Determinants of the threat of the middle-income trap

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Abstract

The aim of this article is to construct a model that explains the probability that an economy will be caught in the middle income trap. The definitions of the phenomenon that function in the literature are reviewed and the theoretical and empirical research available in this area are analysed. This is followed by a presentation of the variables applied in the research, the methodology adopted for selecting the research sample, and the statistical tools used to achieve the aim of the article. In the next sub-chapter, the author presents and discusses the results of the model estimation. The results of the base model and three alternative models whose calculation is based on a modified database are presented. The estimation of each model was carried out by the logit and probit method.

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1 Introduction

The term middle-income trap was first used by Gill and Kharas in a World Bank report entitled *An East Asia Renaissance: Ideas for Economic Growth* of 2007. The idea of the middle-income trap resulted from observing the development process of countries at the middle-income level, only some of which managed to join the group of the best-developed countries. Gill and Kharas (2007) noticed that a given country achieving a high level of income is not an automatic process, as might result from the neoclassical theory of economic growth, but depends on the fulfilment of certain conditions. The authors stress the necessity to implement an appropriate strategy that provides for the diversification and specialisation of production, the development of innovations, and transformation of the education system so that it will educate people who will then be able to develop and implement new products, and not only to adopt existing technologies. Gill and Kharas stress the essential role of the state in the economic growth process, which contrasts with conclusions resulting from neoclassical theory.

The middle-income trap has gained much popularity, becoming the subject of many scientific and popular science publications. Special attention is paid to middle-income countries, where debates are held about the possibilities of these countries maintaining a high economic growth rate over a long period and joining the group of the best-developed countries.

Works on the middle-income trap are both theoretical and empirical. Theoretical research is usually focused on attempts to embed the trap phenomenon in economic theory. Among such research, we may distinguish papers aimed at proving or refuting the existence of the trap and others devoted to searching for factors that increase the risk that a given economy will be caught in the trap.

This article is empirical, and its aim is to create a comprehensive model that explains the probability that a country will be caught in the trap. Many publications devoted to searching for trap determinants may be found in the literature. Most frequently, authors construct many regression equations using control variables to show the impact of specific variables on the risk of the trap occurring, while research based on one equation concerns only narrow thematic areas. There is no wide model referring to many aspects that would constitute a tool to verify the statistical significance of specific variables, or that may be used to forecast the probability of the occurrence of the phenomenon. The author hypothesises that countries which are more dependent on foreign capital and whose entities play a minor role in their economy are more exposed to being caught in the middle-income trap. This is reflected in the poor investment position of the economy. The second hypothesis refers to the trade structure. The risk of being caught in the trap is greater for countries which export mainly agricultural products or low-processed industrial goods, as well as countries whose main export goods are raw materials. Therefore, greater diversification of exports should negatively impact the probability of being caught in the middle-income trap.

2 Definitions of the middle-income trap

In 2015, eight years after the term middle-income trap was introduced into scientific circulation, Gill and Kharas made a summary of consideration in this area. They distinguished three broad definitions that occur in the literature, emphasising the division into qualitative and empirical definitions.

2.1 Qualitative definitions of the phenomenon

Gill and Kharas (2015) define the middle-income trap as a trap of an economic policy based on the incorrect diagnosis that results in the mismatch of the development strategy to the structural features of a given economy. One basic reason for being caught in the trap is that some countries attempt to maintain a development model based on supporting labour-intensive, pro-export economic sectors, disregarding the loss of competitive advantages in these areas as a result of high wages. They also draw our attention to countries which tried to transform themselves into a knowledge-based economy too quickly, without sufficiently developed institutional infrastructure.

According to Ohno (2009), middle-income countries must achieve higher stages of the value chain. He equates the trap with the adopted development strategy being dependent on such natural limitations as the extraction of raw materials or inflow of foreign investments. Ohno favours the state's active industrial policy and sees the reasons for the middle-income trap in lack of appropriate microeconomic foundation for development processes. Garrett (2004) concentrates his consideration on the need for technical progress and the difficulties caused by globalisation and the liberalisation of trade, leading to problems of middle-income countries climbing the value chain.

The concepts of Gill and Kharas (2015), Ohno (2009) and Garrett (2004) are qualitative and descriptive. Therefore, we may categorise them under the first of three groups of definitions distinguished by Gill and Kharas. The common feature of qualitative definitions is the concentration on a given economy's structural features being the key factor that conditions the growth of the total factor productivity. The role of the movement of labour from the low-productivity agricultural sector towards more productive sectors, such as industry or services, is also stressed.

2.2 Empirical definitions of the phenomenon

The second and third definitions distinguished by Gill and Kharas are empirical. The second definition is connected with a given country remaining at the middle-income level for a long period. Such an approach requires the adoption of criteria to define what middle income is and how long a given economy remains at the middle-income level before it can be stated that it has been caught in the trap. Spence's consideration (2011) fits into this definition. He indicates that until 1975, only a few countries managed to reach a GDP per capita level of USD 10,000 measured in purchasing power parity expressed in 2005 prices. Spence's analysis was developed by Felipe, Abdon and Kumar (2012), who distinguished two middle-income ranges: the first range between USD 2,500 and USD 7,500, and the second between USD 7,500 and USD 11,500, measured in purchasing power parity expressed in 1990 prices. Felipe, Abdon and Kumar (2012) consider that a country has been caught in the trap if it remains in the first income range for more than 28 years or in the second income range for more than 14 years.

The thresholds separating individual income ranges proposed by Spence (2011) and Felipe, Abdon and Kumar (2012) were established arbitrarily, with theoretical or empirical justification. Eichengreen, Park and Shinet (2013) and Aiyar et al. (2013) present a different approach in their works. They attempt to empirically set income ranges in which the probability of an economic slowdown is higher than average. The results of research carried out by Eichengreen, Park and Shinet (2013) indicate that the probability of a slowdown is particularly high when the economy is in the income range between

10,000 USD and 11,000 USD and between 15,000 USD and 16,000 USD, while Aiyar et al. (2013) indicate the income range between 1,000 USD and 12,000 USD.

