China. The study concentrates on two main aspects. One is the nature of the main barriers affecting trade flows between the two countries. The other is the composition of Poland – China trade. Clearly, one should remember that the differences between the European and Chinese economic and political systems pose the greatest challenges to further relationships. On the other hand, the need for mutual cooperation has never been greater than now, primarily considering environmental changes and rule-based multilateralism. The BRI project may fit well into this context by building climate-friendly infrastructure. In a joint report by Bruegel, Chatham House, China Center for International Economic Exchanges and the Chinese University of Hong Kong, the authors underline the potential of EU – China trade and investment linkages, which includes opportunities to build infrastructure in a climate-friendly way by combing China's Belt and Road Initiative and the EU's Juncker plan for strategic investments (more in: García-Herrero et al., 2017).

The development of trade in goods largely depends on trade barriers applied to bilateral trade. Therefore, we start with a study of the significance of tariff and non-tariff barriers in mutual EU – China trade relations, including transport-related barriers. Regarding NTBs, those are mainly derived from the EU Market Access database, and as for transport-related barriers – the logistics performance index (LPI) is used. One can expect that non-tariff barriers

are relatively more significant than TBs, even though there are no formal bilateral trade arrangements between the EU and China.

In this context, it is interesting to know how much Poland – China trade fits railway transport. The premise here is that railway connections are quicker but costlier than sea shipping, being more suitable for perishable or high value goods. Therefore, as the next step, we study the composition of bilateral trade in static and dynamic terms. We expect that the BRI could become an effective tool for reducing barriers to Poland – China trade.

The BRI initiative includes many corridors. According to a Chinese government document on the initiative, the project in its part devoted to the China – Europe corridor envisages the construction of land and sea connections, including the strengthening of 'China – Europe freight trains' (NDRC, 2015). In this analysis, we only consider the railway connection.

The economic effects of the BRI has been explored by many researchers since its official launch by President Xi Jinping in 2013 which is largely due to an immense geographical scope of this project and a large number of countries involved in it. For predicting trade effects of the BRI on trade flows the Gravity model has been widely used. This theoretical framework bases on Jan Tinbergen's description of the patterns of trade between countries as "proportional to the gross national products of those countries and inversely proportional to the distance between them" (Chaney, 2018). The latter including such variables as trade barriers (Hagemejer and Śledziewska, 2017). In 2018 OECD presented preliminary evidence of BRI effects on global trade (OECD, 2018). By using a Poisson pseudo-maximum likelihood estimator proposed by Santos Silva and Tenreyro (2006) to avoid biased estimates in the presence of heteroskedasticity, and consider cases where the dependent variable is equal to zero, they assessed that trade creation is less present in BRI-origin countries than in OECD-origin countries and that is related to weaker connectivity within the BRI (OECD, 2018). Poland was also included in the study as one of the BRI-participating economies, for it has a cooperation agreement with China. Two findings of this research concerning economic linkages between China and BRI-participating economies are worth being mentioned here, namely China exports and investments in the construction sector. Poland ranks first among EU BRI-participating economies (all EU-15 countries except Cyprus and Malta) as far as average Chinese exports for 1993-2017 are concerned, which is consistent with gravity theories of trade. Cumulative China investments in the construction sector from 2005 in Poland are ranked third in the group, after Hungary and Romania, even if Poland had a better average credit score over the period 2005-2017 (OECD, 2018).

2. Impediments to Poland – China trade

2.1. Tariff barriers

The importance of the BRI project to Poland – China trade is related to how much room for improvement there is when it comes to trade barriers. There are two main groups of direct barriers, i.e. tariff and non-tariff barriers (TBs and NTBs respectively). There are also impediments indirectly affecting trade in goods, related to barriers to trade in services. Some services are pivotal to trade in goods; first of all, transport and distribution supply chains and, to a lesser extent, market bridging and supporting services. We use the terms of two out of the four clusters of services identified by the OECD in its report on services trade policies. For more information see (OECD, 2017). Firstly, let us consider tariff barriers.

Table 1 shows the level of tariffs applied in EU–China trade in 2016. The average tariffs imposed by the European Union on its WTO partners amounted to 10.8% for agricultural and 4.2% for non-agricultural products. The level of duties faced by EU exporters on the Chinese market was higher by 5 and 4.8 pps respectively. These differences change when tariffs are taken at their trade-weighted value, and they are less pronounced in agricultural goods trade.

Table 1: Tariffs applied to EU – China merchandise trade in 2016, percentage

Specification	Agricultural products		Non-agricultural products	
	simple	weighted	simple	weighted
EU imports	10.8	8.7	4.2	2.8
EU exports	15.8	12.5	9.0	8.2

Note: EU imports: Simple average MFN and Trade-weighted average. EU exports: MFN average of traded tariff lines in bilateral exchange
Source: based on WTO, Tariff profiles, accessed November 2018.

The analysis of trends in tariff barriers between the EU and China over the last 10 years presented in Table 2 leads to the conclusion that only flows in agricultural products showed quite a large decrease by 4.3 pps in simple tariffs on EU imports and by 4.2 pps in weighted tariffs on Chinese imports. Tariffs on non-agricultural products remained roughly the same but one should bear in mind their already relatively low level.

Therefore, reductions in tariffs are still quite an important potential source of developing trade between Poland and China, especially with regard to agricultural products and Polish exports.

Table 2: Changes in tariffs applied to EU – China merchandise trade between 2006 and 2016 (pp)

Specification	Agricultural products		Non-agricultural products	
	simple	weighted	simple	weighted
EU imports	4.3	3.6	-0.3	-0.1
EU exports	0.6	4.2	0	0*

Note: * There is quite a substantial difference in trade-weighted levels of duties faced by EU exporters of non-agricultural products between the Tariff profiles and the WTO database. In the former, it is larger by 3.6 pps.
Source: based on the WTO database, http://data.wto.org, accessed: November 2018.

2.2. Non-tariff barriers

China's import restrictions on agricultural products also include sanitary and phytosanitary measures. In mid-January 2019, with the number of 13 out of 27, they constituted the largest group of barriers limiting access to the Chinese market for EU exporters (EC, Market Access database, accessed January 2019). Other trade-restrictive measures can be found in pharmaceuticals, medical devices, cosmetics and certain network industries. They take various forms.

As a review of the priority barriers to EU exports to China shows that problems with IPR enforcement belong to the oldest ones. Priority barriers are identified by the European Commission according to the conclusions of the Council of the European Union of 8 December 2008. Despite the legal changes introduced by China, this country remained the EU's biggest challenge in the area of intellectual property rights. According to the annual EC statistics, in 2017, 73% of the number of all suspected IPR-infringing goods seized at EU borders arrived from China. Interestingly, over the years (2014–2017), railway transport remained the least significant means of transport in terms of the number and value of goods detained (EC, 2018).

As can be seen from the Table, other 'old' Chinese restrictions include non-transparent, burdensome and costly certification and licensing procedures, limitations on corporate forms and ownership ceilings as well as on access to public tenders. Among the Chinese trade barriers recently reported to the Commission by EU companies one can find measures introduced by China under cybersecurity legislation. Generally, they exclude foreign companies operating in certain industries from information systems or put them in a less competitive position, especially by obliging them to disclose sensitive information. The excessive reach of Chinese measures can be seen not only in the Cybersecurity Law. The scope of draft Cryptography Law covers products providing encryption as well as those using it; therefore, most ICT products fall into the categories.

A review of the measures listed above as regards the value that can be added in these sectors leads to the conclusion that EU companies are mostly preoccupied with Chinese barriers on high value-added products and that, with a few exceptions, they have been introduced since the outbreak of the financial and economic crisis in the past ten years. One can also conclude that, even though China joined the WTO in 2001, Chinese requirements vis-à-vis foreign enterprises considerably deviate from the international standards and global practices. In the light of the EU annual Report on Trade and Investment Barriers 2018, China displayed the largest increase in new barriers in 2017 (EC, 2017). In its report, the EC considers the prospects for the introduction by China of new barriers to be significant. Those new barriers announced by China would apply to low risk food and wine products. According to the EC, the impact of market access barriers introduced by China in 2017, excluding restrictions that are difficult to quantify (e.g. services, horizontal), accounted for more than one-third of the overall effect in industrial sectors and roughly half of the value of trade flows affected in the agricultural sector. Given that China remains one of the EU main trade partners, its trade policy has a significant impact on EU exports.

2.3. Logistic barriers

In order to measure Polish and Chinese trade logistic performance, the World Bank Logistics Performance Index (LPI) will be used. The drivers of this performance in both countries will be compared to the LPI top performer.

In a nutshell, the International LPI shows how easy it is to bring goods into a country. Basing on survey feedback from export companies, it measures six aspects of trade logistic performance (Arvis et al., 2014): 1) the efficiency of the clearance process by border agencies, including customs; 2) the quality of trade and transport infrastructure (including railroads); 3) the ease of arranging competitively priced international shipments; 4) the competence of logistic service providers; 5) the ability to track and trace consignments; 6) timeliness, i.e. the frequency with which shipments reach consignees within scheduled or expected delivery times. All components are rated from 1 (negative: very low / very difficult / hardly ever) to 5 (positive: very high / very easy / nearly always).

In terms of the LPI score, Germany was the top LPI performer in 2018 (see Figure 1). China performed slightly better than Poland and was ranked 26th, two places above Poland (World Bank, 2018).

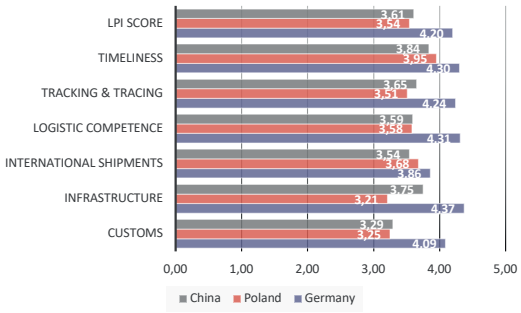

Figure 1. Performance on trade logistics in Poland, China and Germany in 2018
Source: based on the World Bank International LPI database, https://lpi.worldbank.org/international/global, accessed February 2019

In the case of China, the efficiency of the clearance process by border agencies was the weakest element, with regard to both the other categories and the gap to the leader. The quality of trade and transport infrastructure was ranked higher, the second best after timeliness. Unlike China and especially Germany, Poland scored poorly in this category, showing the most room for improvement in this field. Like China, Poland achieved the best result in the frequency with which shipments reach consignees within scheduled delivery times, scoring better than China. Poland also scored relatively well in the ease of arranging competitively priced shipments, enjoying in this category the smallest gap to Germany.

For a more balanced picture, let us use a weighted aggregate score based on the four latest LPI ratings. The aggregated 2012-2018 results illustrated in Figure 2 show that the average LPI scores achieved by China and Poland were similar and amounted to 3.60 and 3.50 respectively. A comparison of the two graphs leads to the conclusion that the observations made with regard to LPI results for 2018 are also valid for the composite results. It may be concluded again that, generally, there is no significant difference between China and Poland. The largest gap to the disadvantage of Poland concerns the quality of trade and transport infrastructure.

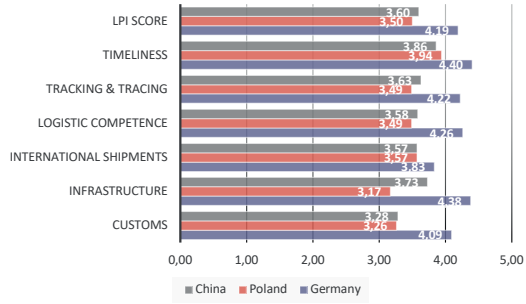

Figure 2. Performance on trade logistics in Poland, China and Germany, aggregated results 2012–2018
Source: based on the World Bank International LPI database, https://lpi.worldbank.org/international/aggregated-ranking, accessed February 2019

Poland's scores have a rather narrow confidence interval, which facilitates analysis over time. Trends for the individual components of the LPI in 2007–2018 are presented in Figure 3. The most significant improvements occurred over the first three years and the scores rose over the following time interval for customs, infrastructure, international shipments and logistics quality, although the line became flatter. The scores for all components also improved over the last two years, except customs.

The progress made by Poland with regard to logistic performance resulted in a change in the country's distance to the best performer. Over the period, Poland reduced the gap from 36% in 2007 to 21% in 2018. Despite the continuous improvement in the perception by respondents of Poland's infrastructure (with the exception of 2014), this component has always been ranked lowest.

Poland's 2018 LPI results for the logistics environment confirm that assessment. As shown in Table 3, the quality of railway transport infrastructure and services are evaluated in Poland at the lowest level compared with other modes of transport. The percentage of dissatisfied respondents is higher in Poland than in China and Germany.

It is worth noting, though, that the LPI and its indicators highlight that the physical movement of goods is supported by a broad range of services involving activities beyond transportation. The World Bank Connecting to Compete report 2018, looking in detail at the logistics environment, revealed that 'reliability is typically much more important than speed' (Arvis et al., 2018).

