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# **BALTIC TIGERS FACING THE MIDDLE-INCOME TRAP?**

Authors: Ernests Bordāns  
Madis Teinemaa

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Ernests Bordāns

and

Madis Teinemaa

Supervisor: Oļegs Krasnopjorovs

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Ernests Bordāns, Madis Teinemaa

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## **Baltic Tigers Facing the Middle-Income Trap?**

### **SUMMARY**

This paper investigates the prospects of Baltic countries' economic convergence with the EU by studying the characteristics of *middle income trap* (MIT) and estimating the probability of the Baltic Tigers facing it. We complement the existing literature in three ways. First, we propose an original MIT definition considering major drawbacks of previous researches and compiling unique time and country-specific benchmarks based on weighted average income growth of trading partners. Second, we construct several multivariate panel data logit models to study which economic, social and political factors could be associated with MIT. Third, we are first to quantitatively assess the probability of the Baltic countries facing MIT. Our results suggest the Baltic countries currently are not trapped since their GDP per capita growth rate exceeds that of comparable middle-income countries, weighted average of trading partners and the EU region. Furthermore, the probability of them facing a MIT is low (somewhat higher in Latvia and Lithuania than in Estonia), compared to other European countries. However, MIT probability of the Baltic countries is likely to rise if further income convergence with advanced countries will not be accompanied with structural reforms. We find that quality of public institutions (especially government effectiveness and control of corruption), business-friendly regulations, income equality, stable macroeconomic environment, prudent fiscal policy as well as developments in higher education, innovation and product sophistication are crucial to avoid MIT in the future.

**Key words:** middle income trap, economic growth, structural reforms, institutions, income convergence

**JEL:** C23, C25, O11, O43, O47

## CONTENTS

SUMMARY	1
INTRODUCTION	3
1.DEFINING THE MIDDLE INCOME TRAP	4
1.1. Theory of Middle Income Trap	4
1.2. Middle income level definition in the literature	5
1.3. Middle income trap definition in the literature	6
1.4. Our Middle Income Trap definition	8
2.METHODOLOGY AND DATA	10
2.1. Literature on Middle Income Trap determinants	10
2.2. Estimating the determinants and probability of Middle Income Trap	11
2.3. Data description	13
3.EMPIRICAL RESULTS	14
3.1. Identification of Middle Income Traps	14
3.2. Determinants of the Middle Income Trap	18
3.3. Middle Income Trap predictions for the Baltics	26
3.4. Middle Income Trap predictions for other EU countries	29
3.5. Alternative policy scenarios	30
CONCLUSIONS	31
BIBLIOGRAPHY	33
APPENDIX	36

## ABBREVIATIONS

GDP – Gross Domestic Product
EU – European Union
FDI – foreign direct investments
IMF – International Monetary Fund
MIT – middle income trap
OECD – Organisation of Economic Co-operation and Development
PPP – Purchasing Power Parity
PWT – Penn World Tables
REER – Real Effective Exchange Rate
WTO – World Trade Organization
USA – United States of America
USSR – Union of Soviet Socialist Republics

## INTRODUCTION

Even despite the deep economic recession in 2008-2009 the Baltic States have shown impressive economic performance since the beginning of 21st century. Beating the odds of many, Latvia, Estonia and Lithuania have managed to increase their GDP per capita levels (at PPP) from roughly one third to two thirds of the European Union average between 2000 and 2014 (see Appendix A). In truth, this rapid catching up was experienced largely because the income gap between the Baltics and the EU was so large (thus, the Baltics had relatively low labor costs, higher marginal returns to capital, opportunity to import technologies etc.) and due to some short term economic growth boosts (e.g. credit boom). The post-crisis period, however, posted considerably slower economic growth than before the crisis, and many suggest that Baltic States might be facing the mysterious *middle income trap* (MIT) (IMF, 2015b; OECD, 2015).

Pundits suggest that we cannot expect Baltics to simply keep converging with the EU with the same pace as before given a considerable change in their relative income and overall macroeconomic environment, and remind that the only European country that recently has substantially changed its GDP per capita rank is Ireland (for instance, Hansen, 2013).

However, economic convergence among the European countries is crucial for more successful policy coordination and European economic integration. Hence, middle income trap in the Baltics or elsewhere in Europe can be a significant threat to further integration.

Although the current slowdown might not yet mean that Baltic economies are trapped (IMF, 2015b; Kasjanovs, 2015), it may indicate a necessity for more profound structural reforms. For instance, Staehr (2015) stresses the necessity for education and anti-corruption reforms, while Kazaks et.al. (2015) for Latvian case emphasizes the need for more growth-friendly government spending and policies supporting innovations. Also other MIT literature emphasizes that countries at similar development stage as the Baltic States need to revise their economic policy in order to avoid economic slowdown (Ohno, 2009).

Even though pundits have conceptually agreed on what is and what might be causing the middle income trap, there is no official definition for MIT. Apparently, it is something that combines being at middle-income level and experiencing low economic growth. Different researchers offer different numeric definitions for such situation; literature has agreed neither on thresholds for middle income level, nor characteristics of *trap*. Thus, we begin with reviewing the literature on each of the component of MIT definition and propose our original definition that we believe addresses most of the challenges identified in previous literature. Then we apply our definition and find countries that have historically been or currently are caught in MIT. For the Baltic States we also check whether they are caught in MIT according to other common definitions proposed in the literature. Afterwards we construct several multivariate panel data logit models to find which economic, social and political factors are consistently associated with MIT occurrence. We apply these models to estimate the probability of Baltic countries facing MIT and check whether this probability increased during the recent years.

To our best knowledge, no study taking into account so many explanatory factors and quantitatively assessing the probability of countries facing the MIT has been carried out.

The remainder of the paper is structured as follows: section 1 offers a MIT definition, section 2 describes methodology and data; section 3 presents the findings of MIT occurrence as well as empirical results of MIT determinants and expected MIT probabilities for the Baltic States, while the last section concludes.

## **1. DEFINING THE MIDDLE INCOME TRAP**

As far as no unified MIT definition exists, we must firstly, agree on “middle income level”, and secondly - on characteristics of *trap*. We review the literature on both definitions and identify the major drawbacks. Then we offer an intuitive MIT definition that we believe solves most of the identified problems.

### **1.1. Theory of Middle Income Trap**

In their original paper Gill, Kharas and Bhattachali (2007) were the first to name and discuss MIT as a potential threat to a continued East Asian countries’ growth to high income level. They claimed that in order to continue to grow, the East Asian countries must develop economies of scale by continuing to increase the share of high-technology products in their immense international trade, improving the knowledge absorption capacities (via education, property rights, competitiveness), building strong financial system, including periphery regions in trade networks and eliminating inequality. Since then, researchers have mostly studied the MIT in the context of sustainability of East Asian “miracle”, and the slowdown of Latin American and Middle East countries.

When defining the MIT, most papers refer to how Gill et.al. (2007) characterized it initially. To their mind, country is caught in MIT at the point when it is not capable of outcompeting lower-income countries with their factor prices and also not able to compete with the technology and productivity of high-income countries. In other words, the strategy for economic growth at low-income level is not so efficient at middle-income level anymore (Kharas and Kohli, 2011).

The loss of competitiveness among middle-income countries can be explained by W. Arthur Lewis (dual-sector) development model which states that low wages and imitated technology may boost growth at the low-income economies by moving labor from labor-intensive agricultural sector to more productive (and better paid) manufacturing; however, eventually, with rising income, labor-intensive sectors become less competitive and marginal returns from imitated technology decrease. Thus, further growth can only occur with technological advancements based on innovation not imitation (Agenor, Canuto and Jelenic, 2012). Similarly, Ohno (2009) proposes to view the economic development as a four-stage process where slowdown can occur at any transition between the stages. In his view, the MIT occurs when an economy is moving from light manufacturing, which is mostly established by FDI, to a stage where local human capital must be developed and share of high-quality production - increased.

It is important to note that because MIT has not been defined unambiguously and its identification in most researches depends on the definition chosen by authors, we cannot be fully sure that MIT is really a *trap*. For instance, Im and Rosenblatt (2013) conclude that even though middle income countries rarely advance to high income levels and it is a troubling issue, their growth and convergence patterns do not differ that much from the usual path where human capital, infrastructure, institutions, TFP and investments are crucial. Similarly, skeptical authors have shown middle income countries do not present signs of consistently lower growth than low-income countries (Bulman, Eden and Nguyen, 2014).

## 1.2. Middle income level definition in the literature

Generally, there are two ways how literature has approached definition of middle income level – either with absolute thresholds or relative thresholds (see Table 1)<sup>1</sup>.

**Table 1. Middle income level classifications in the literature**

Source	Definition of middle income level
World Bank (2016)	1025 – 4035 – 12475 (GNI per capita; 2014 \$)
Felipe, Abdon, Kumar (2012)	2988 – 10833 – 17557 (GDP per capita PPP; 2005 \$)
Aiyar, Duval, Zhang, Puy, Wu (2013)	2000 – 15000 (GDP per capita PPP; 2005 \$)
Eichengreen (2014)	10000+ (GDP per capita; 2005 \$)
Woo (2012)	20-55% of USA (GDP per capita PPP)
Robertson, Ye (2013)	8 – 36% of USA (GDP per capita PPP)

Some papers distinguish higher and lower middle income levels; in those the middle number in the table is the threshold.