The third broad definition of the trap is based on the indication of a lack of convergence of a given economy in relation to a specific highly developed country that is a technology leader. Most frequently, this country is the United States of America. Im and Rosenblatt (2013) and Agénor and Canuto (2012) calculated the ratio of GDP per capita of a given country to the GDP per capita of the USA and observed its variation over time. The conclusions of both works are analogous: the probability of middle-income countries achieving a high income level is very low. Furthermore, commonly observed cases of the convergence with the United States stopping prove that the country has been caught in the trap.

3 The middle-income trap in theoretical research

The phenomenon of the middle-income trap cannot be explained through neoclassical growth theory. Neoclassical models provide for the convergence of levels of income per capita between individual economies. Therefore, based on the neoclassical theory, it is impossible to justify the long-term economic slowdown connected with the convergence process stopping. Although the AK model and Lucas model (Romer 1996) do not account for the convergence process, they do not explain the slowdown in growth at the middle-income level. And while the term middle-income trap has been used in scientific circulation for several years, it has no theoretical foundations. The majority of the research carried out in this area is empirical. As neoclassical theory does not provide for the occurrence of development traps, researchers try to make use of unorthodox economic theories or create their own. The starting point is the derogation of one or several assumptions of the neoclassical theory.

3.1 Middle-income trap and Lewis' model

Gill and Kharas (2015) try to justify the theoretical phenomenon of the trap based on Lewis' model. In Lewis' model, we distinguish two sectors of the economy: the agricultural sector, in which the majority of the population work, and the market-oriented modern industrial sector. Due to the workforce surplus in the agricultural sector, the marginal product is close to zero. The movement of labour from the agricultural sector to the industrial sector does not cause a decrease in production in the agricultural sector, but it does affect the development of the industrial sector. The wage level in the agricultural sector, determined by the minimum subsistence level, increases the marginal product of work, whereas, in the industrial sector, the wage level is equal to the marginal product of work. The fact that the wage level in the industrial sector exceeds the wage level in the agricultural sector constitutes a factor that initiates the movement of labour. This process lasts until the exhaustion of the surplus labour resources in the agricultural sector. This point is referred to as the Lewis turning point. Gill and Kharas indicate that economies frequently achieve the Lewis turning point when they are at the middle-income level. Wages exceeding the level of the marginal product and the lack of perfect mobility of production factors constitute deviations from the neoclassical growth theory.

3.2 The middle-income trap in the context of the theory of development stages

Neoclassical growth theory assumes that all economies move along a unified path towards a steady-state. Therefore, economies go through a convergence process towards a steady-state. Based on the neoclassical theory, we cannot distinguish any stages that would constitute the growth path. There is also a lack of differentiation of factors that condition economic growth, depending on the distance of a given economy from the steady-state point. Therefore, there are no exogenous barriers which prevent moving to the next development stage.

Rostow's concept of growth stages presents a different approach. This theory is based on the paradigm of one development path, although this path is not uniform. Rostow distinguished six stages of the development process, indicating that moving to each stage is automatic. After remaining at a given stage of development for a specific time, each economy moves to the next stage. Finally, all economies reach the last development stage. This theory, like the neoclassical theory, does not identify any barriers that make it impossible for a given economy to move to the next development stage (Bartkowiak 2013, p. 117–118).

Ohno (2009) also distinguishes stages that make up the economic development process. In this approach, moving to the next development stage is not automatic, but it depends on the fulfilment of specific conditions. Ohno distinguishes five stages of development, starting with a pre-industrial economy, based on low-productivity agriculture, and ending with the stage in which a given economy can manufacture technologically advanced products and set trends in the world economy. According to this concept, the initiation of development processes is possible due to the inflow of foreign investments. Industrial companies managed by foreign entities are established. At the next stage, domestic branches of industry occur, which serve as suppliers of semi-products for foreign companies that play a key role in the economy at this stage. From the point of view of analysing the middle-income trap, moving from the third to the fourth development stage is crucial. It involves replacing foreign entities with domestic ones in all areas, such as management, technology development, logistics, quality control or marketing. In order to do this, it is necessary to internalise knowledge and skills. This process is very difficult, which is why many economies are not able to carry out this type of structural transformation. Without the ability to maintain a high pace of economic growth, they are caught in the development trap.

The approach presented by Ito (2017) is similar to Ohno's concept. According to Ito, economic development also consists of many stages, and maintaining convergence with the best-developed countries over a long period is possible only when specific conditions are met. Avoiding the middle-income trap and joining the group of the best-developed countries is possible only if there is a transformation of the economic model towards one that is knowledge-based. The concepts of Ohno and Ito are not based on strong theoretical foundations, and they have not been subject to a broader empirical verification. They are general and schematic, meaning that they cannot be regarded as a comprehensive theory that explains the middle-income trap.

3.3 Synthesis of the neoclassical and endogenous growth models and the middle-income trap

One of the directions of consideration concerning the theoretical foundations of the middle-income trap concept is an attempt to carry out a synthesis of neoclassical and endogenous economic growth

models. Gill and Kharas (2015) indicate that the exogeneity of technical progress implied by the Solow Growth Model constitutes a problem when analysing the trap. They consider a weak point of endogenous growth models is the fact that they concentrate on moving the technological frontier by creating new technologies, not by adapting and diffusing the existing technologies that occur in countries at the middle-income level. For middle-income countries, Gill and Kharas (2015) indicate the need to synthesise both models and transform the economic system so that productivity growth could be based not on the cross-sectoral allocation of production factors, but on technical progress, which leads to a given economy climbing the value chain.