The importance of opened markets free of administrative and logistic barriers, in particular due to such projects as the BRI, depends on how close the trade links are between Poland and China and to what extent the project fits into the commodity structure of these ties.

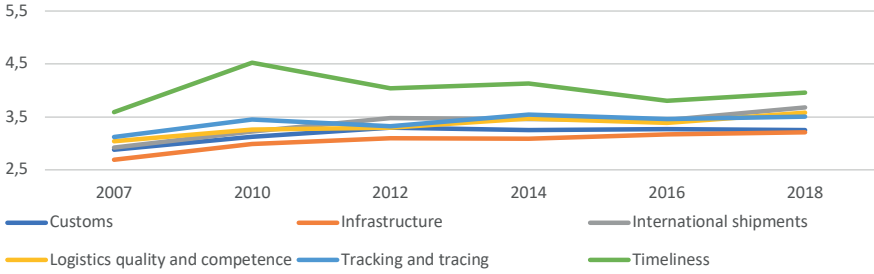

Figure 3. Logistic performance by component in Poland, 2007–2018
Source: based on the World Bank International LPI database, https://lpi.worldbank.org/international/scorecard/line/254/C/POL/2018#chartarea, accessed February 2019

Table 3: Selected domestic LPI results for Poland, China and Germany by mode of transport, 2018, % of respondents

Mode of transport	Level of fees and charges high/very high			Quality of infrastructure low/very low			Quality of services high/very high		
	PL	CN	DE	PL	CN	DE	PL	CN	DE
Maritime/ports	0	33	47	0	0	0	100	58	95
Air/airports	50	8	58	33	0	0	50	71	95
Road/s	0	9	27	0	18	14	67	58	95
Rail	0	33	25	50	9	23	0	42	62

Source: based on the World Bank Domestic LPI database, https://lpi.worldbank.org/domestic/environment_institutions/2018/C/POL#chartarea, accessed February 2019.

3. Poland – China trade

In compliance with Article 206 of the Treaty on the Functioning of the European Union, Poland is a member of the EU customs union. Therefore, Poland shares not only common tariffs and non-tariff barriers with other EU Member States but also its territory. Once entered into the EU market, imports enjoy free movement within the EU. Therefore, we will take a look at both Poland – China and EU – China trade flows. Yet, before examining that, let us consider whether and to what degree the process of deindustrialisation can be observed in the analysed economies.

3.1. Manufacturing in Poland

Figure 4 below shows the gross value added (GVA) of manufacturing in Poland compared to China and the EU. It turns out that the decline in manufacturing did not apply to Poland. In fact, over the last ten years, the share of manufacturing in Poland's economy slightly grew by 1 pp, compared with a decrease by 1 pp in the EU and 3 pps in China.

As Figure 5 shows, the growth rate of Polish manufacturing exports kept pace with the increase in total exports and, as a consequence, the share of manufacturing in Poland's total exports remained quite stable, fluctuating slightly between 61% and 63% over the last years. Between 2005 and 2015, the value of manufacturing exports rose by 115%, 3 pps above the growth rate of exports.

In the same period, Polish goods sent to the Chinese market experienced more dynamic changes in terms of value and proportion between manufacturing and total exports. In 2015, the value of total and manufacturing exports to China was around six times higher than a decade earlier, whereas manufacturing represented 67% of total exports.

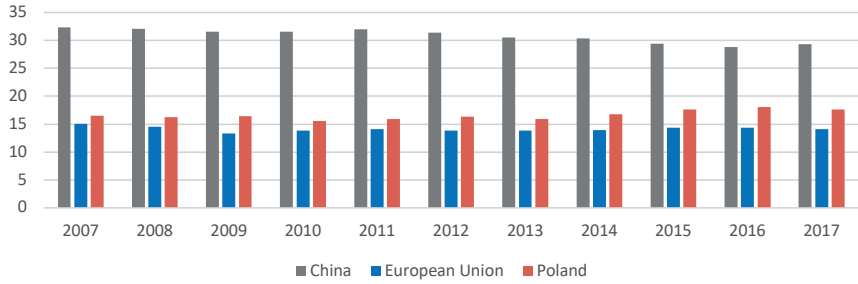

Figure 4. GVA of manufacturing in Poland, China and the EU, % of GDP, 2007–2017
Source: based on the World Bank data, https://data.worldbank.org/indicator/NV.IND.MANF.ZS?end=2015&locations=EU-PL-CN&name_desc=false&start=2000&view=chart, accessed February 2019

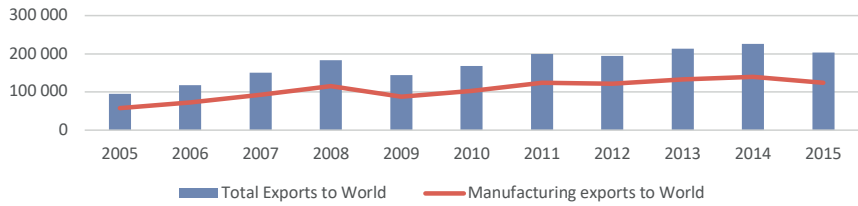

Figure 5. Poland's total and manufacturing exports to the world market, 2005–2015, USD million
Source: Based on OECD data, https://stats.oecd.org/Index.aspx?DataSetCode=TIVA_2018_C1#, accessed February 2019

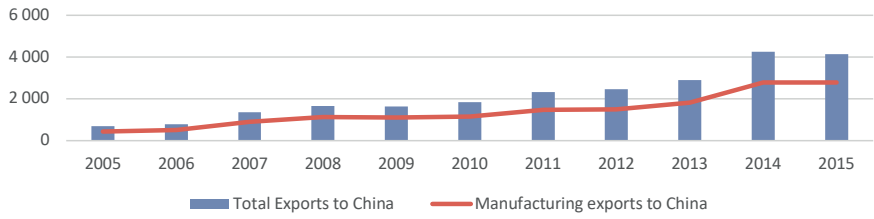

Figure 6. Poland's total and manufacturing exports to China, 2005–2015, USD million
Source: based on OECD data, https://stats.oecd.org/Index.aspx?DataSetCode=TIVA_2018_C1#, accessed February 2019

3.2. Development and structure

The EU and China are each other's second-largest market for exports and imports, after the US. Table 4 shows that despite the permanent negative balance for the EU, the value of its gross exports to China rose faster than the value of gross imports with a growth rate higher by 77 pps at the end of the period covered. That was mainly due to the large reduction in gross imports in 2009. The drop in exports in terms of annual rate was half as much as in gross imports (10% against 20%).

The EU imports of intermediate products suffered the most from the economic crisis even if their value was below the value of final products imported by the EU from China between 2007 and 2014. On the EU export side, the value of intermediate goods and services exceeded the value of final products throughout the reference period.

Table 4: EU – China bilateral trade, 2006 – 2015, USD million

Specification	2006	2009	2012	2015
EU EXP	101,993.1	142,537.1	260,571.3	297,189.2
EU IMP	164,272.7	220,670.1	315,152.6	352,184.6

Source: Council of the European Union of 8 December 2008.

Manufacturing goods dominate overwhelmingly the EU and Polish merchandise trade with China (see Table 5). The share of agricultural goods is most noticeable in exports, especially in the whole Union, with a positive balance there. But even there they accounted for 2% of EU exports.

Figure 7 shows that this positive balance evolved steadily from 2011, mainly due to the increase in EU agricultural exports. EU exports of agricultural goods to China were characterised by the highest rate of growth over the last decade, comparing to EU imports of agricultural goods from China as well as to EU – China flows in manufacturing products.

Table 4: EU's and Poland's merchandise trade with China in 2015, USD million

Specification	Exports		Imports	
	Agricultural	Manufacturing	Agricultural	Manufacturing
EU	4,138.4	208,150.9	2,125.5	311,732.1
Poland	34.9	2,775.7	77.1	18,321.8

Source: Council of the European Union of 8 December 2008.

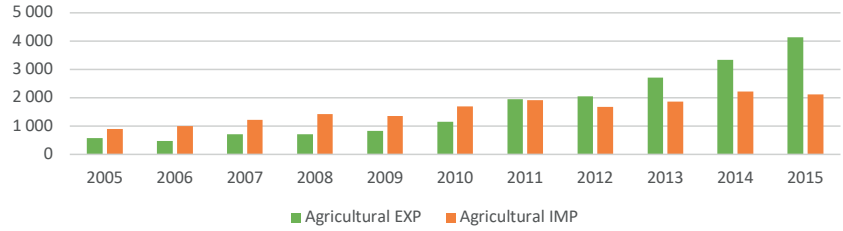

Figure 7. EU trade with China in agricultural goods, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

As shown in Figure 8, the latter also grew more rapidly on their export side, although at a more moderate rate. The EU – China trade in manufacturing products was also more affected by the economic crisis in 2009, especially EU manufacturing imports. It can hardly be explained by the extent of offshoring since in 2015 intermediate products represented about 50% of EU manufacturing imports, which was below the levels observed in agricultural goods but also in EU exports. Nevertheless, the deficit steadily narrowed compared to all trade in manufacturing goods, with the exception of 2007 and 2008.

The development of Poland – China trade in agricultural goods was less stable compared to EU – China trade and displayed a deficit over the whole period, although its size diminished from 2013 in relation to total trade flows (see Figure 9).

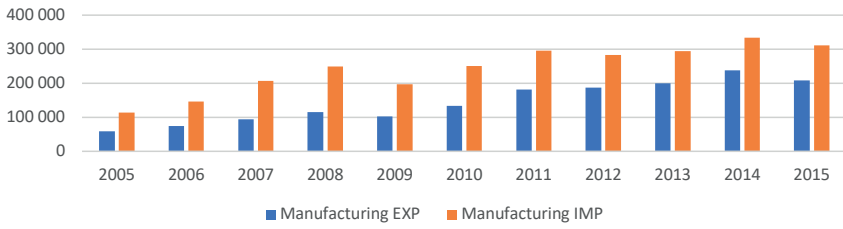

Figure 8. EU trade with China in manufacturing goods, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

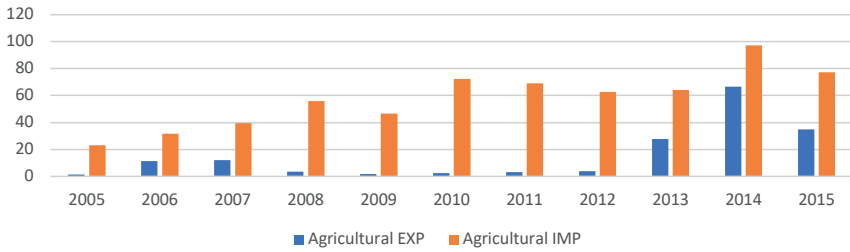

Figure 9. Polish trade with China in agricultural goods, 2005 – 2015, USD million
Source: as in Table 4

As for the EU as a whole, Poland had a deficit in bilateral trade with China in manufacturing products throughout the period under examination. However, Poland's deficit was larger when compared to the trade value. The deficit to exports and imports ratio was more than three times higher in Poland and amounted to 74% in 2015.

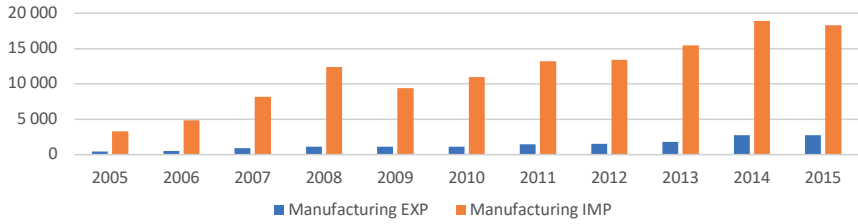

Figure 10. Polish trade with China in manufacturing goods, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

Figure 11 shows that despite a massive increase in the value of high-technology exports of Poland of nearly seven times between 2004 and 2017, the most substantial change was related to the strong, long-term upward trend in Chinese high-technology exports with a growth rate of 200%. The EU high-technology exports growth was less than one-ninth of it. As a result, the EU and Chinese flows became closer to each other in terms of value.

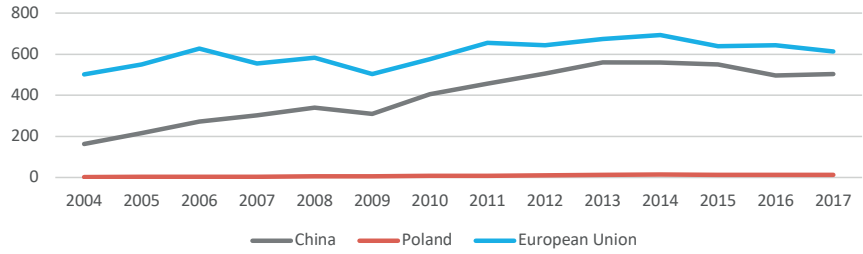

Figure 11. High-technology exports of Poland, China and the EU, 2004 – 2017, USD billion
Source: based on the World Bank World Development Indicators, https://data.worldbank.org/indicator/TX.VAL.TECH.CD, accessed February 2019

The share of high and medium-high technology sectors remained stable in the EU over the period under examination (see Figure 12). These sectors represented a large part of EU exports to China, reaching more than three-fourths of total value each year. With the exception of 2009 and 2015, the value of EU exports of high and medium-high technology products to China increased steadily in absolute terms from 2005. As a result, EU exports rose in value by 264% between 2005 and 2015.