*Source: created by the authors.*

With regards to absolute income level benchmarks, first thing to notice is that these thresholds tend to be very broad. For instance, according to Felipe et.al. (2012) classification, some upper-middle income countries can be roughly six times richer than the lower-middle income countries. However, comparing two so different countries and providing the same policy recommendations might be a questionable strategy. Moreover, the absolute thresholds hold stable over time. Thus, theoretically we could e.g. identify that Honduras (GDP per capita in 1950s was above \$2000) was in a MIT back in 1950s and 1960s. But, can we make any meaningful conclusions by comparing the economic situation of Honduras during 1960s with that of Spain in 2010, which is also believed to be *trapped*?

At the same time, this absolute threshold would mean that back in 1960s there were practically no high-income economies. However, back in 1960s when the richest countries were advancing to high-income levels (by absolute values) they lived in much poorer world overall, with less developed trading partners, less foreign technologies to imitate and, thus, determinants of their growth might have been different. So, can we apply their lessons to nowadays world? Similarly, Rosenblatt et.al. (2013) points out that if we assume an absolute threshold for middle income, then the majority of high income countries were trapped in MIT in the 20<sup>th</sup> century because it took very long for them to advance to high-income. This raises a question of whether a middle income trap is fully endogenous problem of countries and being trapped or escaping is a

<sup>1</sup> Felipe et.al. (2012) set benchmarks in 1990 prices; for convenience, we estimate these benchmarks in 2005 prices adjusting them by the historical inflation.

question of their policies regardless of the *time* and income-level of other countries, or it also depends on how the country looks relatively to others.

Moreover, setting the precise absolute income level benchmark is even more ambiguous task, because MIT is assumed to be the point where a country can compete neither with low, nor high income countries (as it is stuck between low-wage and high-productivity stages of development) (Gill et.al., 2007). Hence, the definition inherently assumes that there are wealthier and more productive countries in this world. However, wealth and productiveness have grown substantially over the last 60 years, changing the view of what are “wealthier and more productive countries” “with which the middle-income countries must compete”. Thus, the income level that can be achieved by imitation of foreign technologies increases over time.

Following these logics, it seems obvious that for studying middle-income trap, we need a definition of middle income that includes some dynamic, time-varying trend. Many authors defined middle income as percentage of USA per capita GDP, however, different papers use different benchmarks. For instance, Woo (2012) defines middle income between 20 and 55% of US income level, while Robertson and Ye (2013) – between 8 and 36%. Given our focus on Baltic States, it seems reasonable to choose such middle income thresholds that would include countries that are similar to the Baltics, i.e., Baltics should not be at the lower or higher end of the threshold.

### **1.3. Middle income trap definition in the literature**

Once the benchmarks for middle income level are set (if at all), existing literature on MITs offer us several ways how to identify traps. Generally, two approaches can be taken for identifying traps – statistical methods or intuitive rules (*of thumb*).

With regards to intuitive methods, Felipe et.al. (2012) offer identifying countries in the MIT as those that have spent more years as middle income countries than on average countries historically have. They find that the median number of years it took on average for countries to get through the middle income was 42 years. And thus, they estimate that 35 of 52 middle income countries were trapped in 2010.

Advantages of this definition are that one can estimate the average growth rate necessary for countries to avoid MIT and, thus, also specific periods in history when different countries have been trapped. However, some challenges of this definition might be identified. Firstly, authors admit that the number of years spent in middle income largely depend on the historical time period we look at, i.e. the later country entered the lower-middle income level, the shorter time it spent there on average, and nowadays countries tend to cross the absolute thresholds quicker. Secondly, no consistent data is available before 1950s, thus, we cannot know how long before 1950 some countries had already been in the middle income level. Thirdly, authors’ methodology *implies* that there always *must* be countries in the MIT (those that are below average growth) i.e. country can be considered to be trapped simply if it is growing slower than others have been historically. And lastly, global macroeconomic environment and growth rates have varied greatly over time; thus, country’s current economic growth that is influenced by overall global environment and random circumstances might not be compared to historical benchmarks.

Eichengreen et.al. (2014) offer another intuitive method for identifying the MIT. By employing GDP per capita data starting from 1957 they look for points in time (years) where a country after 7-year (t-7) average annual income growth of at least 3.5% experiences a drop in the average growth for the next 7 years (t+7) by at least 2 percentage points. The time “t” is identified as a slowdown. In case several years in a row are identified as slowdowns, Chow test for these years is employed to find the most significant break point in the growth rate. Eichengreen et.al. (2014) identify that most often slowdowns occur at 10 000 – 11 000\$, 15 000 – 16 000\$, and around 17 000\$ GDP per capita PPP.

Advantage of this methodology is that it identifies years when the slowdown (trap) is the most pronounced and, thus, should work well for studying which factors caused a slowdown. However, the assumptions of this model raise many questions. Firstly, according to Penn World Tables there were only 11 countries with income level above 10 000\$ in 1956, thus, this methodology rules out many possible subjects for study. Secondly, the benchmark of 3.5% for growth before the slowdown rules out all countries that might have been in a trap for the whole period and never achieved 3.5% growth (e.g. South Africa), and the level of this benchmark seems arbitrary. Third, the 2 percentage point growth slowdown is not well justified. For instance, countries that have experienced GDP per capita growth of 10% and now have slowed down to 8% would also be identified as being in a trap.

Several authors define MIT by looking at long-run growth rates. For instance, Woo (2012) considers a middle-income country to be trapped if its income level relative to USA (PPP) was above 20% in 1960 and had not surpassed 55% by 2006. In turn, Robertson and Ye (2013) define MIT if long-run per capita income forecast lie in the middle income range and the difference between the country’s income level and that of US is log-stationary (i.e., income level is not converging to that of USA). Note, however, that these definitions assume that country can be trapped for the whole period (46 years in Woo, 2012). In reality, however, country’s economic performance can greatly vary over such a long time period; thus, it would be hard to precisely estimate the determinants of MIT. Moreover, these definitions imply that middle-income countries must grow faster than high-income countries (USA) generally; however, this does not have a robust empirical evidence. Besides, Robertson and Ye (2013) definition does not allow *any convergence*, thus, it might not identify countries that are growing very slowly but have some convergence; or countries that are diverging from the USA.

Using a statistical approach, Aiyar et.al. (2013) predicts expected GDP per capita growth for each year by regressing GDP per capita growth on physical capital stock, human capital index and lagged per capita income. They identify MIT by looking at the distribution of differences between the expected and actual growth; country is identified to be in a trap if the residuals for certain years are in the 20<sup>th</sup> percentile of all residuals calculated (i.e. the expected growth was substantially larger than the actual).

The main challenge of this methodology is that its accuracy depends on the assumptions of their theoretical growth model (that GDP growth can be predicted by those three factors). Thus, we face the joint-hypothesis problem when we cannot tell whether their theoretical growth model is wrong or whether a country is not caught in MIT. Moreover, this model would not identify a MIT in countries where MIT is caused or is

reflected in low investment in physical and human capital. Hence, it is more of a test for the model.

#### 1.4. Our Middle Income Trap definition

As can be seen, the MIT definition is ambiguous and we identify all methodologies to have some challenges. The key characteristics that the definition should inhabit in order to be used for our quantitative analysis are (1) ability to capture a precise time period when the slowdown occurs, (2) *trap* should differ from a short term economic slowdown, (3) countries identified as middle income level must be comparable (at a similar development stage), (4) the definition must take into account global, as well as regional macroeconomic environment and (5) the definition of MIT should correspond as much as possible to how the researchers have agreed to characterize it – country stuck between competitive low-wage and high-productivity status. Our key premise is that country can be considered trapped if it is growing slower than it *should be*.

We choose to use relative benchmarks for determining middle income countries and define relative income ranges as percentages of the USA's income level (assuming USA to be the World economic leader for the whole time period observed (Robertson et.al., 2013)).

We set the lower income level benchmark at 15% of the USA (that is 6402\$ at PPP 2005 \$ in 2014) in order to ensure that all Baltic countries are identified in the middle income level for the whole period since their data is observed (since 1990s). Next, we choose 70% of the USA GDP per capita as the upper benchmark for middle income level because that represents the average income level of the European Union over the time, and we assume that exceeding the average income of the one of the richest regions in the world (EU) would imply that country is above the middle income.

Baltic States started off in 1990s with the income level at PPP of around 20% of USA and now are approximately halfway through our middle income definition. Setting the respective middle income level benchmarks ensures us that almost half of the countries are European and most African countries are excluded (list of all countries identified as middle income at some point can be found in Appendix B).

We regard a country being *trapped* in a certain year if it fulfils three country-specific criteria related to its GDP per capita growth rate.