According to Pinto (2014), whether the growth is endogenous or exogenous in a given case is of crucial importance for the economic policy. He refers to the work of Aghion and Howitt (2009), who brought together the neoclassical theory and the endogenous growth theory. According to Aghion and Howitt (2009), economic growth occurs as a result of moving the technological frontier and imitating existing technologies. The larger the distance of a given economy from the technological frontier, the greater the advantages of imitating the technology. They emphasise the role of institutions in development processes, indicating that development based on imitation requires different institutions than development based on creative, innovative activities.

Agénor (2013) looks for factors that condition the choice between a development strategy based on imitation and a strategy based on innovations. He underlines the specific role of appropriate infrastructure in the structural transformation process of the economy. When implementing the strategy based on imitation, access to basic infrastructure, such as roads or the energy network, is sufficient. When the development is based on innovations, access to more advanced infrastructure, characterised by greater complementarity with regard to human capital, becomes necessary. Due to positive external effects connected with human capital, the development of advanced infrastructure stimulates the development of innovations (Wojtyna 2016).

3.4 The middle-income trap in the context of New Structural Economics

Lin (2014) tries to justify the theoretical phenomenon of the middle-income trap based on assumptions resulting from new structural economics, which he created. New structural economics explains certain economic phenomena that neoclassical economics and structuralist economics could not. According to Lin, countries differ in terms of the availability of production factors, depending on their development level. Developing countries are characterised by relatively vast resources of labour and small capital resources, while the opposite is true in developed countries. The availability of production factors in countries affects the development of their prices, which in turn determines in which sectors a given country achieves comparative advantages. The purpose of implementing an economic policy to catch up with the richest countries is structural transformation, which is connected mainly with increasing capital resources in the economy. The structural transformation results in a change of comparative advantages and the development of new industrial sectors. As the entry of companies to new sectors is connected with risk, Lin indicates the need for the active policy of the state to create incentives for entrepreneurs to enter newly-created branches, as well as protecting them, minimising risk and potential losses. The state's role is particularly important when developing infrastructure and creating an institutional environment. Lin concludes that low and middle-income countries need to create new branches of industry to avoid development traps.

4 Middle-income trap in empirical research

In addition to the theoretical research on the middle-income trap, empirical research has been developed. It may be divided into two basic groups, i.e. one group aimed at proving or refuting the existence of the trap and another group aimed at searching for and verifying statistically economic and non-economic factors that increase the probability that an economy will be caught in the trap. This article falls into the second group. Thus, the literature review will be limited to research that searches for the determinants of the middle-income trap.

Research devoted to statistically verifying the impact of specific factors on the probability that a country will be caught in the middle-income trap is not homogeneous. It is possible to distinguish three types of research works. Most frequently, we encounter works in which authors try to statistically prove the impact of many factors from different thematic areas. They usually create many regression equations that include variables from individual areas, and frequently, these equations are supplemented by several control variables. In this case, the dependent variable is binary, and the regression equation parameters are estimated using a logit or probit model. Such an approach makes it possible to demonstrate the statistical significance of a large number of determinants of the examined phenomenon. On the other hand, research using such a methodology does not produce a comprehensive model explaining the phenomenon.

A broad-based search for determinants of the middle-income trap, which explores many different thematic areas, may be found in the work of Aiyar et al. (2013). They identified cases of economic slowdown using criteria proposed by Eichengreen, Park and Shinet (2013). The authors constructed separate regression equations for a sample consisting of all countries available in their database as well as middle-income countries and then compared the results. More than 20 detailed variables grouped into six thematic areas, i.e. institutions, demography, trade, economy structure, the micro- and macro--economic environment, as well as infrastructure, were subject to the statistical verification.

The work of Bulman, Eden and Nguyen (2017) is slightly different, as their research sample included only middle-income countries. For them, middle-income ranges from 10% to 50% of the USA's GDP per capita. After excluding countries whose main export is fuel, the authors were left with a sample of 41 economies. Their research distinguished the countries that managed to join the best--developed countries in the analysed period and those which did not. They also included a statistical verification of factors that make it probable that a country would join the best-developed countries, but not factors that increase the risk that a country would be caught in the trap. Their analysis covered six areas: human capital, economic openness, economic structure, macro-economic factors, policy and management, as well as inequalities and demography. They first compared values of individual variables between the countries which did and did not manage to join the group of the best-developed countries. The second step was to create a regression equation using nine variables that referred to different thematic areas previously analysed and control variables.

Tugcu (2015) has a similar structure to the works of Aiyar et al. (2013) and Bulman, Eden and Nguyen (2017). First, he selected countries which had avoided the middle-income trap and those that were caught in it. Countries that were considered caught in the trap were those whose income per capita in the period covered by the research was in the range 20–55% of the USA's income per capita. Countries which managed to exceed the level of GDP per capita constituting 55% of the USA income and join the group of the richest countries were considered those that had avoided the trap. Applying

these criteria, Tugcu (2015) created a research sample consisting of 26 countries. Twenty-one factors grouped into seven thematic areas were subject to statistical verification. The areas he analysed that were connected with human capital formation, such as knowledge and education, as well as trade and production structure, appear in works described earlier.

The remaining three areas, i.e. employment, energy and health, were not analysed in other works on the middle-income trap. In the area of employment, Tugcu considered indicators that constitute the percentage of employees with a specific level of education. Therefore, these indicators may be indirectly classified as human capital. For energy, he constructed indicators that represent the relationship between electric power that comes from a specific type of power plant, e.g. a nuclear power plant or coal-fired power plant, to the total production of electric power in a given country. For health, he took into account two indicators, i.e. the share of public expenditure and private expenditure on health care in GDP.