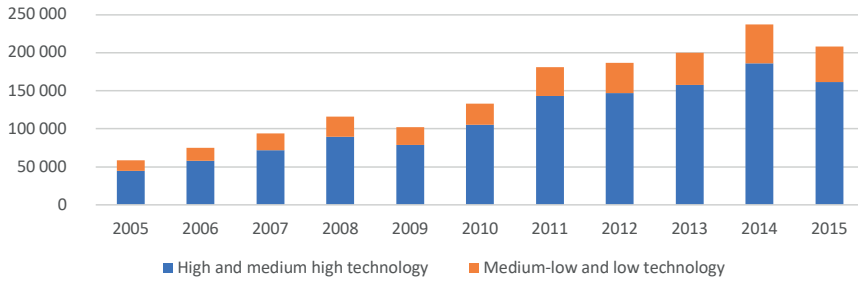

Figure 12. EU exports of high and medium-high technology products to China, 2005 – 2015, USD million
Notes: The division of manufacturing sectors into two groups was based on the Eurostat high-tech classification of manufacturing industries (https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:High-tech_classification_of_manufacturing_industries). The group of high and medium-high technology sectors includes: Computers, electronic and electrical equipment; Chemicals and non-metallic mineral products; Machinery and equipment, n.e.c.; Transport equipment. Other manufacturing sectors classified under the 'Medium-low and low technology' name are as follows: Food products, beverages and tobacco; Textiles, wearing apparel, leather and related products; Wood and paper products; printing; Basic metals and fabricated metal products; Other manufacturing; repair and installation of machinery and equipment.
Source: Council of the European Union of 8 December 2008; Author's calculations; accessed March 2019

A more detailed analysis of the structure of EU exports of high technology products to China shows that exports of chemicals and pharmaceutical products increased most over that period with a growth rate of 370% (see Figure 13).

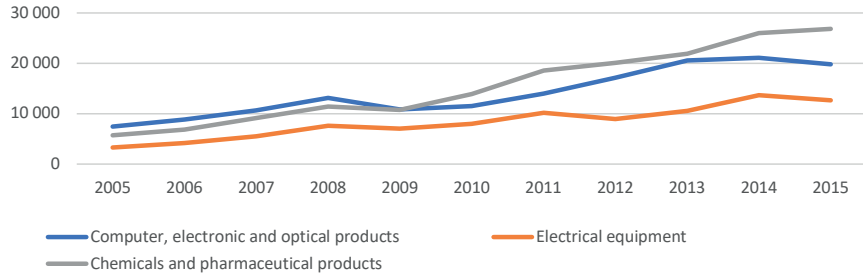

Figure 13. EU exports of high technology products to China, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

An analysis of the EU import side shows that the share of high and medium-high technology products was 10 – 12 pps lower in EU imports but, even then, it amounted to 60 – 67% and showed more visible changes over the last decade (Figure 14). Nevertheless, one can hardly see any clear pattern of those changes. The growth rate was lower in EU imports than in EU exports by 100% between 2005 – 2015.

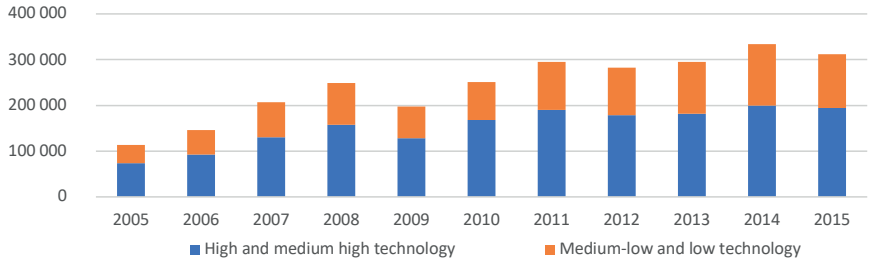

Figure 14. EU imports of high and medium-high technology products from China, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

The EU displayed a negative balance in trade in high and medium-high technology products with China from 2005 (Figure 15). The ratio between the debt and the value of trade dropped to a single-digit level from 2012, reaching its lowest level of 3.5% two years later.

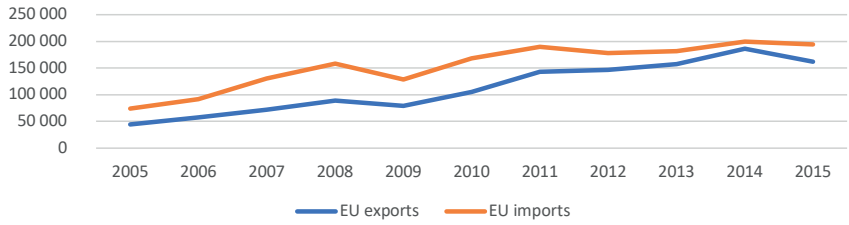

Figure 15. EU bilateral trade in high and medium-high technology products with China, 2050 – 2015, USD million
Source: Council of the European Union of 8 December 2008

The trends in Poland's exports to China differed in terms of share of high and medium-high technology products in the total value of Polish sales on the Chinese market (see Figure 16). It amounted to 60% in 2015 and was 18 pps lower than the level observed in the whole Union. It also fluctuated strongly throughout the period covered. Nevertheless, the value of Polish exports of high and medium-high technology products to China grew steadily in absolute terms from 2015 except for 2012, exceeding the growth rate for the EU at 552% against 264%.

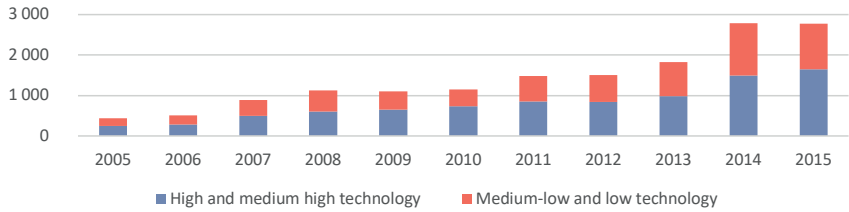

Figure 16. Polish exports of high and medium-high technology products to China, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

A different sector, namely electronic equipment, was a frontrunner in terms of growth in Poland (Figure 17). It increased 14 times between 2005 and 2015, outpacing computer, electronic and optical products but, first of all, chemicals and pharmaceutical products. As a result, it took the leading position over the latter.

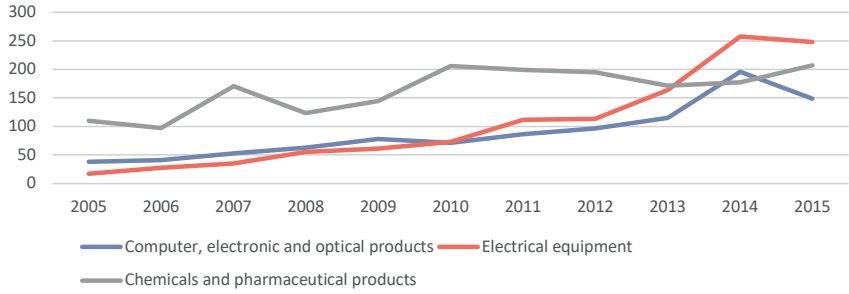

Figure 17. Polish exports of high technology products to China, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

The share of high and medium-high technology products in Polish imports from China amounted to 70%, thus exceeding the corresponding ratio for exports by 10 pps in 2015 (Figure 18). As with EU exports, there is no clear pattern in the way it changed over the whole period under analysis. Similarly, to the EU, the growth rate in Polish imports of high and medium-high technology products from China was lower than in exports, despite reaching a high level of 433%.

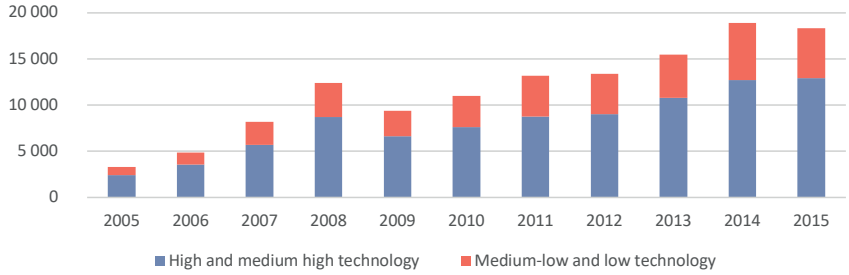

Figure 18. Polish imports of high and medium-high technology products from China, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

Transport equipment was a growth driver for EU and Polish exports to China. Classified as medium-high technology, that sector grew in the EU and Poland by, respectively, 578% and 2875% between 2005 and 2015. In the EU, a strong increase concerned motor vehicles, trailers and semi-trailers with a growth rate of 768%.

As the EU, Poland recorded a negative balance with China in high and medium-high technology products trade (Figure 19). However, the value of trade rose steadily, with one exception in 2009. The ratio between the debt and the value of trade remained at a high level, mostly above 80%. Its lowest level of 77% was recorded in 2015

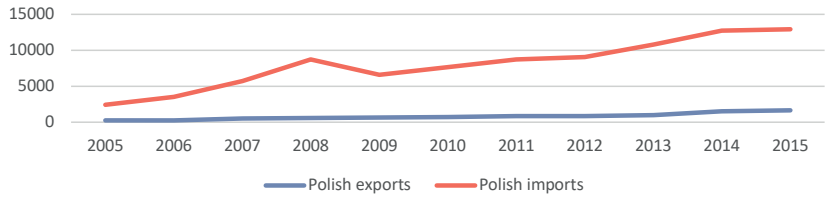

Figure 19. Polish bilateral trade in high and medium-high technology products with China, 2005 – 2015, USD million
Source: Council of the European Union of 8 December 2008

4. Conclusions

The study aimed to evaluate the role of the Belt and Road Initiative for EU – China trade relations, and especially for Polish trade. Two main aspects were analysed. Firstly, we studied the nature of the main barriers affecting mutual trade. Secondly, the composition of Poland – China trade was examined.

The analysis indicates that tariff and non-tariff barriers remain an important determinant of future development of trade between Poland and China. This conclusion especially concerns Polish exports, as duties imposed on the Chinese market are 5 pps higher. Moreover, over the last decade the level of tariffs on manufacturing products remained the same. In addition, China introduced non-tariff restrictive measures targeting products in which the EU displays its export specialisation vis-à-vis its Chinese partner. The trade measures introduced by China only in 2017, excluding restrictions on services and of horizontal nature, accounted for more than one-third of the overall effect in industrial sectors and roughly half of the value of trade flows affected in the agricultural sector. The new trade obstacles can be found in particular in pharmaceuticals, medical devices, cosmetics and some network industries. Among those measures, one should mention the requirement to disclose sensitive information introduced by China under cybersecurity legislation. It covers not only products providing encryption but also products using it. Therefore, most ICT products fall into those categories.

In the light of the above findings, especially the significant increase in non-tariff barriers on EU manufacturing products exported to China, priority should be given to efforts to reduce trade barriers. The BRI could become an effective tool for improving the business environment for EU exporters. Although it would not change the trade measures applied by the two economic partners directly, negotiations and other forms of cooperation accompanying the project could influence commercial policy indirectly.

As railway transport remains the means of transport being the least affected by the problem of the infringement of intellectual property rights in terms of the number and value of goods detained, the BRI might also have a positive impact in that area. The significance of that is all the greater because IPR protection and enforcement in China are not effective. At the same time, China remains the EU's biggest challenge as almost three-fourths of all suspected IPR-infringing goods seized at EU borders arrive from China.

While the BRI project can impact Chinese administrative measures indirectly by easing the trade negotiations between the EU and China, it might directly reduce transport barriers by improving connectivity. This analysis shows that the most room for improvement in transport infrastructure exists in Poland. The country scored poorly in this category not only when compared to the best performing Germany but also to China.

The importance of the BRI as a tool of improving transport infrastructure in Poland is even greater since one can expect that the role of EU cohesion funds that mostly contributed to the improvements that occurred in Polish transport infrastructure will diminish in the next EU financial perspective. As the analysis shows, despite the continuous improvement in the perception by respondents of Poland's infrastructure (with the exception of 2014), this

logistic component has always been ranked lowest. From that point of view, the BRI project should be seen as a driver for reducing logistic barriers to trade, especially given the fact that, according to the LPI survey, within this category rail infrastructure is the element to elicit general dissatisfaction. The quality of railway transport infrastructure and services are evaluated in Poland at the lowest level compared with other modes of transport. The percentage of dissatisfied respondents is higher in Poland than in China and Germany.