Firstly, we wish to compare each country's growth rate with other countries at similar economic development stage, to see if the specific country is performing as well as other countries that are also in the transition between labour and technology-intensive industries. However, even within our defined middle income level range, countries at the poles of the defined range are at somewhat different development stages and have fairly different growth trends over time. Thus, in order to be sure that we compare growth rates of comparable countries, we divide middle-income countries into four sub-groups according to their income level – (1) countries at income level of 15%-20% of the USA, (2) at 20%-30%, (3) at 30%-50% and (4) at 50%-70% of the USA (list of countries in each range may change every year). These income level intervals were chosen (a) to ensure enough observations in each group every year; (b) to make sure

that each interval is not too wide and we can expect each set of countries to be similar; and (c) because in recent years all Baltic countries belong to the same (30%-50% of USA) income level interval.

Secondly, keeping in mind that growth rates differ across regions (e.g. due some regional economic shocks), we compare each country's growth rate with its respective region's average growth rate. According to World Bank classification we divide countries into the following regions – East Asia and Pacific, Europe and Central Asia, European Union (partly overlaps with Europe and Central Asia), Middle East & North Africa & South Asia, Sub-Saharan Africa, Latin America. Most of the previous MIT definitions did not take into account how the external macroeconomic environment impacts country's performance in a specific year; however, we believe that it is important to control for external factors when studying which internal factors are associated with MIT, and regional growth is a better proxy for external macroeconomic environment than the World growth rate. Moreover, comparing middle income countries growth rates with region's average growth rate (despite the fact that the regions also include countries at much different income levels) is justifiable because according to the underlying MIT theory, countries that are in MIT should be growing slower than both low and high income countries.

Thirdly, we compare each country's growth rate with the weighted average growth rate of its trading partners' in the specific year (weighted by the share of total exports). We believe that having a country-specific benchmark is particularly important, because firstly, the trading partners' growth accounts for external shocks even better than regional growth rate (countries located in periphery areas of their regions might not be affected from regional developments as significantly as from its trading partners); secondly, trading partners' growth rate is an approximate benchmark of external demand and if country is not able to keep up with the growth in trading partners, it might indicate that there is an issue with country's competitiveness.

To summarize, our proposed MIT definition is as follows: we consider a country be trapped in middle income during a specific year if its 1) GDP per capita lies in the range of 15-70% of the USA's income level and 2) GDP per capita growth rate is lower than a) the average growth rate of other countries globally in its respective income level range (15-20%, 20-30%, 30-50% and 50-70% of the USA), b) its respective region's average growth, and c) weighted average growth of each country's trading partners.

The key advantage of using all three growth benchmarks together is to account for many limitations that each of these three benchmarks would have if used individually. If a country is growing slower than each of the benchmark, we can be more certain that the growth of this country is lower than it *should* be. Relatedly, we need several growth benchmarks to avoid a situation when half of the countries would be trapped “by definition”. By comparing countries growth rates not only to other middle income countries, we avoid situations when fast-growing middle income countries would be considered trapped just because other middle income countries are growing even faster (as in Felipe et.al., (2012) methodology). Moreover, our definition does not assume that there should be an absolute convergence with the USA (as implicitly assumed by Woo (2012) and Robertson et.al. (2013)).

By using Hodrick-Prescott filter for GDP per capita values (described further in methodology), we remove impact from economic cycles and record slowdown as a middle income trap only when it is related to a long term growth trend. Moreover, we can identify a country to be in MIT even if we do not have long historical GDP per capita data (as is the case for the Baltics).

## 2. METHODOLOGY AND DATA

After agreeing on MIT definition, we review our methodology on selecting consistent MIT determinants as well as discuss features of the dataset.

### 2.1. Literature on Middle Income Trap determinants

In a qualitative paper, Kharas et.al. (2011) suggest that in order to avoid MIT, apart from the *prerequisites* of manufacturing industry becoming more capital and skill intensive and services as share of GDP increasing, the key strategy should be development of the domestic demand that is necessary as a platform for domestic companies with global ambitions. Relatedly, income inequality might be a reason for country to be stuck in a MIT, as unequal income distribution can lead to domestic demand growing slower than the GDP, and at some point country can face a slowdown because of underinvestment in human capital. Kharas et.al. (2011) recommend three key policy reforms – specialization, structural reforms for improving TFP, and decentralization and privatization.

Researchers have employed different intuitive arithmetic and statistical estimation methods like probit, logit and proportional hazard models for studying the determinants of MIT. Aiyar et.al. (2013) employ probit regressions (with binary variable whether a country in a specific year is in MIT or not) and Bayesian averaging as robustness tests, and estimate the impact of 42 different explanatory variables (including lagged and differenced values). They find that better rule of law, less government involvement, lower regulations, lower dependency ratio, higher trade openness, higher investments, services and agriculture as share of GDP, lower capital inflows, larger public debt, smaller distance to trade, higher regional integration and higher export diversification are associated with lower probability of MIT. By employing similar econometric methodology, Eichengreen et.al. (2014) complements the literature by finding that lower MIT probability is also associated with higher private consumption, lower fertility rates, lower employment share in manufacturing, higher share of population with secondary and tertiary education and more high-technology exports.

Berg et.al. (2012) employ proportional hazard model to estimate the expected length of (previously described) “growth spells” (including lagged and differenced factor values). They find that growth is likely to persist if there is current account surplus, more sophisticated exports, openness to FDI, income equality, democratic institutions and macroeconomic stability. Agenor et.al. (2015) employ an overlapping generations simulation model, and conclude that MIT occurs because of misallocation of talent, low productivity growth, inefficient labor market, lack of property rights and weak (especially – advanced (e.g. IT)) infrastructure.

Felipe et.al. (2012) emphasize the potential of a country for further structural changes. They estimate revealed comparative advantage (RCA) and apply Hausmann and Klinger (2006) methodology to export data. They find that number of products with RCA, share of core products in exports, product sophistication and uniqueness of country's exports are associated with lower risk of MIT.

Several gaps can be identified in the previous literature on MIT determinants. Firstly, previous papers that have used logit or probit estimations might have estimation biases, i.e. Aiyar et.al.(2013) do not include any control variables in their final model specification, and Eichengreen et.al. (2014) include only income level, pre-slowdown growth and dummies for crises as control variables, even though previous economic growth literature has identified many other factors to be relevant. Moreover, their regression specifications may feature significant multicollinearity caused by regressing cross-correlated variables in a single model (e.g. Aiyar et.al.(2012) only regresses variables of the same category in each regression). Also, existing literature is missing an attempt of building a multivariate regression model that would include only statistically significant variables and maximize its explanatory power. Furthermore, vast majority of the previous literature has focused on identifying the significant factors; however, we go a step forward by quantifying the actual probability of certain countries facing the MIT and assessing the magnitude of the effect of certain factors for the Baltic States. Lastly, in comparison to the enormous economic growth literature, the extent of different economic, social and political factor studied by MIT researchers is still very limited and we complement the literature by studying many more relevant factors (including some unconventional factors like the relative wealth of trading partners).

## **2.2 Estimating the determinants and probability of Middle Income Trap**

In order to find robust MIT determinants and estimate the probability of the Baltic countries facing the MIT we (1) choose control variables for initial assessment of significance of potential MIT determinants; (2) construct several multivariate panel data logit models; (3) apply these models to predict the MIT probability for particular countries, including the Baltic States; and (4) test how the developments in factors that may be influenced by the government change the probability of MIT for the Baltic States.

We employ multivariate panel data logit regressions in order to quantitatively assess the impact of different factors on the probability of MIT. A binary variable indicating whether country in the specific year was trapped or not is always used as the dependent variable. We perform random effect regressions. Firstly, Hausman specification test implies that performing random effect estimations is appropriate for our data. Secondly, fixed effect estimations automatically omit many countries with zero variance in the dependent variable (e.g. countries that have never been trapped).

We cannot fully rely on previous literature when proposing a set of control variables because, firstly, middle income trap literature is currently still rather limited and inconclusive with regards to its findings; secondly, even economic growth literature is largely indecisive about which factors have a consistent influence on economic growth (Levine and Renelt, 1992) and, thirdly, our MIT definition is original and it is worth testing as many variables as possible.

Findings of cross-country economic growth research are rather sensitive to the specification of regression model; thus, researchers often find contradicting coefficient signs for the same factors and no clear consensus on the *right* model specification exists (Durlauf and Quah, 1999; Levine et.al., 1992). Nevertheless, most economists agree that univariate regressions can be misleading and individual factors should always be studied by using a set of relevant control variables, moreover, there should be several robustness checks (Hosmer, Lemeshow and Sturdivant, 2000; Sala-i-Martin, 1997).

We choose our control variables based on the following criteria: 1) they must have been used as control variables in previous literature and found to be consistently significant, 2) all chosen control variables must be significant when regressed together and they must maintain their significance in majority of regressions with other factors added to the model, 3) they should have low cross-correlation, 4) they must have sufficient amount of observations in our dataset (starting from 1960s), and 5) their influence on MIT probability should have a clear causality. After surveying the economic growth literature we find that the most often used control variables are GDP per capita, investment share in GDP, population growth, some human capital measure, proxy for trade openness, fertility, world economic growth, government size and dummies for time periods, but rarely all of them are used together (Levine and Renelt, 1991).

