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How to escape the middle income trap: international evidence from a binary dependent variable model

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Abstract. *The middle-income trap refers to an economic situation at which a country gets stuck when it achieves the middle-income status. According to Rigg et al. (2014), there are 28 countries which by 1987 had attained middle-income status but in 2012 still remained in this middle-income category. In this context, this study aims to find a way out from the trap by analyzing countries some of which are high-income status and the others are not. To this end, the study employs a binary model with the cross-section data of 26 high and middle-income countries and estimates the marginal effects that have a good potential to show the way out from the trap. Findings indicate that countries which spend more on secondary education, health and R&D, which have more educated labor force, which experience higher level of labor force participation, which export high-tech items and which create higher level of value added in the manufacturing industry are more likely to achieve the high-income status. On the other hand, countries which spend more on primary education, which import more, and which create higher level of value added in the agricultural sector are less likely to get the high-income status.*

Keywords: The middle-income trap, Logit, Marginal effects, Cross-country analysis.

JEL Classification: E01, O11, O47.

1. Introduction

In the late 20th and early 21st centuries, the world economy has faced with rapid economic growth performances of some emerging economies especially in East Asia. This improved the well-being, raised the aggregate demand and caused the other parts of the world economy to develop. In a short period of time many of the countries that are classified under low-income country group have reached the middle-income status, and a few of them such as South Korea and Singapore have attained the high-income level. However, many of the countries that experienced rapid growth performances have faced with growth slowdowns and got stuck in the middle-income level. Gill and Kharas (2007) is the pioneering study which identifies the inertia of getting stuck at the level of middle-income. According to them this phenomenon is called as the middle-income trap (MIT).

Although there is no broadly agreed definition, the MIT refers to a situation in which a middle-income country (MIC) falls into economic stagnation and becomes unable to advance its economy to a high-income level for certain reasons specific to MICs (Egawa, 2013). In addition, Rigg et al. (2014) state that the MIT refers to countries that experience a growth slow-down when they achieve middle-income status.

Today, the risks of falling in to the MIT and the ways of escaping it are two of the most prominent topics of development economics. For instance, Kharas and Kohli (2011) state that there seems to be a connection between experiencing poverty and the MIT. Egawa (2013) suggests that a delay or failure to change the economic structure from an input-driven growth model into a productivity-driven growth model is a factor in triggering the risk of a MIT. Tho (2013) tabulates the factors behind triggering and getting stuck in the MIT as follows:

Table 1. *Factors behind the middle-income trap*

Factors of triggering a MIT	Factors of getting stuck in the MIT
1. Inability to increase the inputs • Increase in wage level • Excessive public investment 2. Worsening of the problem unique to MICs • Over-dependence on exporting manufacturing • Regional income disparity • Income inequality among households • Population ageing, drying-up of demographic dividend	1. Inability or limitation to improve productivity • Lack of innovation and investment in R&D • Inefficient use of the infrastructures • Insufficient inter-industry labor mobility • Insufficiency of the amount and quality of higher education and vocational training • Mono/oligopoly of main industries by state-owned enterprises • Lack of government's ability to formulate implement a comprehensive growth strategy • Poor governance, Spread of corruption • Policy for excessively protecting low-productivity industries (including agriculture) 2. Inability to solve the problem unique to MICs • Failure of facilitating domestic demand • Failure in implementing income re-distributional policy measures • Delay in human development • Shortage of government budget for economic reforms

Although the MIT was conceptualized for the countries that are categorized under the middle-income status, there is a problem of deciding what measures the middle-income level (Aiyar et al., 2013). For example, there is World Bank's classification which is based on each economy's gross national income (GNI) per capita conversed by the Atlas

method(1). According to this classification, countries having 2012 GNI per capita between $1036 lower and $12615 upper bounds are named as the MICs. In addition, the catch-up index that was developed by Woo (2012) is also used to determine which countries are trapped at the middle-income level. This index is measured as the ratio of a country's income per capita to the US's. According to Woo (2012), a country is in the MIT, if its index value is between 20-55% bounds.