By contrast, the BRI project is more suitable for China and the EU as a whole than for Poland in terms of commodity structure of bilateral trade. The share of high and medium-high technology products in the total value of Polish sales on the Chinese market amounted to 60% in 2015, being 18 pps lower than the level observed in the whole Union and 10 pps lower in Polish imports. Poland also recorded a negative balance with China in trade in high and medium-high technology products. The ratio between the debt and the value of trade remained at a high double-digit level, mostly above 80%. On the other hand, the development of Polish exports of high and medium-high technology products to China is more dynamic than in the EU (552% against 264%) and China (433%). As far as perishable agricultural products are concerned, they represent a small proportion of Poland – China trade. Further analysis should take into account the measurement of bilateral trade in value added terms.

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Fundamentals of financial and economic security management of Ukrainian enterprises

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ABSTRACT

The financial and economic security of an enterprise is a complex system that includes a certain set of internal characteristics aimed to ensure the efficiency of corporate resources use in each direction of activity. The basis of the development of a complex system of financial and economic security of an enterprise should be a defined concept. Each enterprise is a system that includes different, interconnected components, which in order to ensure proper degree of protection against possible negative impacts should be considered comprehensively. The content and structure of the financial and economic security system depend on the specifics and nature of the activity of the enterprise, its potential, the markets that it operates, as well as its management. The financial and economic security system of an enterprise must be comprehensive and independent from similar systems of economic entities.

Keywords: economics, finance, security, enterprises, Ukrai.

1. Introduction

Modern issues of ensuring and managing the financial and economic security of enterprises in different industries are quite significant and relevant in the present conditions, as cases of unfair competition, raiding attacks and fictitious enterprises that lead to possible threats to the profitable normal functioning and development of enterprises in Ukraine occur more and more increasingly. In order to overcome and counteract various threats, there is a need to create, further support and efficient management of the system of financial and economic security of enterprises. Permanent changes in the external and internal environment, emergence of new factors that create the basis for the use of the latest methods of providing and managing financial and economic security, require the need for further study by both theoreticians and practitioners.

1.1. Formulation of the problem

Globalization of the economy, international integration, increased competition in all spheres of human activity, as well as changes in both the external and internal environment generate a number of threats that can affect the state of socio-economic development of the country as a whole and certain economic entities in particular.

Existing threats can influence the level of production efficiency, its competitiveness and competitiveness of products, as well as rational use of all types of resources, ensuring high profitability, solvency and financial sustainability. One of the conditions that will ensure the successful functioning and development of both enterprises and the economy in general is financial and economic security in various fields of activity of enterprises (Frolov, 2015). The concept of managing a modern enterprise, in an environment where there are active raider seizures of business, its absorption by larger

companies, corporate conflict situations, competition, fictitious enterprises and other administrative and criminal offences in the field of business, requires the formation of financial and economic management security of an enterprise.

The actuality of the problem of effective management of the Ukrainian enterprises financial and economic security is caused by the need of Ukrainian business entities not only to survive in the current crisis reality, but also to obtain and maximise profits both in domestic and foreign markets. The level of financial and economic security depends primarily on the effectiveness of management processes in an enterprise, designed to avoid threats and risks. In addition, continuous monitoring of the status and implementation of effective changes in financial and economic security are conditioned by the necessity of providing a stable functioning and achievement of the main activity objectives of an enterprise.

Therefore, the key point is a detailed study of this problem and the adoption based on studies of appropriate rational decisions and proposals, the implementation of which will lead to an increase in both general and individual performance indicators of Ukrainian enterprises. Ukraine's business entities are going through quite difficult times today. A significant number of them are on the verge of bankruptcy, and many have already gone bankrupt. Exploring this issue, we will reveal the essence and features of financial and economic security not only of an enterprise, but also of the state as a whole. It should be noted that the problem of financial security formation is insufficiently investigated in the context of such components as ensuring financial stability of an enterprise, minimising all financial risks of both the internal and external environment, as well as highlighting the concept of financial security as an independent object of managing a business entity and its concretisation. It requires a comprehensive rational approach for clarifying methods and techniques of realising the financial security of an enterprise, which would provide reliable protection of its economic interests. A constant increase in the risk of economic activity can lead to a significant decrease in the level of the financial condition of an enterprise, and in the future lead to its bankruptcy. Financial and economic security of Ukrainian enterprises is a complex system that includes various components that are aimed at ensuring the efficient use of material, labour, information and financial resources. Therefore, the assessment of the level of financial and economic security, the use of new methods and algorithms for ensuring the financial and economic security of enterprises require further research and continue to attract the attention of many theoreticians and practitioners.

1.2. Analysis of recent research and publications

The concept of "financial and economic security" as an object of management is not so new for Ukrainian enterprises. It should be noted that this concept is often considered in the context of the generalised category of the "economic security of Ukraine", covering the macro level of the economy; however, financial security is not sufficiently studied at the level of Ukraine's enterprises themselves. Therefore, at the level of business entities, the essence and characteristics of the concept of "financial security" are not fully explored and are equated with one of the elements of the general economic security of the state.

According to many modern scientists (Ortinsky V. L., Kuzenko T. B., Moiseenko I. P. and Marchenko O. M., Bondarenko O. O., Susdenko O. V., Shchak N. O., Solomina G. V., Chauhan, M., Kopytko, M., Tanzi V., Hamid R., Shlykov, V. Stachowiak, Z.), the main objective of the financial security of an enterprise is its ability to independently develop and implement an effective financial strategy in terms of risk and a significant number of competitors in the financial security of Ukraine as a whole.

However, despite multifaceted studies in the field of financial and economic security, there is still no scientific consensus on the terminology and mechanism of financial and economic security management, which necessitated theoretical and practical aspects on the research of this problem.

2. Methodology and materials

The methodological basis for writing this article is the provisions of economic theory, the theory of finance, as well as the scientific works of domestic and foreign scientists and economists on the urgent issue of financial and economic security of enterprises on the territory of Ukraine. When writing the article, general scientific and special methods of research are used: analysis, synthesis, scientific abstraction, methods of systematisation and logical generalisation – in case of revealing the theoretical provisions of management of financial and economic security of enterprises in modern conditions of economic instability of Ukraine and substantiation of the categorical-conceptual apparatus; economic and statistical analysis – to identify and investigate the main forms of economic instability as a potential threat to the financial security of domestic enterprises; hierarchy analysis method.

Table 1: Definition of the concept of „financial and economic security of an enterprise"

Author	Year	Scope and depth of study
Ortinsky V. L.	2009	Outlined the basics, system, tasks, structure of the economic services of enterprises, organisations and institutions, highlighted the issues of unfair competition, protection of the commercial secrecy of business intelligence, information security.
Kuzenko T. B.	2010	Disclosed the theoretical principles of financial security as the basis for ensuring the economic security of enterprises, the procedure for identifying and neutralising its threats, the mechanism of security, considered the basics of management and information and analytical security of the financial security of an enterprise in the process of achieving its financial interests.
Moiseenko I. P., Marchenko O. M.	2011	Defined the theoretical and methodological bases of financial and economic management security of an enterprise, and in particular, its principles, methods, functions, mechanisms, basic approaches to organisation, conducted identification of financial and economic security threats, financial and economic activity risks, development of a set of measures for their neutralisation, formation of the strategy of financial and economic security of an enterprise, analysis and assessment of the level of financial and economic security of enterprises.
Bondarenko O. O.	2014	Researched and summarised the theoretical foundations in the field of financial and economic security, analysed the existing viewpoints on enterprises, the content of the concept of "financial and economic security", carried out the content analysis of the concept of "financial and economic security" and grounded the need for a systematic approach to the formation of a financial and economic security of an enterprise.
Podolchak N. Y.	2014	In her work she revealed the essence and importance of the system of financial and economic security management and organisation, analysed the most important components of its security, considered the process of organisation of the service of financial and economic security, paid special attention to the role of risk, strategic management and financial management in the system of financial and economic security of an enterprise.
Susdenko O.V.	2015	Investigated the factors that affect the level of financial security of machine-building enterprises, developed scientific provisions and practical recommendations on the creation of the financial security system of machine-building enterprises.
Shchak N. O.	2015	Revealed the essence of economic stability of an enterprise, developed its typology and principles of collateral, improved typology of factors influencing the formation and also described the main models of self-organization in ensuring economic stability of an enterprise, characterised the developed integral method assessing the stability of the national economy in changing conditions, and previously documented strategic and tactical support for the economic stability of enterprises.
Solomina G. V.	2018	Considered the theoretical issues of the essence of financial and economic security, identified the content of the business entity security mechanism and formulated the conceptual basis and the methodology for assessing, managing and providing financial and economic safety of enterprises.
Author's definition	2020	Management of financial and economic security of enterprises is a set of active actions and activities aimed at ensuring the efficient use of enterprise resources, constant monitoring of factors and possible threats that impede the competitive functioning of an enterprise, development of measures to achieve a high level of financial and economic security of an enterprise as a whole.

Source: based on own research.

The category of financial and economic security in the activity of an enterprise is part of the economic security concept as a sector of the economy. It reflects the level of security and safety of conducting innovative economic activity by an enterprise on the corresponding market, related to attraction of resources, risk; it is natural and its aim is a systematic profit approach (Ivashchenko and Chetvierikov, 2012). At the same time the financial and economic security of an enterprise (as an economic sector) should be considered as an even broader (compared to the economic security of the enterprise) economic category, which "absorbs" the previous two and is based on the indicators of the economic security level at the macro level of the management and performance indicators hierarchy of enterprises as subjects of enterprise activity (Koknaieva, 2011). Financial and economic security of the enterprise is a specific financial and economic condition, which provides protection of its financial and economic interests from internal and external threats and creates the necessity of financial and economic preconditions for sustainable development in the current and long-term periods (Moiseienko, Marchenko, 2011). The financial and economic interests of an enterprise are its objective needs in the sphere of financial and economic activity, the satisfaction of which ensures the realisation of the main targets of its financial and economic development at each stages of the life cycle. The financial and economic interests of an enterprise are unchanged during its economic activity, and are specified at all stages of its lifecycle (Figure 1).

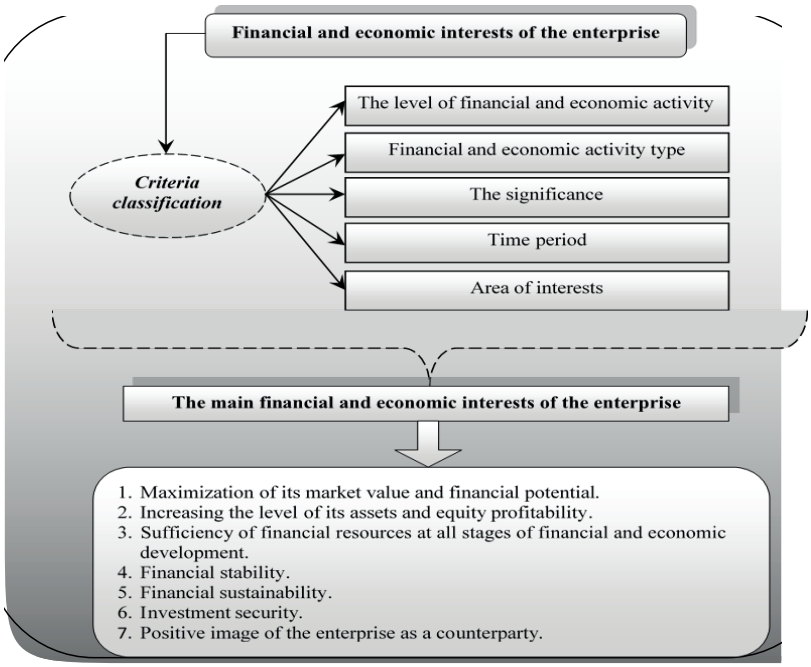

Figure 1. Criteria classification and basic financial and economic interests of an enterprise
Source: Based on: Moiseienko, Marchenko, 2011; Puzyrova, 2010

However, as noted by Stolbov and Shapoval (2013), the concept of "financial and economic security" is complex and requires a comprehensive, systematic approach to understanding its essence and creating the system of financial and economic security management of an enterprise. There are many scientific views on the essence of the concept of "Financial and economic security", so it should be investigated in order to form an optimal system and mechanism for managing financial and economic security. Given the scientific experience of research in the field of financial and economic security, it should be noted that the financial and economic security of an enterprise is a complex and comprehensive concept and it is defined by: a set of works that ensure solvency of an enterprise and liquidity of its current assets; organisational control of all kinds of activity of an enterprise in order to increase its efficiency; qualification, competence and activity of managers; efficiency of use of all kinds of resources; the process of preventing possible losses through internal and external threats (Susidenko, (2015). Financial and economic security of an enterprise is a complex system, which includes a certain set of internal characteristics aimed at ensuring the efficiency of the use of corporate resources in each direction of activity. Thus, security should be considered through the prism of its functional components, which allows to: monitor the factors that affect the state of both the functional components as well as the financial and economic security in general; investigate processes affecting financial and economic security; analyse the distribution and use of the enterprise's resources; study economic indicators that reflect the level of functional components; develop measures that will contribute to achieving a high level of components, resulting in the strengthening of the financial and economic security of the enterprise in general (Susidenko, 2015).