After testing these factors, we find that GDP per capita, investment and government spending shares in GDP, tertiary education enrolment rate and trade openness meets all of our five criteria. In turn, population growth, fertility and dummies for time periods often were not significant when regressed together with other control variables. We do not consider world growth rate as a control variable because it is indirectly included in our MIT definition.

After choosing five control variables, we perform a preliminary assessment of all the rest factors in our dataset in order to restrict the number of factors for further consideration for inclusion in MIT prediction models. We add them one by one as the sixth explanatory variable to the model. Following Bursac, Gauss, Williams and Hosmer (2008), we consider a variable for further inclusion in the main regression model if its p-value in the regression with control variables is below 0.25.

Then we fit the regression model using a stepwise selection procedure (adding variables to the control variables in the model one by one and eliminating any variable that was added previously if it turns insignificant (there are too many variables for using a backwards selection in our case)). However, when using stepwise selection, the model that we *end up with* depends on what are the first variables that we add to the model<sup>2</sup>. Hence, we repeat the stepwise selection procedure numerous times, each time starting by different variables as the first ones to be included in the model. Following the literature (Peng, Lee and Ingersoll, 2002; Hoetker, 2007) we base selection of the best model (it will be our main regression model) on the following criteria: 1) all variables included in the model must be significant at  $p=0.05$ <sup>3</sup>, 2) we consider the Wald Chi-

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<sup>2</sup> This appears because, firstly, there is still some cross-correlation between the variables, thus, the coefficients interact between themselves and, secondly, because we are analysing such a long time period, different variables observations might not overlap and once we add a variable to the model which has less observations than other variables in the model it influences the sample.

<sup>3</sup> Our main prediction model includes two variables significant at 90% level, to compromise for other *good* characteristics of the model.

Square goodness of fit test when comparing similar models, 3) we validate how precise are the predicted probabilities of the models for those observations that are actually *trapped* or *not trapped*, 4) we consider cross-correlation between the variables in order to avoid multicollinearity (Appendix D), 5) we include those variables that have sufficient amount of historic observations, and 6) we want to have variables representing different categories (e.g. institutions, macroeconomic environment, human capital etc.) in order to be sure that the model does not miss any crucial factor.

For robustness check we fit eight additional prediction models by largely following the same described conditions of a *good* model; however, we compromise for one of the conditions – for instance, including variables with less observations. The alternative models' predicted probabilities are less precise than for the main prediction model, they have fewer explanatory variables and different number of observations; however, all variables are still significant. Variables that are included in the all prediction models can be seen in Appendix C, with our main prediction model marked as Model 1.

To be able to analyze also those factors that did not fit in the models (e.g., because of too few observations), we follow Sala-i-Martin (1997) and Levine et.al. (1992) and employ each variable one by one in many different model specifications by using different sets of control variables. The robustness of the impact can be assessed by judging in how many of the regression specifications each variable was found significant. Each variable in our dataset is regressed in 15 different regression specifications. The variables that are added additionally to the five control variables are those variables that are included in the main prediction model. Additionally, we regress each variable of interest by adding it to our main model and four of the alternative models. Appendix E presents an example of our approach to analysing each variable of interest (in this case - population growth)<sup>4</sup>. In our results, we present in how many of the 15 regressions (as percentage) each variable was significant and with what sign.

### 2.3. Data description

Our data set covers 152 countries for the period of 1960-2014 and is based on Penn World Tables 7.1<sup>5</sup> (Aten, Heston, Summers, 2012). However, among these only 68 countries have been at middle income level at some period (see Appendix B for countries and periods under investigation). We follow Aiyar et.al.(2013) and Eichengreen et.al. (2014) and exclude resource-exporter countries whose resource extraction between 1960 and 2013 exceeded 20% of GNI on average<sup>6</sup>. Similarly as Felipe et.al. (2012), we exclude microstates that we define as those with average

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<sup>4</sup> Detailed results (similar to Appendix E) on all other individual regressions are available upon request. We do not attach all regression outputs here because of the large number of such estimation tables.

<sup>5</sup> This database (PWT 7.1) features GDP per capita in constant 2005 prices for time period 1950-2010 and is used by most middle income trap researchers (Eichengreen et.al., 2014; Aiyar et.al., 2013). In order to be able to also study the years of 2010 – 2014 (which are not covered) for the missing years we apply the growth rates of GDP per capita PPP at constant prices data from the World Bank WDI database, and thus, get uninterrupted GDP per capita data until 2014

<sup>6</sup> World Bank data. Countries that we exclude due to their resource richness are Angola, Azerbaijan, Bahrain, Brunei, Darussalam, Bhutan, Congo, Rep., Gabon, Iraq, Kazakhstan, Kuwait, Libya, Nigeria, Oman, Qatar, Saudi Arabia, Turkmenistan, Trinidad and Tobago, Uzbekistan.

population of less than 250 000 between 1960 and 2014 on average<sup>7</sup>. The final data sample includes 2154 annual observations.

Following Eichengreen et.al. (2014) we intended to use seven-year average growth rates ( $t \pm 3$  years) for cross-country growth rate comparisons, assuming that 7 years is period of economic cycle, so that the smoothed growth would represent income growth based on fundamentals. However, as in that case we would lose observations for the last three years, we smooth our GDP per capita data using Hodrick-Prescott (HP) filter<sup>8</sup>.

Given that our study covers such a long time period, considerable political, social and economic developments that have taken place globally over time can have an influence on economic growth (Levine and Zervos, 1993) as well as on the findings of MIT determinants. For instance, as education enrollment rates have increased globally over time, level of human capital that might be considered high (and growth enhancing) for 1960s may look rather low by nowadays standards. We acknowledge that countries at e.g. 50% of the USA's income level in 1960s might have different policy priorities as countries at 50% income level nowadays. That is why we use not only absolute values of possible MIT determinants, but also relative values (compared to the average level of all middle income countries). Some factors are more comparable over time than others. Therefore, relative factor values do not completely substitute the absolute values; they are used as robustness checks and we report results from all regressions - with relative and absolute values of each factor.

We follow Aiyar et.al. (2013) for lagging explanatory variables and include the values of all independent factors as averages of the actual values of current and previous three years. We believe that such approach is more appropriate in our research because, firstly, we are using smoothed GDP per capita data, and, secondly, we are interested in finding the impact of sustained, structural problems in these factors (not just short term fluctuations). The list of explanatory factors which we considered as possible MIT determinants can be found in Appendix J.

### 3. EMPIRICAL RESULTS

First we identify cases of MIT. Then we identify factors that are consistently associated with MIT occurrence. We proceed with estimating the MIT probabilities for the Baltic States and study how these probabilities may change as a result of change in government policies.

#### 3.1. Identification of Middle Income Traps

By applying our MIT definition to 2154 middle income level country-year observations, we consider that 689 (32%) are trapped. Our observed frequency is

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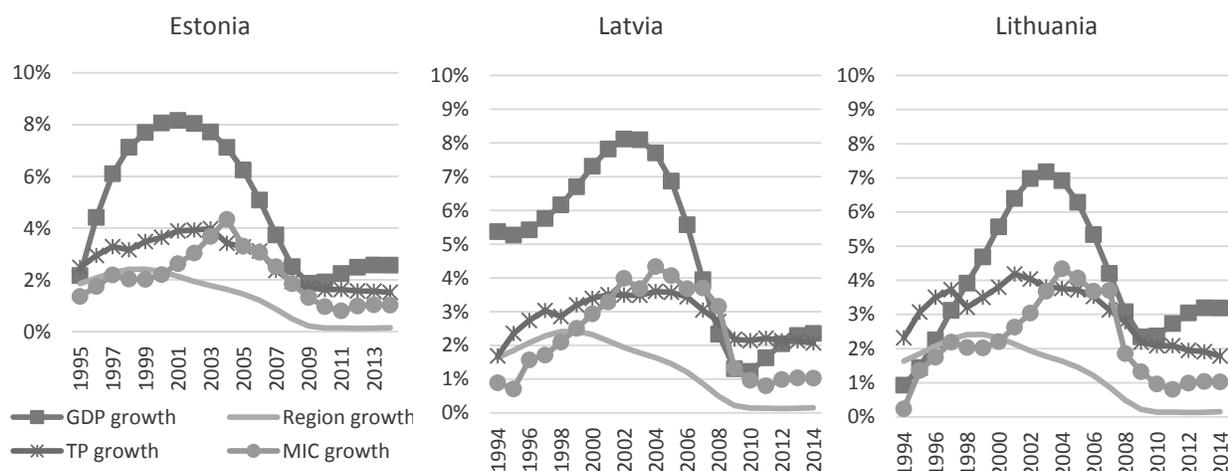
<sup>7</sup> Countries that we exclude are Aruba, Andorra, American Samoa, Antigua and Barbuda, Belize, Bermuda, Brunei Darussalam, Curacao, Cayman Islands, Dominica, Faeroe Islands, Micronesia, Fed. Sts., Grenada, Greenland, Guam, Isle of Man, Kiribati, St. Kitts and Nevis, St. Lucia, Liechtenstein, St. Martin (French part), Monaco, Maldives, Marshall Islands, New Caledonia, Palau, French Polynesia, San Marino, Sao Tome and Principe, Sint Maarten (Dutch part), Seychelles, Tonga, Tuvalu, St. Vincent and the Grenadines, Virgin Islands (U.S.), Vanuatu, Samoa.