This study aims to find a way out from the MIT by following the World Bank's classification of income levels for deciding which countries got stuck at middle-income level. For this purpose, the study employs a binary dependent variable model with the cross-section data of 26 countries some of which have escaped the middle-income trap and attained high-income status, and some others get stuck in middle-income level. The data set consists of 21 development indicators that are categorized under 7 topics.

The paper is organized as follows: Next section is devoted to the literature and novelty. Section 3 presents the data, methodology and findings. Finally, Section 4 concludes.

2. Literature review

As mentioned, the risks of falling in to the MIT and the ways of escaping it are two of the most prominent topics of development economics. However, most of the attempts to deal with the considered problem take place only in the policy- related reports (Yusuf and Nabeshima, 2009; Jankowska et al., 2012; Felipe, 2012a; Felipe, 2012b; Zhuang et al., 2012; Tran, 2013; Im and Rosenblatt, 2013). There are a few numbers of scientific studies which theoretically and/or empirically take the question into account. In this context, it is possible to classify these studies under two strands.

The first strand includes studies that investigate the growth slowdowns experienced by the MICs. Eichengreen et al. (2011) investigate the growth slowdowns of the fast-growing countries and suggest that rapidly growing economies slow down significantly, in the sense that the growth rate downshifts by at least 2 percentage points, when their per capita incomes reach around $17,000 US in year-2005 constant international prices. One of the main findings of the study is that growth slowdowns are more likely in countries that maintain undervalued real exchange rates. Eichengreen et al. (2013) analyze the incidence and correlates of growth slowdowns in fast-growing MICs. Findings indicate that slowdowns are less likely in countries where the population has a relatively high level of secondary and tertiary education and where high-technology products account for a relatively large share of exports.

The second strand is composed of the studies that take the causes of triggering and ways of escaping the MIT into account. Ohno (2009) investigates a possible way of avoiding the MIT for Vietnam and states that, in order to be out of the MIT, the government should guide and complement private sector dynamism, change the policy formulation process, reorganize the public administration system and establish a new technocrat team. Kharas and Kohli (2011) propose that the link between income distribution and macroeconomic growth is one of the possible sources of the MIT. Accordingly, if income distribution

worsens, domestic demand can grow more slowly than potential GDP, and this either results in stagnation, or is temporarily offset through more financial leverage and a growing debt burden of the MICs. In order to avoid from the MIT, MICs had better establish modern and more effective institutions for property rights, capital markets, successful venture capital, competition, and an innovative infrastructure as high-income countries do. Aiyar et al. (2013) examine the determinants of the MIT for a sample of 138 countries over 11 periods between 1955 and 2009. Results show that institutions, demography, infrastructure, the macroeconomic environment, output structure and trade structure are among the factors behind triggering a MIT. Zhang et al. (2013) explore the MIT issue for the Chinese economy. The authors state that if the MIT is assumed to be associated with the inequality that is caused by underinvestment in the human capital of broad segments of its population, economies just like China will face with a serious stagnation in growth when they reach the middle-income level. Tho (2013) attempts to find an answer for Indonesia, Malaysia, the Philippines, and Thailand for being out of the MIT and concludes that, in order to escape the trap, these countries should strengthen research and development capabilities, emphasize the quality and appropriateness of human resources, and improve the institutional system for nourishing a dynamic private sector. Rigg et al. (2014) take the MIT issue into account for Thailand by using the experiences of first and second generation migrants from three villages and concludes that the middle-income trap for these villages in Thailand is as much personal as it is institutional and structural. Finally, Yiping et al. (2014) analyze the link between financial liberalization and the MIT for 80 countries during the period 1980-2010. Findings reveal that the growth effect of financial repression is significantly negative among MICs.

As a contribution to the second strand of the literature, the present study differs from the previous studies in two aspects. First and foremost, this study uses 21 development indicators and utilizes a Logit model to show how those indicators influence to be in or out of the MIT. Second, to the best of our knowledge, no other papers using the same data set have been published. Hence, this paper aims to fulfill this gap and contribute to the empirical literature.