The complexity and versatility of the concept of financial and economic security stipulates the application of a systematic approach to the study and implementation of its organisational principles to a systemic approach. The systematic approach to financial and economic security analysis involves considering the activity of the enterprise as a multilevel structural system and is based on the principles of integrity of the object of study, which provides an opportunity of identifying the interconnection between the elements of the system and development of recommendations for their rational use based on a synergetic effect (Tkachenko, 2019). The systematic approach involves exploring as many connections as possible between system elements and environmental objects to identify and analyse the most relevant of them. One of the main problems of applying the sys-

tematic approach to the study of the financial and economic security of an enterprise is the correct specification of the system, identifying all its essential elements and establishing the totality of relationships between them. Comprehensive system development of ensuring the financial and economic security of an enterprise, as the main component of economic security, must be based on a defined concept, which takes into account the following aspects: each enterprise is a system that includes different interconnected components which protect from possible negative impacts and must be considered comprehensively; the content and structure of the financial and economic security system depend on the specifics and nature of the activity of the enterprise, its potential, the markets that it operates, as well as its management; the financial and economic security system of an enterprise must be comprehensive and independent from similar systems of economic entities.

Contemporary enterprises of almost all spheres of the economy (except financial activity) do not have enough equity to finance their fixed assets, so the overall level of their financial and economic security today is low, and these economic entities are characterised by unequal financial and economic security levels. Therefore, a question arises concerning effective management of the financial and economic security mechanism (Tkachenko, Kwilinski, Tkachenko and Puzyrova, 2019).

Under the management of the mechanism of financial and economic security of an enterprise, it is necessary to understand the formation of its organisational structure (determination of management subjects and their interconnections) and allocation of tasks, powers, responsibilities between individual management units. The organisational structure of the financial and economic security management mechanism of an entity is defined as a composition, interconnections and subcontracts of organisational units (subdivisions) of the management apparatus that perform various functions of financial and economic security management. It is the unity and interconnection of its levels and units (Podolchak, 2014).

The formulation of the concept of financial and economic security mechanism of the enterprise entity based on the results of analysis of its components can be formulated as follows: it is a system of methods, levers, tools, methods of the enterprise's functional activity, for which its financial interests are secured. In such a formulation, the mechanism is understood as an objectively existing, inherent entity, a dynamic and systemic formation that can be used to influence its development while providing the insurance for its development parameters.

The conditions of an enterprise, the existence of external and internal threats are not stipulated, but the sustainability must be achieved under the conditions of hazards and threats; it is a system of financial methods, levers, tools, ways of achieving such financial conditions of an enterprise that is characterised by resistance to external and internal hazards and threats. In this sense, the mechanism of financial and economic security is understood as a subjective-objective, static system of hierarchically aligned financial methods, tools that are used or can be used to influence its functioning and development (Frolov, 2015). The object of the mechanism of financial and economic security of an enterprise is included in its structure, regardless of how the concept of the mechanism is interpreted. If the concept of the mechanism is considered in its direct sense, then the object is included in the derivative manner due to the interconnections between the subjects of management. If the mechanism is considered as a derivative, the object is included in the mechanism directly, since the mechanisms of its functioning have managerial influences on itself. The subject of the financial and economic security mechanism of an enterprise is the activity of financial security entities as the implementation of principles, functions, strategic program or specific measures to ensure financial security aimed at financial security objects (Solomina, 2018).

Based on the formulation of the concept itself, the object is considered financial security. Thus, the financial mechanism of the financial security of an enterprise is a complex concept, which is a part of a general process of management of financial and economic security of enterprises, with several hierarchical levels of manifestation of an entity that can be organized depending on future research goals and directions (Moiseienko, Marchenko, 2011).

The contemporary process of managing the mechanism of financial and economic security of enterprises is very relevant. In addition, at its initial stage it should provide for the definitions and identification of factors that have an impact on prevention, minimisation or complete elimination of negative consequences of destabilising the factors of implementation. Existing hazards and threats of the enterprises' activity can have the following manifestation:

– challenges: a combination of circumstances, not necessarily negative impacts, which need to be addressed, and their ignorance can have positive and negative consequences for the activity;

– threats: the environmental impact, its subjects or internal elements of the system, which can lead to losses;
– risk: the occurrence of subjective or objective events in each of the areas of activity in connection with the actualisation of the threat, which can lead to positive or negative consequences and cause deviations from the planned parameters;
– hazard: the form of threat manifestation which leads to real losses (Susidenko, 2015).

Considerable theoretical achievement in this direction is the generalisation of the concept essence of the "financial and economic security of an enterprise (small and medium-sized enterprise sector)". It is characterised as a condition of a system of regulation and the level of development of enterprises that is followed by security guarantee of important interests of individual entities of the enterprise's activity and business in general from internal and external threats (Figure 2).

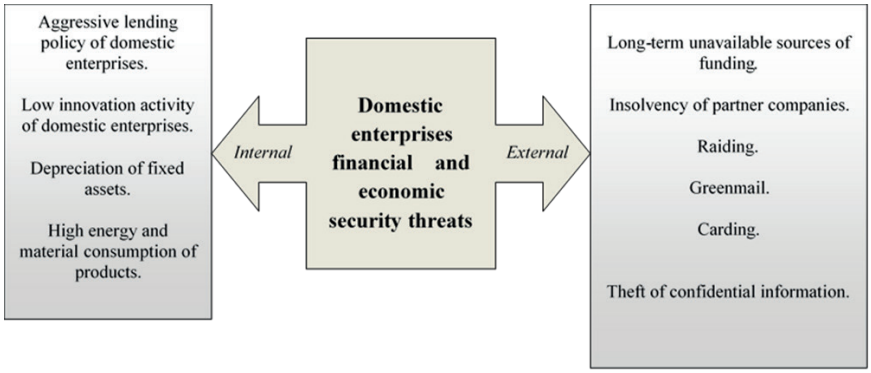

Figure 2. Possible threats of domestic enterprises financial and economic security
Source: Based on: Tkachenko, Kuilinsk, Kaminsk, Puzyrova, 2019

The most urgent internal threats of domestic enterprises financial and economic security are the following:
– aggressive lending policy of domestic enterprises. Its application provides that non-current assets and only insignificant part of current assets of the enterprise are financed with the help of own funds and long-term loans. Short-term loans prevail in the total sum of all liabilities. For such financing, the cost of capital is minimum, but the risk related to liquidity is high;
– low innovative activity of domestic enterprises. Innovation is carried out by a small fraction of Ukrainian industrial enterprises, which decreases in recent years;
– depreciation of fixed assets. According to statistics, half of the fixed assets used in the Ukrainian economy were depreciated;
– high energy and material consumption of products.

The most pressing external threats to the financial and economic security of Ukrainian enterprises are the following:
1. Unavailability of long-term sources of funding:
– long-term loans and borrowings are an important source for an enterprise financing that allows it to maintain financial independence.
2. Insolvency of the partner companies:
– according to the analysis of statistics, more than a third of enterprises in Ukraine are still unprofitable. In addition, permanent losses are a direct path to bankruptcy and, consequently, insolvency. The cases of debt repayment due to the financial and economic crisis of 2008 have particularly increased. Financially insolvent enterprises carry a potential threat to the successful working enterprises.
3. Unfair competition,
4. Raiding:
– according to the Anti-raider union of Ukraine's entrepreneurs, at least 40-50 specialised raid groups operate in the country, i.e. groups which consist of experienced lawyers and economists. Ukrainian raiding has a significant criminal component: the unlawful actions are made with the involvement of armed formations, and sometimes even the employees of the law enforcement system. Some powerful industrial and financial groups of Ukraine are involved in ordering and organising raider actions that lead to redistribution of property. The following types of raiding may be distinguished:
5. "White":
– consolidation of the controlling interest.
6. "Gray":

– capture of an enterprise that is on the verge of bankruptcy without violating the law;
7. "Black":
– is carried out with the help of criminal evictions (falsification of documents, blackmail, threats, murders);
8. Greenmail:
– blackmail by buying a large number of shares of a particular company with the next offer to sell them under certain conditions. A classical corporate blackmail scheme assumes that the attacking structure buys from the stock market a small stake in a thriving company. Then comes the turn of complaints in the regulatory and law enforcement agencies, as well as lawsuits on any occasion. The ultimate goal is to obtain the retreat either for the waiver or the sale of their stock pack for an overpriced sum. A classic greenmailer is an investment company that carries out its business under unfriendly takeover projects. Such companies use the services of highly qualified lawyers and economists;
9. Carding:
– is a forgery of payment cards. Banking security experts believe that in 85% of cases, the bank employees themselves, having access within the course of their business activities, steal secret information. The main methods of preventing carding is the establishment of limits on the amount of funds that can be withdrawn from the card at once by using modern electronic security, encryption of cards, informing clients about withdrawing funds from the card, etc.;
10. Theft of confidential information:
– can significantly affect the financial and economic condition of an enterprise. Statistics show that 20% of commercial secrets leakage leads of 60% of bankruptcy. As a rule, most of the domestic enterprises steal personal data, including customer information (57%), specific transaction details (47%), financial reports (38%), intellectual property (25%) and business plans (19%) (Solomina, 2018);
11. Threats:
– caused by globalisation processes. In the globalising process, a special place is taken by the globalisation process of international financial markets.

Depending on the scale of production for a separate enterprise, specific threats and factors of financial and economic security for Ukrainian enterprises are given in Table 2.

Table 2: Definition of the concept of „financial and economic security of an enterprise"

Type of enterprise	Security factors
Small	State of consumer demand
	Access to credits
	State permits system
Medium	Access to credits
	State permits system
	Lack of ownership rights
	Optimum capital structure formation
	Presence of the manifestations of monopolism
	Raider attacks
Large	Stock market impact
	International cooperation and integration into the global economic space
	Technology development, innovation
	Raider attacks
	Dividend policy

Source: based on own research.

The implementation of the financial and economic security mechanism of an enterprise requires some management and organisation. Such organisation should be based on a targeted approach to ensuring the primary purpose of security. Taking into account the interpretation of financial and economic security mechanism as a system of levers, tools and ways of functioning of an enterprise that has constantly secured its financial interests, the latter may form the basis of such organisation as a target to be achieved.

In addition, it is necessary to consider the hierarchical structure of financial and economic security mechanism of enterprises. Since there is some efficiency in the levels of perception of the essence of financial and economic security mechanism (both a broad and narrow meaning), its functions (basic and specific) and tasks (three levels), a certain hierarchy of implementation levels of such management in security must be

presented. Therefore, there is a need to distinguish and organise in a hierarchical manner the typical stages and tasks that arise in the course of financial and organisational interconnection implementation of the financial and economic security mechanism by the levels of responsibility of governing bodies. Therefore, the financial and economic security mechanism should be directed not only at eliminating threats, but also at building an effective process that ensures financial stability, sustainability and benefits to the entity under the conditions of uncertainty and risk. The process of functioning of such a mechanism is multistage and purposeful. Thus, it is possible to allocate the level of governing bodies, each of which will have a certain amount of responsibility and authority considering the stage and tasks of financial and economic security mechanism implementation. The governance structure consists of three levels, which are endowed with an appropriate amount of authority and responsibility (Figure 3).

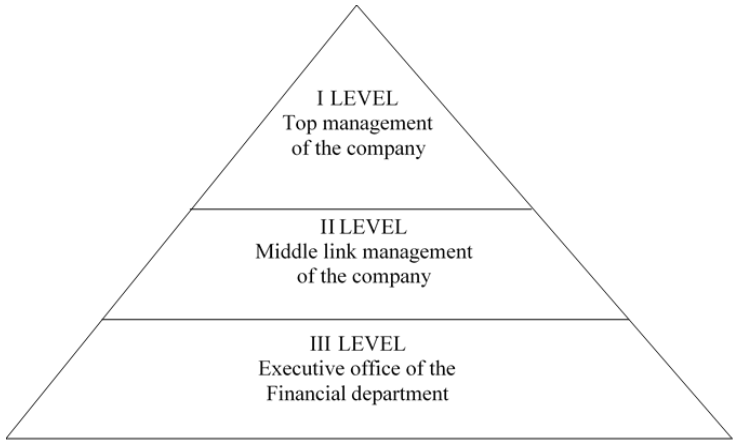

Figure 3. Levels of governing bodies in implementing the mechanism of financial and economic security of enterprises
Source: Based on Frolov (2015)

Financial and economic security management of an enterprise requires the presence of a certain management object (Kuzenko, 2010). When building a general system of this management, its object is the financial activity of an enterprise as a whole. Enterprise security management as a system of management involves certain entities. The modern practice of financial management distinguishes three main groups of such entities: the owner of an enterprise (1 level of responsibility), the general financial manager (2 levels of responsibility) and the functional financial manager (3 levels of responsibility). The peculiarity of organisational management of the financial and economic security mechanism of an enterprise is unequal distribution of functions, tasks and other aspects between the governing bodies in different economic conditions, with different tasks and different approaches to ensuring financial security.