<sup>8</sup> We set the smoothing parameter  $\lambda$  at 21, in order to maximize the correlation between the estimated 7-year average growth rate and HP-filtered GDP per capita growth rate.

substantially lower than 67% found by Felipe et.al. (2012) and higher than 11% reported by Aiyar et.al. (2013). Note, however, that MIT probability cannot be compared directly to other papers as the MIT definitions are different.

We find that seven countries are currently trapped among the EU Member States - Spain, Croatia, Cyprus, Portugal, Greece, Slovenia and Italy (Italy slipped back into middle income from high income level in 2010, see Appendix B). Regarding the Baltic States, we find that neither of them is currently caught in the MIT. Furthermore, the Baltic States have been avoiding the MIT since 1994 with a great confidence beating all three growth thresholds of MIT (regional, trading partners and other middle income countries growth rates). Nevertheless, the economic recession has had a significant influence on all three Baltic States, and Latvia's growth rate during 2009-2012 dropped somewhat below that of trading partners (see Figure 1).

**Figure 1 Baltic countries GDP PPP per capita growth rates compared to MIT definition thresholds (income growth of trading partners, region and average of middle income countries in specific income range where the country belongs to)**

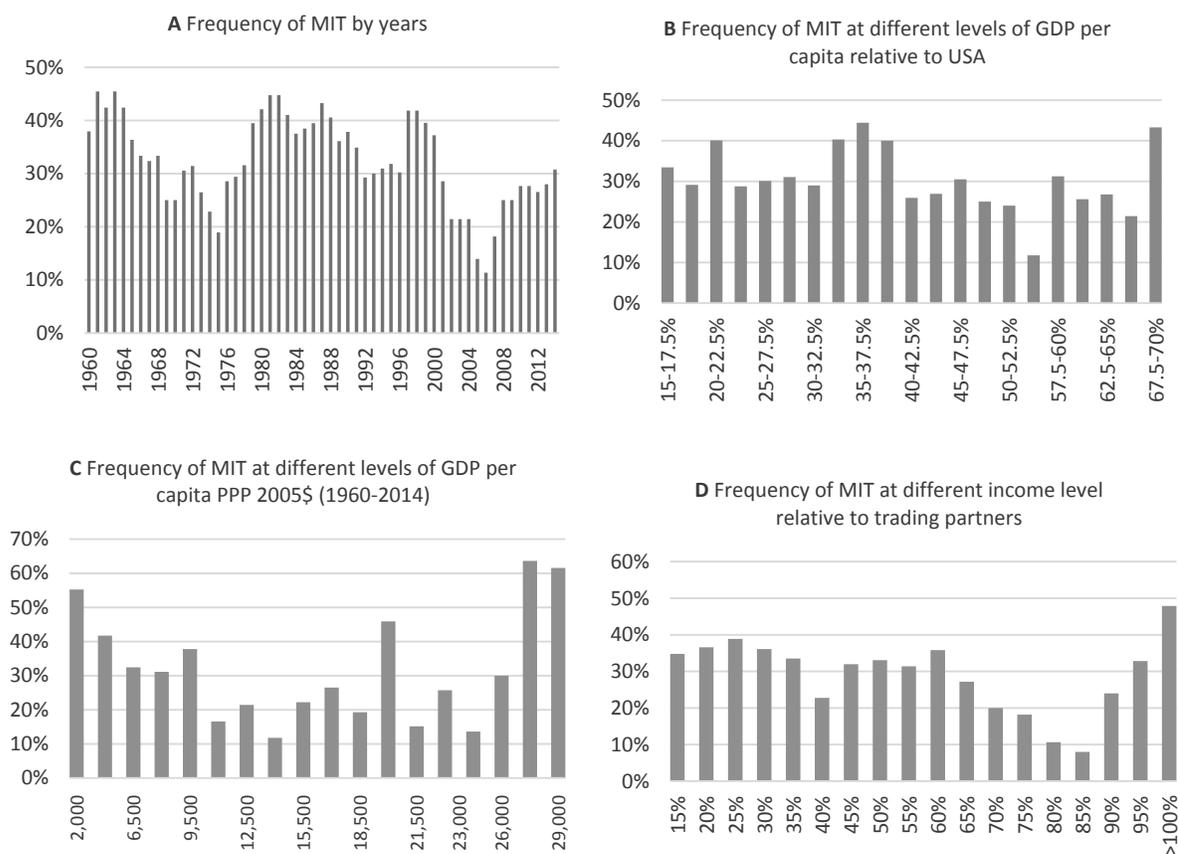


Source: created by authors.

Frequency of middle income trap differs across regions. Middle income countries of Latin America were caught in a trap most often (45% of all observations, particularly often before 1990; see Figure 3). Such finding is consistent with previous literature. For instance, Cimoli and Correa (2002) describe Latin America being caught in a “low growth trap” due to their transition period. In turn, middle income countries of East Asia and Pacific region have been performing rather well with MIT frequency being just 11%. Apart from featuring some of the largest success stories of middle income countries historically (e.g. South Korea and Singapore), also other countries have avoided prolonged economic slowdowns, except for New Zealand in 1980s – 1990s. The average frequency of MITs observed in the EU between 1960 and 2014 is 25%.

MIT frequency has also been different over time. In some years during mid-1970s it's frequency dropped well below 30%. However, between 1980 and 2000 middle income traps occurred relatively more often. One of the reason is the collapse of USSR with “new” trapped middle income countries entering the dataset. Finally, together with the global economic boom the MIT frequency dropped again in early 2000s and increased thereafter reflecting a global slowdown (see Figure 2A).

**Figure 2 Frequency of MIT by years, absolute and relative income levels**



Source: created by authors.

Our identified middle income traps usually occur for several consecutive years, and this is consistent with the theoretical assumption that MIT is more than a short term economic slowdown, and country can be caught in a bad equilibrium for a prolonged time period. We identify only few cases when a country was caught in MIT for just one year. Such finding may seem unintuitive. However, we still include such observations because given that our GDP per capita data is smoothed, it is unlikely that a country was identified to be in MIT due to one-off event; it rather indicates that this country was on the edge of MIT for some period of time.

Countries at income level of around 32.5-40% of the USA has had a considerably higher frequency of MITs than countries at other income levels (see Figure 2B). This is a relevant finding given that Latvia and Lithuania are currently at around 33% and 37% of USA income level respectively. Relatedly, our results suggest that MIT occurs more often at the poles of middle income level (in absolute USD terms) i.e. below 10000 \$ of GDP per capita and above 26000 \$, as well as around income level of 20000 \$ (see Figure 2C) which the Baltic States are currently closely approaching. Countries at income level of around 65-85% relatively to their trading partners on average have experienced traps less often than countries at lower or higher income levels relatively to their trading partners (see Figure 2D). This suggests decreased wealth gap between home country and trading partners might not be causing MIT per se. It should be noted



## 3.2. Determinants of the Middle Income Trap

Appendix C presents the significance and signs of factors that are included in our prediction models. Results on these factors are presented in Tables 2, 3, 4 together with the factors that were excluded from the prediction models but which we analysed individually by employing in different regression specifications. In the Tables we indicate in how many of the 15 regression specifications (as percentage) each variable of interest was significant; if significant, what was the estimated impact on probability of MIT; and whether the variable was significant when included in the main regression model. Moreover, we also show whether the performance of the Baltic States (in 2014) in each factor differs significantly (at 5% significance) from the average values of other countries in the middle and high income level in 2014<sup>9</sup>.

### 3.2.1. Macroeconomic environment

#### Income level

We witness that countries with lower GDP per capita levels are less likely to fall into trap even when controlling for other factors. Impact is significant in almost all of our group regressions including our main MIT prediction model. These findings for GDP per capita impact on MIT likelihood are in line with vast evidence that has been found for conditional  $\beta$ -convergence throughout different research approaches (Islam, 2003; Quah, 1996; Sala-i-Martin, 1996).

This result indicates that as the Baltic economies develop, the probability of getting trapped will increase inevitably, and the only way how policy makers can avoid increasing probability of getting trapped is by improving factors that they can influence with consistent structural reforms.

Moreover, we find that higher income level relative to country's trading partners is associated with higher probability of MIT. This result is in line with Arora and Vamvakidis (2005). Hence, trading intensively with wealthy economies can help economy to avoid the MIT.

#### Macroeconomic stability

We find that stable macroeconomic environment characterized by low inflation, low standard deviation of inflation, budget surplus and prudent monetary policy has a significant and robust impact on decreasing the probability of being caught in MIT (Table 2). These findings are consistent with literature (Barro, 1996).

Price stability is necessary especially for middle income countries for easier attraction of investments to improve productivity (Sala-i-Martin, 1997; Fischer, 1993). In turn, unsustainably high budget deficits have caused several EU countries to face prolonged debt crisis. Moreover, Fischer (1993) suggests that macroeconomic uncertainty caused by budget deficit has a negative impact on productivity growth (through lower efficiency of price mechanism) and adverse effect on investment rates. Baltic States are among very few European countries to fulfil the Maastricht criteria and have a low budget deficit, and our findings recommend them to stay on this path.