Lee (2019) looked for factors that condition successful convergence with the best-developed economies, meaning the avoidance of the middle-income trap. The countries he considers successful are those that managed to move from the middle-income level to the high-income level, as well as countries which did not manage to do this but that recorded an average growth rate exceeding 3%. The research was carried out using the probit method, where the dependent variable is binary. The regression analysis considered two variants. In the first variant, countries whose convergence was successful were assigned a value of 1. Therefore, the impact of the examined variables on the probability that a country will undergo a successful convergence and join the group of the best-developed countries was verified. In the second variant, determinants of the middle-income trap were directly examined, as the dependent variable takes a value of 1 for countries considered to be caught in the trap. The research concerned factors assigned to four thematic areas: demography and human capital, institutions and policy, macro-economic environment, and economic structure. These areas, as well as indicators defined by Lee, are close to those included in the research described earlier.

The works presented above concern convergence. The trap is equated with the stoppage of the convergence process in relation to the best-developed countries, which means that a given country is not able to achieve a high level of income. Another stream of research includes publications in which the trap is linked to the economic slowdown of a middle-income country (Ozturk 2015; Otsuka, Higuchi, Sonobe 2017; Lubis, Saputra 2015). The proponents of such an approach define the slowdown and then identify examples. If a middle-income country experiences a slowdown, it is considered to be caught in the trap. With such cases, it is possible to apply various methods to identify the determinants, including the logit or probit model, as with the convergence process. However, instead of using models with a binary dependent variable, authors who connect the trap with a slowdown frequently create economic growth regressions. Basing their research on middle-income countries, they search for factors that negatively impact the growth rate.

The regression model in which the dependent variable is the growth rate was developed by Ozturk (2015). In his research, the panel regression model was applied, and in the analysis, he used data from the period 1980 to 2012 for 76 countries. The major purpose of Ozturk's work was to establish whether the size of the middle class has an essential impact on the economic growth rate. He used a variable that constitutes the percentage of income generated in a given economy that goes to the middle class. Additionally, the regression equation took into account variables representing the number of patents, the inflow of foreign investments, the productivity level, and a number of control variables.

Regressions of the economic growth rate were also carried out by Otsuka, Higuchi and Sonobe (2017). They concentrated on a narrow area concerning human capital formation. Their research included the statistical verification of variables that constitute the number of patents per person, the average total time of education, and the average time of education at secondary and higher levels. Otsuka, Higuchi and Sonobe (2017), like Ozturk (2015), used a panel regression model. The research carried out by Lubis and Saputra (2015) is similar. They also used a panel regression model that considered factors directly referring to human capital.

The third strand of research that looks for factors that increase the probability of the middle-income trap includes publications that try to create a comprehensive model that explains the trap. However, the literature is very limited in this area. Attempts to construct a comprehensive model of the trap may be found in Ozturk (2015) and Lee (2019), discussed earlier. Ozturk (2015) created a logit model used as a tool to assess the probability of whether a given middle-income country will manage to join the group of the best-developed countries. The model considers four variables, i.e. the percentage of income generated in a given economy that goes to the middle class, the number of patents, the inflow of foreign investments and the productivity level. Nevertheless, the variable that represents the inflow of foreign investments is statistically insignificant, even at level 0.1. Two variables are significant at level 0.1, and only one at level 0.05. Therefore, the statistical properties of this model cannot be considered strong. The author did not introduce any modifications to the model specifications to prove the robustness of the results, which means that the prognostic value of this model is very limited.

Lee (2019) constructed two comprehensive models. One examined the probability that a given country would join the group of the best-developed countries, while the other examined the probability that it would be caught in the trap. In both models, the parameters were estimated in two variants, i.e. the first variant used the probit method, whereas the second variant used the probit method with instrumental variables. The first model took into account seven regressors, two of which were statistically insignificant, while one was significant at level 0.1. The model that explains the trap phenomenon is broader as it contains ten explanatory variables, six of them being statistically insignificant. In this situation, it is also difficult to state that the model has strong statistical properties and constitutes a valuable statistical tool for examining whether a given economy can be caught in the trap. The lack of a comprehensive model to explain the risk of being caught in the middle-income trap with strong statistical properties constitutes a research gap which the author tries to fill in this article.

5 Data

The basis for any empirical research is the construction of a database. The first step towards achieving the purpose of this work is to establish the criteria and then select the group of countries considered to be caught in the middle-income trap. To do this, it is necessary to obtain data on the formation of the value of GDP per capita for individual countries within a specific time horizon. The database contains data for 182 countries from 1950 to 2014.[1] Values measured in purchasing power parity expressed in fixed prices were used for the calculation. The author carried out a mathematical operation that involved dividing each value of GDP per capita in the database by the value of the USA's GDP per capita

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[1] The description of the database is presented below in this subsection.

in a given year, thus obtaining an indicator representing the relations of the level of income per capita of a given country to that of the USA.

Seven explanatory variables and one squared variable were used in this model. These variables refer to many essential areas and have a potential impact on the risk of being caught in the trap. One of them is human capital. The variable referring to this area is a synthetic index of human capital (hci). This index is created based on the average number of years that the average citizen is subject to educational processes as well as the relationship between their remuneration during their entire working life and the current net value of costs incurred for their education. Explanatory variables are used for employment rate (emp), to represent the area of the labour market, and public debt (debt), to refer directly to macro-economic stability. The share of consumption in GDP (share_cons) was taken into account from the set of indicators that refer to the economic structure. An indicator of export diversification (exp), which refers to the structure of exported goods, was included in the regression equation. It was based on the Theil index, where lower values indicate a higher degree of export diversification. The index of financial openness (openness) constitutes a variable representing the degree of liberalisation of capital movements. Its calculation requires taking into account such factors as freedom of exchange rate evolution and restrictions connected with transactions recorded in the current account and the capital account. In the area of capital movements, a variable that is the difference between the size of foreign direct investments of domestic entities and the size of investments of foreign entities in the country was also considered (asset_liab).