A relevant structure arises from the functional structure of the entity's financial management formation that is most commonly found in practice. Management structures of 1 level are mainly responsible for the organisation of the financial and economic security mechanism of the entity's functioning, management structures of 2 level are mainly responsible for analytical security, whereas management structures of 3 level of responsibility – for instructive and methodological security.

However, the hierarchy of organisational security elements are implemented by governing structures of other responsibility levels. Thus, the direct implementation of management decisions related to organisational security mechanism is carried out by the 3rd level of responsibility of the governing bodies. The peculiarity of the market economy is the decentralisation of financial and economic security management (Susidenko, 2015). Such entity decentralisation provides for a certain diffusion of the organisational security structure, rather than the occurrence of delimitation in the system of mechanism organisation. Because the relationships in the organization both are direct and inverse, as it is possible to implement different hierarchies of tasks of the financial and economic security mechanism of the business entity, the relations are more effective. As the interconnections in the organization have both direct and reverse nature, and as it is possible to implement different hierarchies of financial

and economic security tasks of an enterprise, so far, the relations are more effective.

Thus, for Ukrainian enterprises, three types of security strategies may be recommended:
– instant strategy according to which the enterprise's security system responds to unexpected real threats to its activities. Then, on the one hand, specially created units in the enterprise in order to avoid unexpected threats in the short term can weaken the effect of these threats, and on the other hand, situations may arise when the company incurs losses in the long term;
– preventive strategy, whereby the company conducts work in advance to identify and predict the impact and consequences of potential threats. Employees (subdivisions) that deal with these problems purposefully conduct work to ensure the favourable conditions for the enterprise's activity;
– compensation strategy, according to which it is more profitable for an enterprise to compensate for losses from the occurrence of security threats than to keep security personnel on staff. This strategy is acceptable when the losses from potential threats are small or it is impossible to implement the previous two strategies. An important aspect of the study of the mechanism for managing the financial and economic security of an enterprise is the analysis of functions.

At the same time, the management of financial and economic security of an enterprise should be aimed at fulfilling three tasks: establishing the system of financial interests of the enterprise that need protection during the operation of the enterprise, and in particular, the search for effective methods to maximise the market value of the enterprise; identification and forecasting of internal and external threats to the implementation of the financial interests of the enterprise; ensuring the effective neutralization of threats for the financial security of the enterprise.

It is also necessary to emphasise the importance of financial and economic security mechanism function of the business entity determined by the specificity of the processes for which it is used. In particular, under the economic security management of an enterprise, Bondarenko (2014) understands the purposeful influence from the enterprise management entities and its security system and entities of it that aim to direct their action to reduce the level of threats and risks, as well as to prevent undesirable financial results. As the complex of threats and hazards is always individual and unique, the organisation of the mechanism should be flexible enough to adapt to this complex and include a wide range of controlled parameters.

It is widely accepted that the systematic approach of the financial and economic security of an entity is provided under the following conditions (Davydiuk, 2013):
– the stability of the financial system is ensured by a sustainable balance of external and internal threats, which causes its dynamic development;
– the initial state of the financial system is characterised by sustainability;
– in the case of increased external threats, the dynamic development of an enterprise is carried out in such a way so as to eliminate imbalances, thereby causing an increase in the intensity of internal financial processes;
– the achievement of a stable non-equilibrium condition causes the imbalance to arise, which stimulates the emergence of new hazards and threats;
– the dynamics of the security system level as a whole is cyclic.

In this case, the main directions of financial management may be financial and economic security (Solomina, 2018):
– strategic planning and financial and economic management;
– budgeting as the most effective planning method;
– operational management of financial and economic activities;
– organization of the current control over the implementation of plans (programs) and the financial budgets of the enterprise's budgeting.

5. Conclusions

Summarising, it can be noted that the financial and economic security of an enterprise should be considered as a universal and complex category based on the system to increase the effectiveness of the enterprise functioning sector, maximize its profits, protect the interests of national, regional and industry producers in the context of highly dynamic changes of market environment (Susidenko, 2015). The results of the study show that theoretical research on financial and economic security has a sufficient number of problematic issues, which are partially investigated, and some require further in-depth study and further scientific development, as well as improvement in the functioning of the financial and economic security mechanism of an enterprise. Further research on the process of financial and economic security management of an enterprise in the future requires development of the current mechanism, the components of which consist of

financial interests of the enterprise, its organizational structure and personnel management, technology management and techniques, functions, principles and methods of management, financial instruments, as well as evaluation criteria.

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Examining market concentration levels of available global financial commodity products

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ABSTRACT

The primary objective of this study is to find disparities in the commodity product offerings in various financial markets across the world along with their market concentration levels. Identifying the product gaps in commodity-based financial products offered by the worldwide financial exchanges can assist the decision-makers to fill the existing gaps and strategically attain the worldwide competitive market of commodity exchanges for all nations. The Herfindahl-Hirschman Index, HHI, is used to measure market concentration grouped by geographical regions or exchanges. Our study is conducted for the time period between 2012 and 2016. The disparity analysis indicates a disparity between the various types of commodity products traded in several exchanges across different geographical regions. Our HHI values reflect a high level of commodity market volume concentration in region-wise analysis and a moderate level of market volume concentration in the exchange-wise analysis.

Keywords: Commodity Exchanges, Commodity Products, Herfindahl-Hirschman Index, Measure of Market Concentration, Commodity Market Regions.

1. Introduction

Rapid fluctuations in commodity prices have always been a concern for both commodity producers and consumers. Apart from the direct government intervention in regulating the market mechanism, there is always a better way to self-regulate the unstable prices using derivative products. Derivative products like forwards, futures, options, swaps, etc., are being introduced in both the developed and developing world to hedge the price fluctuation risk. We saw the development of commodity exchanges from the 17th century and how they have evolved over time. Each exchange includes specific commodity products based on the production and consumption patterns of market participants. Derivative exchanges offer a platform to connect hedgers, speculators and cash markets, which enables the financial growth of the country. Furthermore, exchanges provide price transparency to market participants through market regulations and policies. There was a significant increase in commodity trade volumes in the 20th century. Commodity Exchanges in various parts of the world also opened based on their specialty of commodities. The United States, Brazil, the United Kingdom, France, Korea, Japan and Australia opened exchanges with specific asset class trading. Trading was then measured in several contracts traded (volume-based) under the exchange. Exchanges all over the world got connected to electronic trading systems, and trading operations were carried out 24 hours a day during business days. Commodity futures and other asset class markets extended the trading activity by introducing benchmark indices.

The first options market was introduced in 1982 by the Chicago Board of Trade under which the buyer of an option contract was given the right to sell contract within the prescribed time. Options trading gained popularity in the United States. The Chicago Board Options Exchange was opened to encourage options trading. In 1994, the exchange started elec-

tronic trading system and facilitated a smooth transaction process. By 2009, CBOT had 3600 members and nearly 35 million US dollars were traded through an exchange. The type of commodity derivative products traded via local exchanges is also indirectly influenced by macroeconomic variables such as exports, price volatility, etc. These variables may affect the overall growth of the economy and financial markets. Another implication to commodity markets is price volatility. The inelastic curve of commodity demand and supply leads to volatility in prices (Knittel and Pindyck, 2016). Business cycles in commodity importing countries, changing weather conditions, political instability in export promoting countries, price speculations in commodity markets, exchange rate fluctuations are some of the factors that lead to commodity price volatility (Gubler and Hertweck, 2013; Hou et al., 2017). There is a linkage between the country's economic growth and commodity price fluctuations, along with the development of efficient commodity markets (Harvey et al., 2017). Price discovery of each commodity is unique and depends on the sector operated and its usage. Dimpfl, Flad, and Jung (2017) studied price discovery for corn, wheat, soybeans, soybean meal and oil, feeder, live cattle, as well as lean hogs, and found that prices of these commodities are almost uniquely formed in the spot market, and less than 10% price discovery can be attributed to the futures market.

Financialisation of commodities by setting up more commodity exchanges and increasing the product types available to trade in the commodity exchanges can directly or indirectly assist the creation of a new global market for those products and associated industries. Anderson, Asche and Garlock (2018) found that increased trade created a new global market for certain seafood species and in turn allowed to scale and modernise logistics by commoditising the main seafood species groups.

In contrast to the benefits associated with commodity markets development, there is also a concern that the commodity index trading by speculators has led to the increased prices of the necessary commodities like food grains. Boyd, Harris and Li (2018) showed that there is little evidence to prove that speculators cause market destabilisation. Speculators provide the necessary liquidity to hedgers. Haase, Seiler Zimmermann and Zimmermann (2016) have studied 100 published papers about the role of financialisation of commodity markets in the price distortion. They have found an equal number of studies that support and contradict the effects of speculation, and the results shift against the criticised effects if the studies use direct measures of speculation, except for the price.

Having successful commodity exchanges that represent a wide variety of commodity-based financial products with a greater volume of transactions can hedge the risk of commodity producers in each country along with the creation of market efficiency (Larson et al., 1998). In this study, we will examine the number of commodity products traded in region-specific exchanges and analyse product distribution with respect to geographies. We also intend to examine concentration levels of the volume of contracts grouped by exchanges and grouped by regions to determine the commodity market share across the industry. This study will help decision-makers in both private and public sectors to understand the disparity between the available commodity products in the exchanges across different regions around the world and close the gap strategically.

The Herfindahl index – or Herfindahl-Hirschman Index, HHI, is used to measure market concentration. We will evaluate the volume concentrated HHI index to determine the factors associated with a change in market concentration levels.

2. Literature review

Rashid (2015) examined the benefits of Agricultural Commodity Exchanges (ACX) in developing countries and public policies associated with the agriculture commodity market. Some of the benefits explained were increased earnings in agriculture commodity exports, availability of small stakeholders to the commodity markets, price discovery, improvement and so on. The study stated that there was no empirical evidence of these claims. Commodity exchanges have played a major role in enhancing the agricultural commodity markets. This is true for the emerging or industrialised countries. For the developing countries, the growth of commodity exchanges has been unusual. Another observation was the exchanges led by the government or donor-funded exchanges, which failed in the developing countries such as Sub-Saharan Africa. Lack of enough research, absence of monitoring and evaluation systems were some of the reasons stated for the failure of exchanges. No evidence was found supporting increased export earnings and the availability of smallholders to the markets.

UNCTAD (2009) conducted a study on the development impacts of commodity exchanges in emerging markets. The objective of the study was to analyse how commodity exchanges have

impacted the growth and economic development of developing countries. The agriculture sector and farmers were the focus area of the study. The study revealed that apart from macroeconomic stability and government regulations, liquidity is one of the most important key indicators for the success of commodity exchanges. The study covered the exchanges that are successfully set up and operating in diverse market conditions and different economies. The analysis stated that successful commodity exchanges showed diversity in the pattern of development from country to country.

Amrouk, Poole, Mudungwe and Muzvondiwa (2013) examined the patterns of smallholder market participation in commodity markets. Four countries, Ethiopia, Peru, Tanzania and Zambia were taken as a base for evaluating smallholder participation in the agriculture commodity segment. Based on the project's case studies, it was found that Ethiopian farmers could apply economies of large-scale production in agriculture, and this benefitted them with several positive returns. Farmers gained production and post-harvest handling skills and new employment opportunities were created. They could also apply the processing of value-added products. In Peru, farmers could learn new techniques of farming, such as the use of organic manure, the use of bees for crop pollination, etc. The demand for agriculture labour was increased. Tanzania also showed a positive aspect of agricultural activity. Zambia also showed market participation in dairy products. Milk yield and quality showed an upper trend, and smallholders could apply innovative livestock feeding technologies. Employment opportunities also increased. The study revealed that smallholders were key participants in agricultural markets. They could contribute to overall expansion and innovations to economies.

REJNUŠ (2002) conducted a study to find the importance of commodity exchanges for agricultural commodity trading in the Czech Republic. The study covered some problematic areas in the smooth functioning of commodity exchanges in the Czech Republic. The problem areas identified were low-level liquidity and imperfect participation in international exchange operations. The study indicated that commodity trading via exchange did not provide any benefits to the agriculture industry in the Czech Republic and it identified two possible areas of development in agricultural commodity trading: 1) participation of Czech exchanges in the European system, and 2) agricultural commodity producers directly join foreign systems without channelising via the Czech commodity exchange. The study results stated the above two possibilities of development in the Czech agriculture commodity trading.