3. Data, methodology and findings

3.1. Data

The study employs cross-section data of 26 countries(2) some of which have escaped the MIT and attained high-income status, and some others are stuck in the trap. The data set contains 21 development indicators that all were compiled from World Bank, World Development Indicators database, and those indicators were separated into 7 groups. The first group *Education* includes primary (PRIEXP), secondary (SECEXP) and tertiary education (TERTEXP) expenditures per student that were measured as % of GDP per capita. The second group *Employment* contains labor force with primary (LABORPRI), secondary (LABORSEC) and tertiary (LABORTERT) education levels that were measured as % of total employment and total labor force participation rate (LFPRT) that

was measured as % of total population ages 15-64. The third group *Energy* consists of electricity production from coal (EPFC), natural gas (EPFNG), nuclear (EPFNU) and renewable sources (EPFREN) that were measured as % of total electricity production. The fourth group *Health* includes private (HEALTHEXPPRI) and public health expenditures (HEALTHEXPPUB) that were measured as % of GDP. The fifth group *Trade* contains exports (EXPORT) and imports (IMPORT) of goods and services that were measured as % of GDP and high technology export (HIGHEXPO) that was measured as % of manufactured exports. The sixth group *Knowledge* consists of R&D expenditure (RDEXPEND) that was measured as % of GDP and ICT goods import (ICTIMPORT) that was measured as % of total goods imported. Finally, the seventh group *Production* includes value added in the agriculture (AVA), manufacturing (MVA) and services (SVA) sectors that were measured as % of GDP.

3.2. Methodology

In order to find a way out from the MIT, the present study uses Logit regression model which can be formulated as follows (Halid and Akinnitire, 2013):

$$P_i = E(Y = 1 / X_i) = \frac{1}{1 + e^{-(\alpha + \beta_n X_i)}} \tag{1}$$

where β_n is the vector of coefficients, X_i is the vector of explanatory variables and P_i indicates the probability of being out of the trap depending on the X_i. The dependent variable Y is equal to 1, if a country is out of the trap (i.e. having 2012 GNI per capita higher than $12615), Y is equal to 0, if otherwise (i.e. having 2012 GNI per capita between $1036 lower and $12615 upper bounds).

For simplicity, by setting $(\alpha + \beta_n X_i)$ to K_i, the cumulative logistic distribution function can be shown as follows:

$$P_i = \frac{1}{1 + e^{-K_i}} = \frac{e^{K_i}}{1 + e^{K_i}} \tag{2}$$

where K_i and P_i ranges from $-\infty$ to $+\infty$ and 0 to 1, respectively.

Since P_i is the probability of being out of the trap, the probability of being in the trap can be written in the following manner:

$$1 - P_i = \frac{1}{1 + e^{K_i}} \tag{3}$$

Then we get the odds ratio in favor of being out of the trap:

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{K_i}}{1 + e^{-K_i}} = e^{K_i} \tag{4}$$

Finally, by taking the natural logarithm of Eq.(4) the logit is achieved as follows:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = K_i = \alpha + \beta_n X_i + \mu_i \quad (5)$$

where L_i is the logit and μ_i is the stochastic error term.

3.3. Findings

The Eq.(5) was estimated by using the maximum likelihood (ML) estimator and findings are reported in Table 2. However, the estimated coefficients from Eq.(5) only show the direction of effect. In order to see the magnitude of the independent variables, the marginal effects should be estimated. Thus, to go a step ahead, the marginal effects were also estimated and reported with the coefficients.