The basic source of data is the Penn World Table[2]. It is a cross-section data set that was developed by scientists from the University of Groningen and the University of California, and it is regularly updated. This research used version 9 of the Penn World Table to calculate relative levels of GDP per capita. Two variables were used, i.e. the index of human capital and the share of consumption in GDP. The employment rate was calculated based on data available in the database. In the case of the export diversification indicator, the research was based on calculations performed by Chris Papageorgiou and Nicola Spatafora (Papageorgiou, Spatafora 2012). The data source for capital movements is The External Wealth of Nations Mark II from Lane and Farretti (2007), while data on the formation of the level of public debt were retrieved from the World Bank database.

6 Research methodology

The first stage of the research is to select the middle-income countries and then, pursuant to the criteria adopted, determine which of them have been caught in the middle-income trap. In the literature, there are two ways of determining the middle-income level. The first adopts absolute income thresholds expressed in fixed prices from a specific year, separating individual income groups. The second uses relative income values expressed as a fraction of income per capita of the USA. Felipe, Abdon and Kumar (2012) and Aiyar et al. (2013)[3] used absolute income ranges, while Bulman, Eden and Nguyen (2017) used relative measures of income. For them, middle income ranges from 10% to 50% of the USA's GDP per capita. The average income range determined by Ozturk (2015 is between 20% and 55% of the USA's income per capita. The same criteria were adopted by Woo (2012). Meanwhile, Im and Rosenblatt

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[2] Penn World Table 9.0, University of Groningen, 2016.
[3] Absolute income levels separating individual groups of economies presented in the literature are discussed in subsection 2.2.

(2013) propose the broadest range, where the average income is between 15% and 60% of the USA's GDP per capita.

The second stage is to determine the criteria allowing the conclusion that a given economy has been caught in the trap. Some authors refer to the economic slowdown phenomenon, considering that economies caught in the trap are those which recorded an economic slowdown at the middle-income level. The commonly accepted definition of a slowdown is the one formulated by Eichengreen, Park and Shinet (2013). In this approach, in order to determine the occurrence of a slowdown, it is necessary to fulfil three conditions:

$$g_{t,t-n} \geq 0.035$$

$$g_{t,t-n} - g_{t,t+n} \geq 0.02$$

$$y_t > 10\,000$$

The analysis took into account two seven-year periods which occurred directly before and after the potential slowdown. The first condition informs that the average growth rate in the seven-year period before the potential slowdown exceeded 3.5%. The second condition means there was a decrease in the pace of growth by at least 2 percentage points in the period after the year diagnosed as the turning point compared to the earlier period. The third condition proves that low-income countries were excluded from the research sample. Aiyar et al. (2013), Bulman, Eden and Nguyen (2017), Lee (2019) and Andrianjaka and Rougier (2019) connect the fact that a country has been caught in the trap with the occurrence of a slowdown. A different approach is presented by Tugcu (2015) and Ozturk (2015), who concentrated on determining whether a given country has joined the group of the best-
-developed countries. Therefore, the trap is equated with remaining in the middle-income range for an appropriately long period and a lack of movement to the group of the richest countries.

The author of this article refutes the idea that there is a direct connection between the trap phenomenon and an economic slowdown. Such an approach is inappropriate as it means that countries which have recorded a slowdown resulting from the global business cycle may be considered to be caught in the trap. The slowdown in economic growth that occurred in the 1970s after the so-called oil shock, for example, and after the 2008 financial crisis, should not be equated with the trap. Otherwise, the research may lead to incorrect conclusions regarding the determinants of the trap. The author proposes separating consideration of the slowdown topic and concentrating on the convergence.

Im and Rosenblatt's (2013) understanding of the trap is a better proposition. The first step is to determine the relative income ceilings that separate individual income groups. In this area, many criteria have been proposed, but there is no scientific evidence to conclude that one author's research methodology is more accurate than another. This work favours the methodology proposed by Im and Rosenblatt (2013) and assumes that the average income is in the range of 15% to 60% of the USA's GDP per capita. It is the broadest of all ranges in the literature, thus making it possible to obtain the widest possible research sample. The middle-income trap exists if the process of convergence with the USA stops. The convergence process was considered to have stopped if, in the five years before the diagnosed point, there had been an upward trend in GDP per capita compared to the USA, but a downward trend was observed in the five years after the turning point. The research covered

the period 1950 to 2014. Using the above-described methodology, 27 cases of countries being caught in the middle-income trap were detected. For each country considered to have been caught in the trap, the regression analysis considered data from 20 years, including ten years before the turning point and ten years after, together with the year defined as the turning point. The research sample was supplemented with countries that managed to leave the middle-income range in the examined period and join the best-developed countries. Thirteen such cases were diagnosed. For these countries, the regression analysis considered data from years in which a given country remained at the middle-income level.

The purpose of this research is to construct a comprehensive model to explain the middle-income trap. In this way, it is possible to confirm the statistically significant impact of variables included in the model on the probability that a given economy will be caught in the trap, and to use the developed model to assess the probability that a specific economy will be caught in the trap. The basic statistical tool applied in this research is the logit model. The explanatory variable is binary. Countries considered to be caught in the trap were assigned a value of 1, while 0 was assigned to countries which managed to join the best-developed countries. Seven explanatory variables and one variable squared were used in this regression model.

The hci, share_cons, openness, emp and debt variables are universal. It means that regardless of whether we consider a specific case of middle-income countries in the context of the middle-income trap or whether we consider low-income countries in the context of the poverty trap, or if we analyse the impact of these factors on the economic growth regardless of the level of income at which a given economy is, we expect that the signs of the parameters of these variables will be the same. According to economic theory, a higher level of human capital, a lower share of consumption, a higher share of investments, greater financial openness of an economy, a higher employment rate and lower public debt have a positive impact on economic development processes. It applies to countries at the low-, middle- and high-income level.