Agarwal and Kaur (2013) conducted studies to analyse the growth of commodity markets in India and how agricultural commodities serve as an arbitrage opportunity. The study also highlighted price volatility related to agriculture commodity markets. An overall study emphasised the landscape of commodity futures markets and how they evolved over time. The results of the study indicated that the status of the agriculture commodities market in India is uncertain. Many studies are available to understand equity markets, but no study has gone to analyse the shape of commodity markets. The study opens a door for researchers to further investigate the status and growth of commodity markets in developing countries.

Tsetsekos Panos (2000) noted some factors that demand appropriate structuring of derivative exchanges in emerging countries. Derivative markets have created investment opportunities for institutional investors as they can hedge and manage their risks in the commodity asset class. Large business entities in emerging markets also have diverted to derivative markets to manage their commodity and financial risks. The study identified the need for structured derivative exchanges in emerging markets. There are several factors that need to be taken care of for successful derivative exchange functions, some of which are the products that are traded, the structure of the exchange and the strength of the foundation on which the exchange is built. On fulfilling these areas, exchange trading will benefit both investors and the emerging markets economy. The study enlists good lessons to build structured derivative exchanges in emerging markets.

Carter (1999) conducted a survey on commodity futures markets and the formation of commodity futures prices. He considered two pricing theories – the theory of normal backwardation and the theory of storage. The study stated that most recent work supported the theory of storage price, but its convenience yield component was controversial. The study highlighted that futures trading via the electronic platform and managed commodity funds play a significant role in the futures markets. The study concluded that the futures market is a major player in managing economic and financial risks.

Cashin, McDermott and Scott (2002) examined global commodity prices under business cycles such as booms and slumps. The study identified that booms and slumps in prices are prevailing issues in commodity-exporting countries. The study was conducted with two

main observations. Firstly, commodity price slumps stay longer than the price boom. Secondly, reduced commodity prices during slumps were found to be larger than the prices expected to increase in the subsequent boom. Another conclusion was that the association between the probability of an end of a price slump and the duration of slump time was independent of each other.

Cheung and Morin (2007) examined the impact of emerging Asia on commodity prices. The study considered oil and metal commodities for examining their prices in Asian markets. Due to rising production in China, demand for commodities has increased over some time. The study evaluated the impact of emerging Asia on oil and metal prices in the Bank of Canada Commodity Price Index (BCPI). Business cycles in emerging Asia have played a significant role in oil price movements, whereas metal price movements have also been affected due to growing industrial development in Asian economies. The study gave direction to examine the relationship between commodity prices and demand for commodities in emerging Asian countries.

Roache (2012) performed an analysis of China's impact on the world's commodity markets. Base metals and crude oil are considered to identify an impact under the demand-supply cycle. The autoregressions (VARs) methodology is used by estimating the impact of aggregate activity shocks such as world primary production of the commodity, the world's industrial production excluding China, China's consumption, the real short-term US interest rate, US dollar effective exchange rate, and real price of the commodity. The results of the study indicated a short-term impact on oil prices, and base metal was seen in China during shocks. At the same time, consumption did not influence commodity prices. In comparison to the United States, the study showed an increasing trend of China's impact on the world's commodity markets, but compared to the United States, China's impact was smaller. The study also highlighted the biggest challenge that was uncovered in the research. The challenge was to study the demand for commodities in China at the time of economic re-balance. Arnade, Cooke and Gale (2017) examined the transmission of international commodity prices to the domestic Chinese markets. The results showed that stabilisation policies carried out by the Chinese government to protect the prices of the domestic Chinese markets from the international commodity prices cannot be sustained over a long term.

Irwin and Sanders (2011) examined the correlation between index funds, financialisation and commodity futures markets. One part of the study showed that index investment influenced the prices of futures. At the same time, another part indicated no relation between index fund positions and commodity futures prices. Linkages between index investments and commodity futures prices were not consistent in different scenarios. The results of the study indicated that the belief that index funds influences prices was in doubt. The study gave direction to further research on finding the correlation between the behavior of commodity prices and other products under various macroeconomic variables.

Cabrales, Castro and Joya (2014) performed research on the effect of US monetary policy shocks on commodity prices in Colombia. As per the study, Colombia was one of the world's largest exporters of oil, coal, ferronickel and gold commodities in 2010. Colombia's commodity exports contributed to 64% of total exports. The empirical study was based on the VAR model and quarterly time series data were used between 1980-2010. The research indicated that there is a huge impact of US monetary policy shocks on exported commodity prices in Colombia. Monetary policy variables can be considered for examining commodity prices fluctuations.

Cutler, Chan and Li (2005) conducted an empirical analysis to identify linkages between commodity and Consumer Price Index (CPI) in Mainland China and Hong Kong. Using Vector Autoregression (VAR) methodology, comparisons were made with the United States. Positive correlation was found between non-fuel commodity prices and CPI inflation. An increase in the non-fuel commodity prices led to an increase in CPI inflation in Mainland China and Hong Kong. Bivariate and Multivariate analyses were conducted to examine the relationship between these variables. Changes in energy prices were not indicators for an increase in CPI inflation. The results varied from commodity to commodity. No significant evidence was found to determine that all commodity prices are related to CPI inflation.

We have seen many studies explaining the benefits of financialisation of commodity markets, price discovery mechanics of commodities, the performance of commodity markets under macroeconomic variables along with the linkages between commodity markets and the status of the economy. Another set of studies explored the role of exchanges for smallholders in different countries, limitations of agricultu-

ral commodity exchanges in emerging markets, correlation of commodity markets with monetary policy changes, the connection between commodity price fluctuations and economic growth in terms of import / export parameters and so on. Many of these studies have proved the benefits of the commodity markets along with their links with overall economic factors and growth. But none of the above-mentioned studies captured the disparities or market concentration of commodity-based financial products in various exchanges across the world. Understanding the concentration levels help us to create more competitive commodity markets across all the regions of the world rather than confining them to only a few countries.

In this study, we are going to examine the variety of commodity products available in the world-wide commodity exchanges along with their traded volume and their market concentration levels as per various exchanges and different regions around the world. This analysis will help both the individual and institutional commodity market investors to have a global view of the available commodity products in various exchanges. This study also helps investors to analyse the number of commodity products available and their volumes traded in terms of exchanges and world regions. In turn, an investor can choose to invest in developed or developing markets as per their risk and return analysis. Arbitrageurs can use this study to find a list of similar commodity contracts traded across various exchanges and find their price differences to benefit from the price arbitrage.

We will also study market concentration levels of commodity products traded in terms of exchanges and world regions. This analysis will help the policymakers to spot the disparities in the development of commodity markets and their traded volumes. By spotting the disparities, policymakers can revisit their strategies and implement necessary steps to increase the number of commodity exchanges or the available commodity products in their respective countries or regions. Large scale private investors can also use the market concentration levels analysis to spot the opportunities in establishing a new commodity exchange in underserved countries or regions across the world. In this juncture, our study lays an important foundational analysis for the development of commodity markets and their product offerings from both the investment and policy-making perspectives.

3. Data Description

This section has three sets of data: 1) Product Types and Exchanges, 2) Contract Volume Exchange-wise (2012–2016), 3) Contract Volume Region-wise (2012–2016).

3.1. Dataset 1 – Product Types and Exchanges

The dataset contains region-wise exchanges list and each exchange authorised for trading commodity products. The following regions are covered with the exchanges. 58 exchanges are covered to perform disparity analysis. Refer to Table 1 for data information.

Table 1: Commodity Products vs. Exchanges

Specification	Africa & Turkey	South America	North America	Asia	Europe
No. of Exchanges	2	4	18	26	8
No. of Products Traded	493	455	8157	2689	1712

Note: The table shows the number of total exchanges per region and no. of products traded per exchange. This data is collected manually from various individual commodity exchange websites.
Source: own research.

Countries analyzed under Asian derivative markets are Australia, China, Hong Kong, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Singapore, South Korea, Taiwan, Thailand and United Arab Emirates. Asian derivative markets cover the largest share of commodity trading. European derivative markets are covered in Germany, Hungary, Italy, Russia, Sweden and the United Kingdom. Latin American derivative markets taken for our analysis are Argentina, Brazil and Colombia. North American derivative markets observed are Canada and the United States. South Africa and Turkey are taken as another region.

3.2. Dataset 2 – Region-wise Commodity Contracts Volume

Commodity contracts volume traded in Asia, North America, Europe, Latin America and other regions (Africa and Turkey) are taken for the years 2012, 2013, 2014, 2015 and 2016. Refer to Table 3 for region-wise information.

3.3. Dataset 3 – Exchange-wise Commodity Contracts Volume

Commodity contracts volume traded in exchanges across all regions specified above are taken for the years 2012-2016. Refer to Table

1 (Appendix) for contract volume data exchange-wise.

In this study, we will use dataset 1 to conduct disparity analysis between the number of exchanges located in each region versus the number of product types traded in each region. This analysis is conducted to gain a clear idea about the gaps existing in the global commodity markets.

Dataset 2 will be used for performing market-level concentration analysis using region-wise data on the contract volume for 5 years. This analysis gives us the idea of the commodity market concentration level and its interpretation using the HHI calculation methodology. Dataset 3 will be used for measuring market-level concentration using exchange wise data on total contract volume for 5 years. This analysis gives us the idea of the commodity market concentration level and its interpretation using the HHI calculation methodology. It will give us some insight into the growth of the commodity futures and options market.

4. Methodology

4.1. SCP and NEIO

In an industrial organization (IO), the Structure-Conduct-Performance (SCP) paradigm was the main framework for empirical research between the 1950s and early-1980s. There was a causal chain running from the market structure and the firm's conduct, to its performance. By the 1980s, the empirical opponent of this theory is the New Empirical Industrial Organization (NEIO). In the last two decades, the NEIO is the front runner in the empirical IO literature, but it is lagging in the number of studies being carried out. This situation could be due to the fact that the SCP paradigm has evolved over time and is still carried out strongly in most developing countries (Lee, 2007). Thus, we will use the SCP approach in our analysis using Market concentration measures due to its popularity among readers across the globe.

4.2. Market Concentration Measures

Market concentration is a function of a number of firms and their respective market share of the total industry. The modern scientific literature offers multiple measures on Market concentration but none of them are perfect (Ginevičius and Čirba, 2007). In economics, the Concentration ratio (CR) and the Herfindahl index (HHI) are commonly used market concentration measures due to their simplicity in calculation. N-firm concentration market ratio (CR(n)) provides us with a common measure for the market structure, which shows the combined market share of N largest firms on the market. Concentration ratios can range 0 to 100 percent. 0% represents the perfect competition scenario, and 100% represents the monopoly.

The Herfindahl index (HHI) measures the size of a firm in relation to the total industry and an indication of the total amount of competition among them. The HHI is defined as the sum of squares of the market shares of the firms within the industry. The result can range from 0 to 1.0. In the case where the whole percentages are used, the result ranges from 0 to 10,000 points. An increase in the HHI value indicates a decrease in competition. The N-firm concentration ratio does not take changes in the size of the largest firms into account. The Herfindahl index (HHI) avoids this problem. Kvålseth (2018) made a comparison between the N-firm concentration market ratio (CR(n)) and the Herfindahl index (HHI) and found that the HHI has an advantage over the CR(n) by following strict Schur-convexity if market shares are known for all the firms within a market. The Herfindahl index (HHI) is also used by the US Justice Department and the Federal Trade Commission (FTC) to evaluate any mergers and acquisitions.

The main drawback of the Herfindahl index (HHI) is that it requires the market shares of all the companies in the market to be known. In our case, we know the market shares of all the commodity exchanges as they are quite limited in number per region. The Herfindahl index (HHI) critics argue that the methodology cannot account for the benefits of network industries (Toby Roberts, 2014). Commodity Exchanges cannot be classified as network industries so that we can use the Herfindahl index (HHI) due to its popularity and simplicity in the calculation.

4.3. Region-wise Commodity Contracts Volume

In this section, we are using the volume concentration index, HHI, to measure the commodity market concentration using region-wise data for 5 years and see the trend of how the industry performs. The HHI is calculated by squaring the number of contracts of all regions and then summing up those squares. The equation of HHI_{Region} is as follows –

$$HHI_{Region} = \sum_{i=1}^{k} p_i^2 \quad (1)$$

where:

$$p_i = \frac{No.\,of\ contracts\ per\ region}{Total\ Contract\ Size}$$

The number of contracts traded in the region for the year and total contract volume of the year is given. Contract volume concentration is measured for the year between regions in terms of the total number of contracts traded in the region with respect to total commodity contracts traded across the world. The period analysed is 2012-2016. Contract Volume is the total no. of commodity futures and options contracts. The HHI will determine the level of commodity market concentration per year.