Table 2. *Estimated coefficients and marginal effects*

Variables and Diagnostics		Coefficients	Marginal effects
Education	PRIEXP	-0.355 (0.05)	-0.037 (0.02)
	SECEXP	0.437 (0.02)	0.046 (0.00)
	TERTEXP	0.052 (0.38)	N.A.
	Pseudo R^2	0.42	
	Correct classification	%88.46	
Employment	LABORPRI	0.857 (0.03)	0.107 (0.01)
	LABORSEC	0.787 (0.04)	0.098 (0.01)
	LABORTERT	0.787 (0.03)	0.099 (0.00)
	LFPRT	0.225 (0.08)	0.028 (0.02)
	Pseudo R^2	0.32	
	Correct classification	%80.77	
Energy	EPFC	-0.005 (0.75)	N.A.
	EPFNG	-0.043 (0.37)	N.A.
	EPFNU	0.009 (0.68)	N.A.
	EPFREN	0.437 (0.26)	N.A.
	Pseudo R^2	0.19	
	Correct classification	%80.77	
Health	HEALTHEXPPRI	1.691 (0.26)	N.A.
	HEALTHEXPPUB	2.370 (0.01)	0.214 (0.00)
	Pseudo R^2	0.52	
	Correct classification	%88.46	
Trade	EXPORT	0.194 (0.02)	0.021 (0.00)
	IMPORT	-0.160 (0.05)	-0.017 (0.02)
	HIGHEXPO	0.165 (0.07)	0.018 (0.03)
	Pseudo R^2	0.39	
	Correct classification	%80.77	
Knowledge	RDEXPEND	5.200 (0.00)	0.368 (0.00)
	ICTIMPORT	0.220 (0.20)	N.A.
	Pseudo R^2	0.61	
	Correct classification	%88.46	
Production	AVA	-19.888 (0.11)	N.A.
	MVA	3.341 (0.09)	0.169 (0.03)
	SVA	0.840 (0.13)	N.A.
	Pseudo R^2	0.74	
	Correct classification	%88.46	

[a] Numbers in parentheses are *p-values*.

Estimates indicate that tertiary education expenditures, electricity production from coal, electricity production from natural gas, electricity production from nuclear sources, electricity production from renewable sources, private health expenditures, ICT goods imports, value added in agriculture and value added in services do not have statistically significant coefficients. Thus, it is not appropriate to interpret the coefficients and estimate the marginal effects for these indicators. On the other hand, remaining variables have all statistically significant coefficients. Accordingly, countries that spend more on secondary education are 4.6%, that have more labor force with primary, secondary and tertiary education levels are approximately 10%, that have higher total labor force participation rate are almost 3%, that experience more public health expenditures are 21%, that export either more normal or high-tech goods are 2%, that spend more on R&D are 36.8% and that have higher value added in manufacturing are 16.9% more likely to have 2012 GNI per capita higher than $12615 (i.e. being out of the trap), whereas countries that spend more on primary education are 3.7% and that import more are 1.7% less likely to have 2012 GNI per capita higher than $12615.

4. Conclusions

According to Tho (2013), the world economy can be divided into four groups and the MICs constitute the second group. In this sense, MIT is the phenomenon that stems from the stagnation of the second group of countries that have already attained the middle-income level. This study aims to find a way out from the MIT by employing a binary dependent variable model with cross-section data of 26 middle and high-income countries.

Since the OLS is not appropriate for estimating the considered model, the ML estimator was utilized and most of the coefficients are found to be statistically significant. Results showed that countries which spend more on secondary education, health and R&D, which have more educated labor force, which experience higher level of labor force participation, which export high-tech items and which create higher level of value added in the manufacturing industry are more likely to achieve the high-income status. On the other hand, countries which spend more on primary education and import more are less likely to get the high-income status. This result implies policies that motivate economic agents to spend more on secondary education, health and R&D activities, promote economically active population to work longer, subsidize exporting high-tech goods and encourage entrepreneurs to invest more in manufacturing may help countries to find a way out from the middle-income trap.

Findings of the present study are consistent with Eichengreen et al. (2013) and Egawa (2013) who indicate the importance of human capital, and Tho (2013) who prove the efficiency of R&D activities in overcoming the MIT.

Finally, the most restrictive issue faced conducting the study is the lack of balanced data for the countries of interest. If this limitation is improved or solved, it can be a good potential for the future researches.

Notes

(1) The World Bank uses Atlas method GNI per capita in U.S. dollars to classify countries for analytical purposes and to determine borrowing eligibility. For more information, see the metadata for Atlas method GNI in current U.S. dollars (NY.GNP.ATLS.CD).

(2) These are Australia, Austria, Belgium, Bulgaria, Chile, Colombia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Ireland, Latvia, Lithuania, Malta, Mexico, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland and United Kingdom.

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