The asset_liab variable is unique, as it represents the investment position of a given country. Low-income countries which have not initiated development processes and which have been caught in the poverty trap are rather closed. Therefore, it should be expected that foreign entities' investments in these countries will be very small, while foreign investments of domestic entities will be even smaller. In this situation, the investment position will be slightly negative.

Pursuant to Ohno's concept of development stages (Ohno 2009), the factor necessary to initiate the development process in the poorest countries is the inflow of foreign investments. Therefore, using the variable that reflects the investment position of the poorest countries, we will consider the inflow of foreign investments, which results in the deterioration of the investment position, to be positive. For middle-income countries, Ohno indicates that domestic entities gaining independence is necessary for further expansion. This requires the internalisation of knowledge and skills, which results in domestic entities replacing foreign entities in all areas, such as management, technology development, logistics, quality control or marketing. The economy becomes more mature and independent, and domestic entities become strong and self-reliant. These phenomena are reflected in changes in the country's investment position. The anticipated increase in domestic entities' assets abroad, which reflects their position on the market, improves the economy's investment position. While analysing the case in which a given country joins the group of the best-developed countries, it should be expected that the sign of the parameter assigned to the variable representing the given country's investment position will be different from the parameter occurring in the case of the analysis of a country leaving the poverty trap.

The exp variable is also special. In Ohno's concept (Ohno 2009), the condition for avoiding the middle-income trap is the domestic entities' ability to manufacture highly processed goods. The creation of specialised branches of industry using advanced technologies has a positive impact on the diversification of goods exported. As a rule, developed countries are characterised by greater export diversification than poorer countries, which usually export agricultural products, simple industrial goods and minerals. For this research, greater diversification of exports should reduce the risk that a country will be caught in the middle-income trap. In the hypothetical case of analysing determinants of leaving the poverty trap, expectations concerning the sign of the parameter for the variable that represents the level of export diversification are not uniform. There are a number of countries, such as Iraq, Congo, Gabon or Equatorial Guinea, characterised by a high share of fuel in export and, as a consequence, a low level of export diversification, which managed to leave the middle-income range. At the other end of the spectrum is the Democratic Republic of Congo, for example, which, despite vast natural resources, is still in the poverty trap. Possessing vast natural resources does not guarantee the initiation of economic growth and moving to the group of middle-income countries, although there are many countries that have managed to do this. Therefore, it is difficult to conclude clearly that lower export diversification directly connected with a greater share of fuel in export constitutes a factor that negatively affects the probability of leaving the poverty trap.

In order to confirm the resilience of the results to modifications of the regression equation specifications, in addition to the use of the logit model, estimates using the probit model were carried out. Using each of the models, four main regression equations were estimated. The first equation constitutes the basic model. Its estimation was based on the entire sample. When estimating the second equation, African countries were excluded from the research sample. For the third model, the smallest countries whose populations do not exceed 1 million were excluded from the sample, as it was assumed that they are more vulnerable to external shocks. Small economies are frequently dependent on the functioning of one sector of the economy, and shocks in this sector affect the functioning of the entire economy. An analogous situation occurs in the case of countries that export fuel. That is why, when estimating the fourth regression equation, countries in which fuel accounts for more than half of their exports were excluded from the sample. These countries' economic results depend to a great extent on external factors in the fuel market. If a given economy is highly dependent on specific independent factors, the role of factors that were taken into account in this analysis is marginalised. Therefore, the results may be incorrect.

7 Results of the estimates

Table 1 below presents the results of the parameter estimates of four regression equations carried out using the logit model. When estimating each equation, the same model but different research samples were applied.

Table 1

Results of regression equation estimates using the logit model

	1	2	3	4
HCI	–19.9550*** (4.99091)	-19.8879*** (5.02448)	-19.9537*** (4.99146)	-19.7386*** (4.92404)
EXP	4.47514*** (1.26470)	4.46269*** (1.26777)	4.47475*** (1.26498)	3.99108*** (1.42872)
ASSET_LIAB	-37.4672*** (9.48887)	-37.3329*** (9.56005)	-37.4647*** (9.49017)	-36.2241*** (9.37828)
SHARE_CONS	45.0857*** (16.2326)	44.9363*** (16.2689)	45.0827*** (16.2334)	45.6648*** (16.1949)
SHARE_CONS^2	-22.5335** (9.52905)	-22.4716** (9.53357)	-22.5321** (9.52926)	-23.0690** (9.57506)
OPENNESS	-2.24772*** (0.750853)	-2.23889*** (0.754643)	-2.24757*** (0.750889)	-2.24798*** (0.742169)
EMP	-108.152*** (28.6291)	-107.796*** (28.7743)	-108.144*** (28.6335)	-104.677*** (28.3857)
DEBT	0.140348** (0.0632997)	0.139599** (0.0636957)	0.140337** (0.0633023)	0.137545** (0.0617825)
Observations	354	292	263	291
AIC	55.90848	55.89375	55.90821	55.35995

Source: own study.

The value of the parameter with the hci variable was negative, which proves that a higher level of human capital reduces the probability that a country will be caught in the trap. The parameters for the asset_liab, openness and emp variables were also negative, improving the country's investment position. The asset_liab variable, greater financial openness of the economy to capital movements, as well as higher employment rate, constitute factors that reduce the probability that a country will be caught in the trap. Increased export diversification has a negative impact on the risk that a country will be caught in the trap. A positive value of the parameter for the exp variable results from the fact that higher values of the indicator mean lower diversification, and lower values indicate a greater degree of diversification. Factors that increase the probability that a given economy will be caught in the trap are public debt and share of consumption in GDP. In the case of the share of consumption in GDP, a non--linear relation was diagnosed, which is presented in Figure 1. The extreme of the function that indicates the value of the variable until whose achievement the impact of the share of consumption in GDP on the risk that a country will be caught in the trap is approximately one.