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<sup>9</sup> For some factors our dataset does not cover year of 2014; in that cases the latest available data is taken.

### **Economic structure**

Higher investment rate is significantly associated with lower probability of MIT and this factor is significant in 93% of our regression specifications. We also find that higher government expenditure (% of GDP) is associated with higher probability of getting trapped in all 100% regression specifications. These findings are consistent with that of Aiyar et.al. (2013).

Previous empirical economic growth research has provided rather strong results for relationship between investments share and GDP growth (De Long and Summers, 1990; Sala-i-Martin, 1997). Investments are important for countries with a risk of being caught in the MIT, because shift from labour-intensive to more technology-intensive industries cannot happen without capital investments. Staehr (2015) has claimed that relatively large investment rates in the Baltics indicate that marginal returns of capital are still fairly high in this region. Nevertheless, investment rates can also be influenced by government policy actions, for instance, stronger rule of law, stable macroeconomic environment and tax incentives etc.

Regarding GDP structure on production side, we find that only share of agriculture has a significant and negative impact on the probability of MIT in most regression specifications. This finding is in line with Aiyar et.al. (2013). In turn, industry as share of GDP is not significantly related to MIT probability in most of the regression specifications; moreover, the average share of industry in GDP is similar in high and middle income countries<sup>10</sup>.

### **Competitiveness**

We find that pay-and-productivity relation has a robust and significant impact on lowering the probability of MIT. Moreover, higher real effective exchange rate proves to have a significant impact on increasing the probability of MIT in about half of the regression specifications.

These results imply that Baltic policy makers should keep a close eye on labour income share that has continued to increase steadily in the Baltic States since a drop in 2009. Relatedly, the compensation of employees as a share of GDP has increased significantly in Latvia and Estonia over the last years (though still below the peak in 2008), which indicates that compensation is increasing more than productivity, and that has an adverse impact on competitiveness.

Losing competitiveness can turn out to be the prevailing factor for trapping the Baltic States, given that REER in the Baltics has been recently increasing considerably faster than in most other EMU countries (Bruegel, 2015). Our finding on the effect of REER differs from Eichengreen et al. (2014) who found that undervaluation is associated with higher MIT probability, arguing that it may decrease incentives to undertake the necessary reforms. Our finding is that high REER has an adverse impact on growth, as it implies lack of competitiveness and is associated with shrinking exports (in line with Rodrik, 2008). After joining the EMU, the only way how Baltic countries can increase their competitiveness when trading with Eurozone is by a decrease in real factor prices or increase in productivity, as no currency adjustments are possible. Such situation has

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<sup>10</sup> Not reported in Table 2 as we report only results for somewhat significant factors.

pushed several European countries (e.g. Portugal, Greece) into having overvalued currencies (De Grauwe, 2006), and as Eichengreen (2010) suggests, the Baltic countries might experience a similar scenario of large capital inflows and economic growth followed by overvalued currency and economic stagnation, in case they do not control their spending at all times.

### International trade and investments

Higher trade openness, lower trade barriers and tariffs have a robust and significant impact on decreasing the probability of MIT. This result is in line with MIT research (Aiyar et.al. (2013) as well as economic growth research (Levine et.al. (1992)). Notably, many trade openness proxies (freedom to trade internationally index and exports as % of GDP) turn out to be more significant when they are included in the regressions as relative values reflecting rise of global trade over time.

Moreover, we find that large current account deficits are associated with higher MIT probability. This finding is similar to Berg et.al. (2012) who argued that country can achieve sustained growth and avoid *traps* by avoiding large current account deficits and terms of trade shocks.

Small Baltic economies historically have been very open to trade with export and import levels being higher than in the middle income countries on average (see Table 2). However, high openness to trade is related to risk of high trade imbalance. Staehr (2015) has shown that the Baltic States benefited from running a high current account deficit prior to 2008. However, such development is in no way helpful for countries facing a threat of MIT. If a country is not able to grow without creating a large trade deficit it might indicate that the productivity growth lags behind income rise and may signal about weak competitiveness. Moreover, persistent current account deficit can accumulate external debt undermining country's monetary stability (Edwards, 2002).

The association between foreign direct investments (FDI) and MIT is ambiguous. When used as an absolute value, FDI are associated with lower MIT probability (significant in 87% of regression specifications). However, when FDI is included as a relative value, it is associated with higher MIT probability. Thus, our results do not show that FDI may have a key role in avoiding a trap as suggested, for instance, by Foxley and Sossdorf (2011) for the case of Finland, South Korea and Ireland as well as by Han and Wei (2015).

**Table 2. Impact of macroeconomic environment factors on probability of MIT**

	Absolute		Relative		EE vs HIC	EE vs MIC	LV vs HIC	LV vs MIC	IT vs HIC	IT vs MIC	HIC vs MIC
	Impact on MIT	Significance (% of regressions)	Impact on MIT	Significance (% of regressions)							
Government (% of GDP)	+	100%	-	27%		H					
Trade openness	-	100%	-	100%	H	H					
Regulatory trade barriers	-	100%	-	80%	H	L	H	L	H	L	L
Pay and productivity	-	100%	-	87%		H				H	
Inflation	+	100%	+	73%		H	H	L			H
Investment (% of GDP)	-	93%	+	27%							

Government budget balance (% of GDP)	-	87%	+	47%		H	H	H	
FDI net inflows (% of GDP)	-	86%	+	27%		H	H		H
Tariffs	-	73%	-	67%		L	L	L	
Imports (% of GDP)	-	73%	-	33%		H	H	H	
Macroeconomic environment	-	73%	-	60%				L	
Standard deviation of inflation	-	73%	-	40%					H
Freedom to trade internationally	-	67%	-	100%					
Mean tariff rate (%)	+	67%	+	87%					L
Access to Sound Money	-	67%	-	47%		H	H	L	L
Interest rate spread (%)	+	67%	-	27%	L	L	L	L	H
Exports (% of GDP)	-	60%	-	100%					
Money growth	-	60%	+	20%		H			
Region GDP growth	-	53%	0	0%			L	L	
Real effective exchange rate	+	40%	+	60%	L	L		L	
Current account balance	-	29%	+	40%		H	L	L	H
Income level (% of trading partners)	+	21%	+	7%		L	L	L	
Agriculture (% of GDP)	-	7%	-	67%				H	

*Created by the authors. Result list includes variables with robust impact on MIT that have been either 1) significant in at least 50% of regression specifications with absolute value; 2) significant in at least 50% regression specifications with relative value; or 3) significant when controlled with the main MIT prediction model. Other findings and regression results available upon request.*

*EE=Estonia LV=Latvia LT=Lithuania MIC=middle income countries HIC=high income countries H=significantly higher L=significantly lower at 5% significance.*

### 3.2.2. Development

We find that more extensive export diversification, higher tertiary education enrolment rates (and more educated labour force), better credit market regulations, higher technological and innovations advancement, higher economic freedom, lower income inequality, higher competitiveness (proxied by Global Competitiveness Index) and lower domestic credit levels decrease the probability of MIT (See Table 3).

#### Export diversification

Our results show that both more diversified and complex exports significantly decrease the probability of MIT. Extensive margin (proxies of how well country is diversified with regards to number of export products and trading partners) is significant in all regressions both as absolute and relative value; export product diversification is significant in 64% of the regressions as absolute values and in 80% of specifications – as a relative value. Also higher Complexity index (Hausmann, Hidalgo, Bustos, Coscia, Simoes, Yildirim, 2014) that takes into account both export diversification and product sophistication decrease the probability of MIT. However, as complexity index is found to be less significant than diversification, we conclude that while product specialization may be helpful, diversification of exports should be the priority for middle income countries.

These results are broadly in line with Aiyar et.al. (2013) and; however, they confront the findings of Felipe et.al. (2012) who argues that there is a need to “develop comparative advantage in sophisticated and well-connected products” similarly to South Korea. Nevertheless, we side with Caselli, Koren, Lisicky, and Tenreyro (2015) who argue that diversified export base increases resilience to external shocks e.g. commodity prices.

Notably, export product diversification for all Baltic States is significantly lower than the average of middle income countries suggesting that Baltics are overly dependent on

certain exports. Interestingly, level of export diversification of middle income countries is not statistically significantly different to that of high income countries; however, economic complexity index for high income countries is significantly larger (see Table 3) suggesting that export sophistication is in fact a characteristic of high income countries.

Baltic States (particularly Latvia) are significantly lagging behind high income countries in terms of innovations and business sophistication (as shown by Global Competitiveness Report). Literature suggests that innovations are particularly important for a country to advance to high income level and reach the “4<sup>th</sup> stage” of economic development, where country can lead innovations on global scale (Ohno, 2009). Our findings are in line with the literature and show that insufficient innovation and business sophistication, as well as export diversification can jeopardize transition of the Baltics to high income.