4.4. Exchange-wise Commodity Contracts Volume

In this section, we are using the volume concentration index, HHI, to measure the commodity market concentration using exchange data for 5 years and see the trend of how the industry performs. The HHI is calculated by squaring the number of contracts of all exchanges and then summing up those squares. The equation of $HHI_{Exchange}$ is as follows –

$$HHI_{Exchange} = \sum_{i=1}^{k} p_i^2 \quad (2)$$

where:

$$p_i = \frac{No.of\ contracts\ per\ exchange}{Total\ Contract\ Size}$$

The number of contracts traded in the commodity exchange for the year and total contract volume of the year is given. Contract volume concentration is measured for the year between all the given exchanges in terms of the total number of contracts traded with respect to the total number of commodity contracts traded across all exchanges. The period analysed is 2012-2016. Contract Volume is the total no. of commodity futures and options contracts. The HHI will determine the level of commodity market concentration per year.

5. Results

5.1. Contract Volume - Regions

Table 2 shows the volume of commodity contracts traded in each region. During the period between 2012 and 2016, Asia saw tremendous growth in the volume of traded commodity contracts by 144.22%, followed by Europe with 120.4%. Africa and Turkey displayed 92.2% growth, but the total number of contracts traded were still low in number. North America had a reasonable growth rate of 46.35%, whereas Latin America displayed a negative growth rate of -14.01%.

Table 2: Contract Volume – Regions

Region	2012	2013	2014	2015	2016
Asia	1,823,605,643	2,212,697,689	2,497,395,023	3,536,767,906	4,453,664,421
North America	961,399,350	1,179,065,722	1,094,054,710	1,223,078,382	1,407,073,536
Europe	489,841,445	552,931,828	547,895,364	700,937,578	1,079,612,267
Africa and Turkey	4,396,606	4,494,258	4,244,986	4,928,336	8,451,467
Latin America	3,475,867	3,171,776	3,103,778	2,536,412	2,988,729
Grand Total	*3,282,718,911*	*3,952,361,273*	*4,146,693,861*	*5,468,248,614*	*6,951,790,420*

Note: This data is collected manually from various individual commodity exchange websites.
Source: own research.

5.2. Product Types vs. Exchanges

Table 1 shows the number of total exchanges per region and the number of products traded per exchange. This table gives a clear idea of the ratio of exchanges versus the number of commodity products traded. North America tops the market with 8157 types of tradable commodity products followed by Asia with 2689 types of tradable commodity products. Europe has 1712 commodity product offerings. Africa and Turkey have only 493 types of tradable commodity products followed by South America with only 455 product offerings, despite being commodity-rich regions. There is a clear need for development of commodity exchanges and product offering in Africa, Turkey and South America in order to increase the awareness and hedge the price risk of local commodity producers of those regions.

5.3. Market Concentration – Region Wise

Table 3 shows the HHI values for each location for 2012-2016. The volume concentration for Asia, North America, Europe, Latin America and other (Africa, Turkey) regions are taken as the input parameter for the HHI calculation.

The annual commodity contracts volume of 2012 for all regions amounted to 3,282,718,911 with 0.41 HHI. The volume increased in 2013 to 3,952,361,273 with 0.42 HHI. For 2014, the annual commodity contracts volume for all regions showed the amount of 4,146,693,861 with 0.45 HHI. The volume for 2015 increased to 5,468,248,614 with 0.48 HHI and 2016 showed the volume of 6,951,790,420 with 0.48 HHI.

Table 3: Region-wise – HHI

Specification	2012	2013	2014	2015	2016
HHI	0.41	0.42	0.45	0.48	0.48

Note: The table shows the volume concentration for Asia, North America, Europe, Latin America and other (Africa, Turkey) regions. Market concentration levels are clearly shown in the above data. These results are calculated on the basis of the values presented in Table 3.
Source: own research.

Commodity markets are highly concentrated in some regions of the world, leaving behind others in the development. Our results show that policy-makers in Africa, Turkey and Latin America have an opportunity to develop their commodity exchanges to increase their overall economic growth rate.

5.4. Market Concentration – Exchange Wise

Table 4 shows the HHI values for each exchange for 2012-2016. The volume concentration for all the exchanges specified in dataset 3 is taken as the input parameter for the HHI calculation. The annual commodity contracts volume of 2012 for all exchanges sh amounted to 3,282,718,911 with 0.11 HHI. The volume increased in 2013 to 3,952,361,273 with 0.11 HHI. For 2014, the annual commodity contracts volume for all regions showed the volume of 4,146,693,861 with 0.13 HHI. The volume for 2015 increased to 5,468,248,614 with 0.14 HHI and 2016 showed the volume of 6,951,790,420 with 0.15 HHI.

Our analysis shows moderate market concentration in terms of commodity exchanges across the world. We can improve the overall market competition by focusing on the development of new commodity exchanges in the regions of Africa, Turkey and Latin America.

Table 4: Exchange-wise – HHI

Specification	2012	2013	2014	2015	2016
HHI	0.11	0.11	0.13	0.14	0.15

Note: The table shows the volume concentration for the commodity products traded. Market concentration levels are clearly shown in the above data. These results are calculated on the basis of the values presented in Table 3.
Source: own research.

6. Conclusion

The study shows that the ratio of commodity products available in exchanges is not consistent across various regions of the world. During the analysed period between 2012 and 2016, Asia showed tremendous growth in terms of commodity contracts trade volume, followed by Europe. North America showed moderate constant growth as the market had been well-developed before Asia and Europe. Although Africa and Turkey showed a good growth rate, still these countries need further development in order to catch up with the total number of traded contracts. Surprisingly, Latin America depiceted a negative growth rate.

North America still tops the market with the variety of tradable commodity contracts offered, followed by Asia, Europe, Africa and Turkey, as well as Latin America (in decreasing order). Market concentration from the region's perspective showed a high concentration dominated by regions like North America, Asia and Europe, whereas Latin America, Africa are Turkey are lagging. The exchange-wise market concentration showed a moderate concentration ratio. All the above analyses offer untapped opportunities in the development of commodity markets in regions of Africa, Turkey and Latin America. Policy-makers in these regions should create the environment which will be suitable for the development of commodity markets in order to attain overall economic growth. With the establishment of useful policies by the policy-makers in Africa, Turkey and Latin America, large scale private investors will be attracted to invest in the establishment of private commodity exchanges in these regions.

Development of commodity exchanges in Africa, Turkey and Latin America will also decrease market concentration in terms of both exchanges and regions, thereby contributing to the overall competitiveness of global commodity markets. The study gives a thought of further research to identify a need to analyse the parameters that influence the successful establishment of exchanges with a greater number of commodity products under the exchange. The role of the government, liquidity, exchange regulations and policy pre-requisites are some of the parameters that can be highlighted to initiate further studies. After analysing the results, more questions arise concerning such disparities. What are the factors responsible for the disparities seen?

Our study has identified the existing ratio of the number of exchanges and products ava-

ilable. Thus, providing the base to identify an optimal number of exchanges a country should have for the entire derivative market or specific commodity markets. This can be further extended to a country level exchange with a specific asset class.

The study is limited to examine disparities between products available and a number of exchanges across all regions. Further research may be extended by segregating the disparity between Over-the-Counter (OTC) markets and exchange-traded commodity derivatives. Other issues to be addressed are linkages between the factors affecting derivative exchanges and the commodity products available for the exchange. The correlation between mergers and acquisition of exchanges and the growth of commodity products may also be an area of research. This study gives multiple dimensions of further research on identifying the product mix and concentration ratios in the commodity futures markets and the role of exchanges in the growth of commodity derivatives.

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Appendix – Table 1: Exchange-wise – HHI

Exchange	2012	2013	2014	2015	2016
Shanghai Futures Exchange	365,329,379	642,473,980	842,294,223	1,050,494,146	1,680,711,841
Dalian Commodity Exchange	633,042,976	700,500,777	769,637,041	1,116,323,375	1,537,479,768
Zhengzhou Commodity Exchange	347,091,533	525,299,023	676,343,283	1,070,335,606	901,297,047
New York Mercantile Exchange	431,476,470	427,094,038	415,633,905	503,429,700	618,424,303
Moscow Exchange	22,618,770	36,545,272	20,215,684	123,283,868	466,803,780
ICE Futures Europe	282,120,115	333,595,466	335,485,082	390,679,743	438,905,081
ICE Futures U.S.	141,607,334	386,574,783	307,828,353	304,256,123	303,019,500
Chicago Board of Trade	255,441,570	228,684,657	246,873,523	286,763,094	300,630,935
Multi Commodity Exchange of India	388,751,074	264,627,693	133,751,848	216,346,961	245,077,515
London Metal Exchange	159,719,781	171,099,643	177,151,712	169,540,184	156,491,501
Commodity Exchange (COMEX)	84,989,357	92,130,643	79,644,996	81,786,800	110,102,193
Chicago Mercantile Exchange	33,629,296	31,480,288	35,810,346	34,788,631	33,816,457
Nasdaq NFX				3,523,298	31,950,258
Tokyo Commodity Exchange	25,479,111	26,845,712	21,856,063	24,399,068	26,917,289
National Commodity & Derivatives Exchange	44,885,711	32,435,100	30,141,298	29,545,534	20,339,532
SGX Asiaclear	337,591	660,372	2,962,587	7,919,551	15,619,086
Euronext Derivatives Market		10,552,390	13,165,310	14,295,804	13,758,816
Malaysia Derivatives Exchange	7,443,964	7,992,369	10,201,345	11,026,883	11,464,872

Exchange	2012	2013	2014	2015	2016
ICE Futures Canada	5,039,160	5,688,295	5,676,345	5,720,023	6,431,546
Borsa Istanbul	1,397,073	1,737,293	1,515,027	1,428,271	5,025,387
Nasdaq Commodities	880,917	848,765	1,708,870	3,013,983	3,530,916
Pakistan Mercantile Exchange		4,608,831	3,776,229	3,890,968	3,481,167
JSE Securities Exchange	2,999,533	2,756,965	2,729,959	3,500,065	3,426,080
Thailand Futures Exchange	3,805,018	2,255,001	1,574,234	1,487,506	2,923,276
Minneapolis Grain Exchange	1,239,741	1,483,657	2,177,740	2,315,186	2,185,098
ICE Futures Singapore				167,663	1,998,054
Dubai Mercantile Exchange	1,176,056	1,600,918	2,119,936	1,709,888	1,949,658
Bolsa de Mercadorias&Futuros	2,543,758	2,238,113	2,503,796	1,884,786	1,872,974
Singapore Exchange	256,995	346,303	489,79	654,853	1,413,696
Dubai Gold &Commodities Exchange		533,541	607,783	570,343	971,186
Rosario Futures Exchange	588,654	677,878	363,223	406,268	840,079
Indonesia Commodity & Derivatives Exchange	946,828	934,685	691,238	575,896	558,409
North American Derivative Exchange	232,73	304,924	409,502	495,527	513,163
Osaka Dojima Commodity Exchange	209,765	261,445	309,874	412,875	447,734
ASX 24	572,046	375,1	377,359	481,587	418,614
Mercado a Termino de Buenos Aires	343,064	255,537	236,759	245,318	275,676
Japan Exchange		74,612	132,531	175,45	253,607
Taiwan Futures Exchange	138,379	152,524	97,092	131,595	185,624
New Zealand Futures Exchange	7,207	6,981	10,455	27,702	127,275
Eurex	320,999	275,909	156,462	116,676	115,947
Hong Kong Exchanges and Clearing	2		8,79	55,753	29,171
Borsaltaliana (IDEM)	1,239,219	9,47	8,424	3,779	3,61
Budapest Stock Exchange	4,496	4,913	3,82	3,541	2,616
NYSE Amex					83
Kansas City Board of Trade	5,404,241	5,624,265			
NYSE Liffe US	1,799,234				
NyseLiffe European Derivatives Market	22,937,148				
Tokyo Stock Exchange	60,388				
Hong Kong Mercantile Exchange	1,442,705	156,351			
OCC					
Singapore Mercantile Exchange	1,003,184	414,2	1,301		
Chicago Climate Futures Exchange	21,658				
Korea Exchange	22,655	34,926	10,723	34,703	
Bolsa de Valores de Colombia	391	248		40	
Tokyo Grain Exchange	1,603,076	107,245			
Chicago Board Options Exchange	29	52			
Nasdaq Futures Exchange (PBOT)	518,36				
CBOE Futures Exchange	170	120			
Grand Total	*3,282,718,911*	*3,952,361,273*	*4,146,693,861*	*5,468,248,614*	*6,951,790,420*

Note: This data is collected manually from various individual commodity exchange websites. Blank spaces represent non-availability of data for those years. In some cases, this is the result of commodity exchange closure or the establishment of commodity exchange later.

Source: own research.