Figure 1
Function of consumption
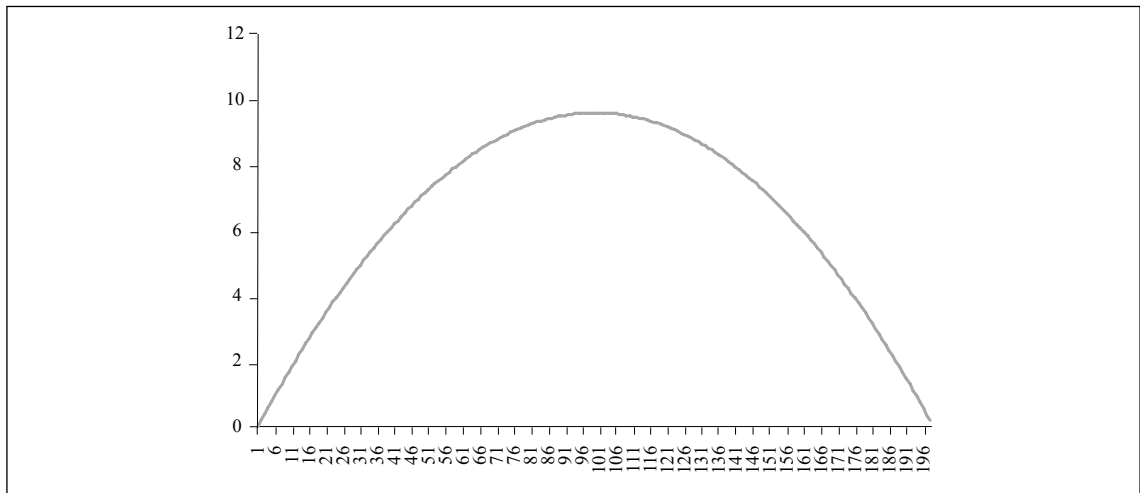
Source: own study.

All signs of the parameters are compliant with expectations. The results regarding the direction of the impact of individual factors on the middle-income trap are close to other findings in the literature. The positive impact of human capital on economic results, and thus a negative impact on the probability of being caught in the trap, are confirmed in the literature (Eichengreen, Park, Shinet 2013; Bulman, Eden, Nguyen 2017; Tugcu 2015; Otsuka, Higuchi, Sonobe 2017). As in this work, those authors do not use a synthetic index of human capital, but indirect indicators, such as the average number of years that an entity takes part in the education process at all levels or at one level. In the area of the GDP structure, the share of investments in GDP, not the share of consumption, is usually analysed.

It should be noted, however, that the share of consumption and the share of investments are connected. This research demonstrates that the share of consumption in GDP has a positive impact on the probability of being caught in the trap. Therefore, in the case of the share of investments in GDP, the opposite effect should be expected. Such a relation in the share of investment is confirmed by Lee (2019) and Bordans (2016). Export diversification and the country's openness to trade are factors very frequently analysed in the context of the middle-income trap, which proves their significance. Their negative impact on the risk of being caught in the trap revealed in this research is also confirmed by Bordans (2016), Ergin (2016) and Ayiar et al. (2013).

The impact of public debt on economic results is not clear. Lee (2019) indicates a negative correlation between the size of public debt and the probability of successful convergence with the best-developed countries. On the other hand, Aiyar et al. (2013) suggest that public debt has a negative impact on the probability of an economic slowdown. In the literature devoted to the middle-income trap, there are analyses of the impact of foreign investments on the economic growth rate (Ozturk 2015) and on the probability that a country will be caught in the trap (Bordans 2016).

This article considers the difference between domestic entities' foreign investments and foreign entities' investments in the country, which represents that economy's investment position. However,

the results of this research do not contradict the results of Ozturk (2015) and Bordans (2016). The improvement of the investment position may result from the decrease in foreign investments flowing into the country, although it is not always the case. It is also possible when domestic entities' foreign investments increase faster than the increase in investments flowing into the country. From the author's point of view, such a situation is desirable and leads to an economy's increased independence and self-reliance.

Six out of the eight regressors reveal statistical significance at the level of 1%. Two variables, i.e. consumption_share^2 and public_debt, are statistically essential at the level of 5%. The results reveal the resilience to modifications in the database. All parameters in each of the estimated regression equations reveal statistical significance at the level of at least 5%. Modifications of the database do not affect the decrease in the significance level of any of the variables.

Table 2

Results of regression equation estimates using the probit model

	1	2	3	4
HCI	-9.30275***	-9.29328***	-9.30275***	-9.21683***
	(1.82405)	(1.83233)	(1.82405)	(1.82434)
EXP	2.44718***	2.44504***	2.44717***	2.31647***
	(0.693965)	(0.694488)	(0.693968)	(0.788601)
ASSETS_LIAB	-17.8312***	-17.8107***	-17.8312***	-17.4642***
	(3.65758)	(3.67620)	(3.65759)	(3.74431)
CONS_SHARE	19.3766***	19.3606***	19.3766***	19.4068***
	(6.74835)	(6.75315)	(6.74835)	(6.71637)
CONS_SHARE^2	-9.79024**	-9.78464**	-9.79024**	-9.85760**
	(4.35183)	(4.35178)	(4.35183)	(4.34141)
OPENNESS	-1.02386***	-1.02260***	-1.02386***	-1.01950***
	(0.317243)	(0.318066)	(0.317244)	(0.314499)
EMP	-50.6511***	-50.6051***	-50.6511***	-49.5599***
	(11.0318)	(11.0598)	(11.0318)	(11.3252)
DEBT	0.0659704**	0.0658544**	0.0659704**	0.0650434**
	(0.0287826)	(0.0288762)	(0.0287826)	(0.0285680)
Observations	354	292	263	291
AIC	57.61818	57.61392	57.61818	57.45736

Source: own study.