### **Human capital**

Tertiary education enrolment rates are significantly associated with lower probability of MIT in almost all regression specifications, when included as an absolute value. This is in line with previous research emphasizing high level of human capital as important factor to avoid MIT (Liu et al. 2013; Egawa, 2013; Staehr, 2015; Agenor et.al, 2015). Kharas et.al. (2011) points out that development of tertiary education is one of the key differences between rapidly growing East Asia and *trapped* Latin America. Interestingly, relative value of tertiary education enrolment rate is insignificant in most regression specifications, suggesting that even if other countries have lower human capital, country cannot foster its development before achieving a certain absolute level of human capital.

We find that secondary and primary education enrolment rates are insignificant in most regressions specifications; that can be explained by already very high enrolment rates (often close to 100%) in most middle income countries. Expenditures on education and healthcare are found to have a positive association with the probability of MIT, probably due to high correlation with government size.

Availability and quality of tertiary education should be one of the key concerns for policy makers in the Baltics if they wish to avoid the MIT. Not only educated labour force is crucial for innovations and higher productivity, but improved education availability may also decrease income inequality (Zhang, Ti, Luo, Liu and Rozelle, 2013; Egawa, 2013) which is one of the problematic factors for the Baltic States on its own. Education has been a hot topic in the Baltics. While higher education enrolment rates are relatively high, the education quality is often challenged. IMF (2015a) and OECD (2015) explain that Latvia and Lithuania still lack high-skilled workforce which is hard to obtain without improving the weak state of vocational education.

### **Income equality**

GINI index is found to have a significant impact on increasing the probability of MIT in 93% of our regressions specifications (including the main model) when used as an absolute value. Moreover, also the relative value factor is significant when included in the main model. Hence, it can be argued that higher income inequality may increase the probability of MIT. This result is in line with findings of Berg et.al. (2012) and Egawa (2013).

Already the seminal papers on MIT identify the crucial role that middle class ought to play in middle income countries advancement to high income (Kharas et.al. 2011; Berg et.al. 2012). They explain that growth in the domestic demand largely depends on the consumption of middle class, as countries cannot rely on ever increasing net exports.

Latvia and Lithuania are among the most unequal countries in the EU in terms of income, and OECD (2015) has explicitly pointed out that Latvia's and Lithuania's income inequality problems can be a cause for further worsening skills mismatch, worse health of the society and undermine sustainable development. Hence, we would recommend Baltic policy makers to address this painful issue by e.g. reforming the educational system to decrease existing skill mismatches.

### Financial advancement

We find that higher availability of financial services and more liberal credit market regulations are associated with lower probability of MIT. In turn, higher stock of domestic credit is associated with higher probability of MIT. When controlling for other indicators of financial development, we do not identify a significant impact on probability of MIT caused by larger financial openness (proxied by Chinn-Ito Index (2008)). Besides, there is some evidence that higher market capitalization (% of GDP) relatively to other countries is associated with lower probability of MIT.

**Table 3. Impact of social and economic development on MIT**

	Absolute		Relative		EE vs HIC	EE vs MIC	LV vs HIC	LV vs MIC	LT vs HIC	LT vs MIC	HIC vs MIC
	Impact on MIT	Significance (% of regressions)	Impact on MIT	Significance (% of regressions)							
Extensive trade diversification	+	100%	+	100%		L	L		L		
Domestic credit by financial sector (% of GDP)	+	93%	+	100%	L	L	L		L	L	H
Education expenditure (% of GDP)	+	93%	+	80%							
Government exp. on education (% of GDP)	+	93%	+	73%							
GINI index	+	93%	+	40%		L	H		H		L
Enrolment in tertiary education	-	93%	-	13%		H				H	
Prevalence of foreign ownership	-	87%	-	93%		H			L		H
Availability of financial services	-	85%	-	93%	L	H	L		L		H
Domestic credit to private sector	+	80%	+	93%	L	L			L	L	H
Credit market regulations	-	80%	-	71%	H	H		H		H	H
GDP per capita	+	80%	-	53%	L		L		L		H
Technological adoption	-	75%	-	7%	L	H	L		L	H	H
PCT patents, applications (per million people)	-	73%	-	80%	L		L		L		H
Innovation and business sophistication	-	73%	-	60%	L	H	L		L		H
Economic Freedom Index	-	73%	-	60%		H				H	H
Self-employed (% of total employed)	-	73%	-	53%		L		L		L	L
Health expenditure (% of GDP)	+	67%	+	87%	L	L	L	L	L		H
Export diversification	+	64%	+	80%		L		L		L	
Global Competitiveness Index	-	57%	0	0%	L	H	L		L		H
Economic Complexity Index	-	53%	-	20%		H	L				H
Total Factor Productivity	-	53%	-	7%	L		L		L		H
Researchers in R&D (per million people)	+	53%	+	7%	L	H	L		L	H	H
Labor force with tertiary education (%)	-	53%	0	0%		H		H		H	H
Quality of overall infrastructure	+	33%	+	100%	L	H	L		L	H	H

Urban population (%)	-	27%	0	0%	L		L		L		H
Ease of access to loans	-	13%	-	60%			L		L	L	H
Population growth	+	7%	+	47%	L	L	L	L	L	L	
Market capitalization (% of GDP)	0	0%	-	53%		L		L		L	

*Created by the authors. Result list includes variables with robust impact on MIT that have been either 1) significant in at least 50% of regression specifications with absolute value; 2) significant in at least 50% regression specifications with relative value; or 3) significant when controlled with the main MIT prediction model. Other findings and regression results available upon request.*

*EE=Estonia LV=Latvia LT=Lithuania MIC=middle income countries HIC=high income countries H=significantly higher L=significantly lower at 5% significance.*

### 3.2.3. Governance

We find that (1) public sector’s efficiency and accountability (less corruption, less wastefulness of funds, increased policy coordination, stronger public institutions), (2) lower government regulation, (3) higher social participation and civil rights (voice and accountability, political and social integration), and (4) more reliable judicial system (rule of law, stronger property rights, efficiency of settling disputes) are consistently associated with lower probability of MIT (see Table 4).

Quality of public institutions, government efficiency, resource efficiency and wastefulness of government spending have all been found to have a significant impact on the probability of MIT in most regression specifications including the main model (either as absolute or relative value). We find higher control of corruption and improved anti-corruption policy to have a robust and significant impact in decreasing the probability of MIT; these factors are significant also when included in the main regressions model.

We find that in order to avoid MIT, country should achieve higher economic freedom, have less (but more efficient) regulations and less obstacles for starting business. Luckily, Baltics are performing significantly better than other middle income countries on average in terms of business regulations, ease of doing business and especially - wage flexibility.

Our findings suggest that tax policy can have a significant impact on the probability of MIT. Direct taxation (specifically top marginal tax and tax on income, profits and capital gains) is associated with higher probability of MIT, while higher taxation of goods and services is associated with lower MIT probability.

Arguably, strong governance is one of the most important factors for avoiding the MIT because transition to high income requires decisive policy and structural reforms. South European countries (e.g. Italy) have shown that delaying reforms can even drag a high-income country back into middle income level. Baltic States have become notorious for structural reforms pulled out during and intermediately after the crisis. However, implementing reforms during “peace times” when they can be targeted at maintaining long term growth, not fighting fire, comes harder; and weak governance may be one of the reasons.

Particularly Latvia and Lithuania are ranking rather poorly by the overall quality of their public institutions in the Global Competitiveness Report (Lithuania – 53<sup>rd</sup>, Latvia – 50<sup>th</sup>). Fish rots from its head, and metaphorically we see this as one of the key risks facing Lithuania and Latvia. Not only because weak institutions have an adverse impact

on the performance *today* (higher corruption, lower tax collection, worse investment environment, higher wastefulness of public spending etc.) but chiefly because these countries can be trapped in a vicious cycle where lack of decisive structural reforms weakens the governance quality even further. Latvia and Lithuania rank 81<sup>st</sup> and 92<sup>nd</sup> respectively in terms of wastefulness of government spending, next to Tanzania, Cameroon and Russia. Overall public-sector performance is also at rather low levels – Latvia is ranked 74<sup>th</sup> and Lithuania – 76<sup>th</sup>. Delayed public healthcare and education system reforms in Latvia present the indecisiveness of government even in cases that are harming society’s well-being *today* (not even mentioning lack of long-term strategy). Such weak rankings in factors that we find to have a significant and robust impact on the probability of MIT (e.g. wastefulness of spending) is even more alarming.

Moreover, our findings on legal system’s impact on the probability of MIT are in line with previous literature claiming that property rights and rule of law fosters countries convergence with high income countries (Knack and Keefer, 1995). Improvements in judicial system require major structural reforms in which Latvia and Lithuania are struggling. IMF (2015a) recommends judiciary system reforms as one of the key structural changes for Latvia, as extremely long trials and stagnating insolvency process reform are some examples of how inefficient judicial system undermine country’s business environment and international image.

Sadly, we must also discuss the large impact that corruption in the Baltics can have on increasing the probability of MIT. For instance, corruption can drag countries into the MIT by ruining the efficiency of resource allocation, ruining business environment and country’s reputation in the eyes of international investors through unfair government tenders, corrupt CEOs of state owned enterprises, vested interests of political party sponsors and unfair court judgments. OECD’s continuous indications at problems with Latvia’s anti-corruption policies (being one of the reasons for the slow acceptance of Latvia at OECD) is a good example of how governance problems undermine country’s prospects for development (OECD, 2015). However, in almost all corruption proxies the Baltic countries are still significantly lagging behind high-income countries. It has been shown by previous researchers that weak public institutions are often the main cause for higher levels of corruption (Abed and Davoodi, 2000).