While testing the resilience of the results, estimates of the four regression equations presented above were carried out using an alternative method, i.e. the probit model. The results are shown in Table 2. All parameters have the same signs as the estimates carried out with the logit model. As with

the estimates using the logit model, six variables in each of the regression equations reveal statistical significance at the level of 1%, and two at the level of 5%. Modifications of the database and a change in the estimation method do not affect the deterioration of the statistical features of the regression equations.

8 Summary

The result of the research carried out was the creation of a model to explain the probability that a country will be caught in the middle-income trap, which was the purpose of the article. Most authors focus on verifying the significance of the impact of many potential factors, creating numerous models using control variables, concentrating most frequently on examined variables in thematic areas and including them separately in individual regression equations. Thus, the creation of a comprehensive model to explain the trap phenomenon was an attempt to fill the research gap identified by the author. The models of Lee (2019) and Ozturk (2015) do not fill the identified gap as both models contain statistically insignificant variables. In Lee's model, most variables included in the equation are statistically insignificant. Meanwhile, in addition to the lack of significance of one of the variables, Ozturk's model is characterised by a small number of regressors.

In the model constructed by the author, the probability of the trap occurring is explained with the use of seven explanatory variables and one variable squared. The variables included in the model refer to several thematic areas, i.e. human capital and education, capital movements, employment and the labour market, trade, GDP structure, and macro-economic stability. All variables reveal statistical significance at the level of at least 5%, and the signs of the parameters assigned to the variables meet expectations. The empirical research allowed the author to positively verify the research hypotheses, revealing a negative and statistically significant impact of export diversification and the country's investment position on the risk that it will be caught in the middle-income trap.

The developed model may also be used as a forecasting tool, making it possible to assess the risk that a given economy will be caught in the trap. Furthermore, it is also possible to compare different economies in this area and thus distinguish these countries in a given group which are particularly threatened by being caught in the middle-income trap.

References

Aiyar S., Duval R., Puy D., Wu Y., Zhang L. (2013), *Growth slowdowns and the middle-income irap*, IMF Working Paper, WP/13/71.

Agénor P.-R. (2013), *Public Capital, Growth and Welfare. Analytical Foundations for Public Policy,* Princeton University Press.

Agénor P.-R., Canuto O. (2012), *Middle-income growth traps,* Policy Research Working Paper, 6210, The World Bank.

Aghion P., Howitt P. (2009), *The Economics of Growth*, MIT Press.

Andrianjaka R., Rougier E. (2019), What difference does it make (to be in the middle income trap)?: An empirical exploration of the drivers of growth slowdowns, *Structural Change and Economic Dynamics*, 51.

Bartkowiak R. (2013), *Ekonomia rozwoju*, Polskie Wydawnictwo Ekonomiczne.

Bordans E. (2016), *Baltic Tigers Facing Middle-Income Trap?*, Stockholm School of Economics.

Bulman D., Eden M., Nguyen H. (2017), Transitioning from low-income growth to high-income growth: is there a middle-income trap?, *Journal of an Asia Pacific Economy,* 22.

Eichengreen B., Park D., Shin K. (2013), Growth slowdowns redux: new evidence on the middle-income trap, NBER Working Paper, 18673.

Ergin I. (2016), *Breaking out of the Middle-Income Trap: Assessing the Role of Structural Transformations*, London School of Economics and Political Science.

Felipe J., Abdon A., Kumar U. (2012), *Tracking the middle income trap: What is it, who is it in it, and why?*, Working Paper, 715, Levy Economics Institute.

Garrett G. (2004), Globalization's missing middle, *Foreign Affairs*, 6.

Gill I., Kharas H. (2007), *An East Asia Renaissance: Ideas for Economic Growth,* World Bank.

Gill I., Kharas H. (2015), *The middle-income trap turns ten*, Policy Research Working Papers, WPS7403, The World Bank.

Im F., Rosenblatt D. (2013), *Middle-income traps: a conceptual and empirical survey*, Research Working Paper, 6594.

Ito T. (2017), Growth convergence and the middle-income trap, *Asian Development Review*, 34(1).

Lane P., Farretti G. (2007), *Europe and Global Imbalances,* International Monetary Fund.

Lee J. (2019), Convergence success and the middle-income trap, *The Developing Economies*, 58.

Lin J.Y. (2014), *The Quest for Prosperity. How Developing Economies Can Take Off*, Princeton University Press.

Lubis R., Saputra P. (2015), The middle-income trap: is there a way out for Asian countries?, *Journal of Indonesian Economy and Business*, 30(3).

Ohno K. (2009), Avoiding the middle-income trap. Renovating industrial policy formulation in Vietnam, *ASEAN Economic Bulletin*, 26(1).

Otsuka K., Higuchi Y., Sonobe T. (2017), Middle-income traps in East Asia: an inquiry into causes for slowdown in income growth, *China Economic Review*, 46.

Ozturk A. (2015), Examining the economic growth and the middle-income trap from the perspective of the middle class, *International Business Review*, 25(3).

Papageorgiou C., Spatafora N. (2012), *Economic Diversification in LICs: Stylized Facts and Macroeconomic Implications*, International Monetary Fund.

Pinto B. (2014), *How Does My Country Grow? Economic Policy Through Story-Telling*, Oxford University Press.

Romer D. (1996), *Makroekonomia dla zaawansowanych*, Wydawnictwo Naukowe PWN.

Spence M. (2011), *The Next Convergence. The Future of Economic Growth in a Multispeed World*, Farrar, Strauss and Giroux.

Tugcu C. (2015), How to escape the middle income trap: international evidence from a binary dependent variable model, *Theoretical and Applied Economics*, 1(602).

Wojtyna A. (2016), Kontrowersje teoretyczne wokół koncepcji pułapki średniego poziomu, *Gospodarka Narodowa*, 6(286).