**Table 4. Impact of governance on MIT**

	Absolute		Relative		FE vs HIC	FE vs MIC	LV vs HIC	LV vs MIC	LT vs HIC	LT vs MIC	HIC vs MIC
	Impact on MIT	Significance (% of regressions)	Impact on MIT	Significance (% of regressions)							
Cooperation in labor-employer relations	-	100%	-	100%		H	L	H	L		H
Diversion of public funds	-	100%	-	100%	L	H	L		L		H
Wastefulness of government spending	-	100%	-	100%		H	L		L		H
Burden of government regulation	-	100%	-	100%		H			L		H
Voice and accountability	-	100%	-	100%		H		H		H	H
Government efficiency	-	100%	-	93%		H	L		L		H
Control of corruption	-	100%	-	67%	L	H	L		L		H
Legal system & property rights	-	93%	-	100%	L	H	L	H	L	H	H
Government effectiveness	-	93%	-	93%	L	H	L	H	L	H	H
Resource efficiency	-	93%	-	87%		H				H	

Protection of property rights	-	93%	-	60%	L	H	L		L		H
Market Economy Status Index	-	100%	-	47%		H		H		H	H
Ethical behavior of firms	-	93%	-	100%	L	H	L		L		H
Corporate ethics	-	93%	-	100%	L	H	L		L		H
Institutions	-	93%	-	100%	L	H	L		L		H
Ethics and corruption	-	93%	-	20%	L	H	L		L		H
Efficiency of legal framework in settling disputes	-	92%	-	86%	L	H	L	L	L		H
Effect of taxation on incentives to invest	-	91%	-	67%		H			L		H
Anti-corruption policy	-	87%	-	87%		H					H
Rule of law	-	93%	-	87%	L	H	L	H	L	H	H
Efficient use of talent	-	93%	-	80%		H	L	H	L	H	H
Judicial independence	-	80%	-	100%		H	L		L		H
Black market exchange rates	-	87%	-	93%							H
Policy coordination	-	80%	-	40%		H	L			H	H
Political and social integration	-	86%	-	73%		H				H	
Sustainability	-	86%	-	13%		H		H		H	
Welfare regime	-	85%	-	60%	H	H		H		H	H
Civil rights	-	80%	-	87%	H	H	H	H	H	H	
Accountability	-	73%	-	80%	L	H	L		L		H
No. of days to start a business	-	80%	-	20%					H		
Organization of the market and competition	-	79%	-	73%		H		H		H	
Public institutions	-	67%	-	80%	L	H	L		L		H
Flexibility of wage determination	-	73%	-	73%	H	H	H	H	H	H	
BTI Status Index (democracy & market liberalism)	-	73%	-	47%	H	H		H	H	H	
Rule of law	-	67%	-	60%	H	H		H	H	H	
Social capital	-	67%	-	27%	H	H			H	H	
Regulation	-	67%	-	47%		H		H		H	H
Country capacity to retain talent	-	64%	-	20%	L		L		L	L	H
Irregular payments and bribes	-	54%	-	13%	L	H	L		L		H
Taxes on goods and services (% of revenue)	-	60%	-	7%		H					
Stateness	-	57%	+	13%		H		H		H	
Regulatory Quality	-	53%	-	33%		H	L	H	L	H	H
Country capacity to attract talent	-	54%	-	27%	L		L	L	L	L	H
Judicial independence	-	47%	0	0%		H	L		L		H
Taxes on income, profits & capital gains (% of revenue)	+	27%	+	33%	L	L	L	L	L	L	
Steering capability	-	33%	-	20%	H	H	H	H	H	H	L
Undue influence	-	20%	-	87%		H	L		L		H
Top marginal tax rate	+	20%	+	87%							
Labor market regulations	+	20%	+	80%						H	H
Impartial courts	-	20%	-	27%	L	H	L		L		H
Resolving insolvency		0%	+	80%	L		L		L		H

Created by the authors. Result list includes variables with robust impact on MIT that have been either 1) significant in at least 50% of regression specifications with absolute value; 2) significant in at least 50% regression specifications with relative value; or 3) significant when controlled with the main MIT prediction model. Other findings and regression results available upon request.

EE=Estonia LV=Latvia LT=Lithuania MIC=middle income countries HIC=high income countries  
H=significantly higher L=significantly lower at 5% significance.

### 3.3. MIT predictions for the Baltics

As a result of stepwise selection including hundreds of variables and thousands of regressions, we have constructed a highly significant MIT prediction model with mean predicted probability of 59% for trapped observations and 20% for non-trapped observations covering the period of 1977-2014 with 1143 overlapping observations (345 traps) from 53 middle-income countries (Model 1 in Appendix C).

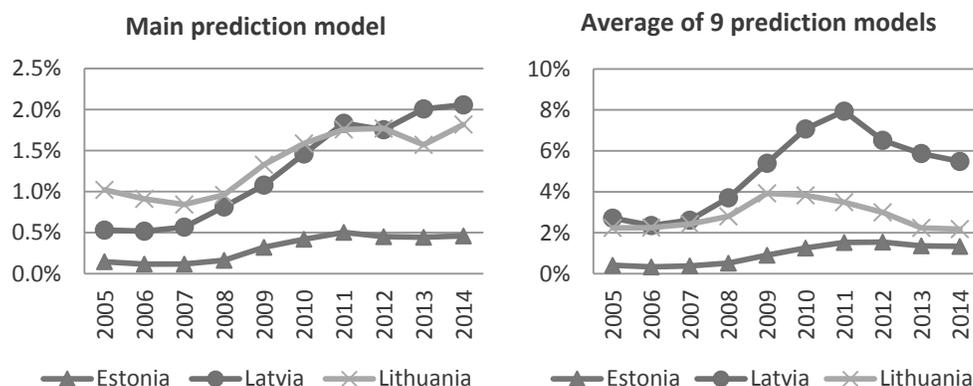
Results of all our prediction models are consistent – MIT probability in the Baltics currently is rather low (see Table 5). Only period when there has been a risk of getting stuck in MIT for Baltics was early 1990s after collapse of USSR with Estonia actually identified as trapped from 1991-1994. However, Estonia (and presumably also Latvia and Lithuania for which we have data only from 1994) escaped the trap with predicted probabilities sharply decreasing over time (1992: 79%; 1993: 49%; 1994: 20%; 1995: 5%). Although MIT prediction for the Baltics has somewhat increased since 2007, it remains low in 2014 (Estonia: 0.5%, Latvia: 2.1%, Lithuania: 1.8%; see Figure 4) compared to mean prediction for middle-income countries (31.6%). To verify that low MIT predictions are not caused by having too wide selection of countries in our dataset, we test robustness using more narrow income range (30%-50% of US). Findings are consistent as MIT predictions for Baltics remain at very low level.

**Table 5. MIT probabilities with different models  
(model 1=the main prediction model)**

	Model								
	1	2	3	4	5	6	7	8	9
# of variables	14	8	12	12	9	11	7	10	9
Estonia	0.46	4.00	0.92	0.85	2.81	0.00	1.22	1.00	0.74
Latvia	2.06	6.02	4.50	4.37	8.31	0.09	2.56	13.06	8.41
Lithuania	1.82	4.71	1.66	2.49	4.23	0.00	2.15	1.77	0.76
Trapped observations	58.68	43.63	51.32	54.61	42.14	54.09	37.26	41.71	39.63
All observations	31.63	28.90	29.52	30.21	26.47	20.83	22.19	20.31	19.54
Non-trapped observations	20.03	22.77	20.30	20.13	19.99	10.62	16.86	13.82	13.67
# of observations	1143	1420	1078	1096	1564	471	768	583	578
... of which trapped	345	419	322	322	459	112	202	137	132
# of countries	53	60	49	50	61	35	53	42	41
Beginning of period (year)	1977	1967	1977	1977	1967	1993	1993	1993	1993
Chi2	132.1	139.7	113.5	117.2	154.6	37.0	56.0	39.2	34.6

Source: created by the authors.

**Figure 4. Estimated MIT probabilities for Baltics using the prediction models**



Source: created by the authors.

For robustness check we also applied existing MIT definitions from the literature to identify whether any of the Baltic States currently may be considered to be trapped<sup>11</sup>.

<sup>11</sup> None of the existing papers have identified any of the Baltic States to be in the MIT; however, they have not used GDP per capita data until 2014 and some of the papers exclude the Baltics from their data sample.

Our calculations show that none of the existing MIT definitions clearly suggest that the Baltics currently are caught in the MIT.

According to the middle income level classifications offered by the World Bank, Aiyar et.al. (2012) and Robertson et.al. (2013) all three Baltic States have already graduated from the middle income level and are now (as of 2014) classified as high income countries (upper thresholds of middle income level proposed by these sources are - 12,736\$ (GNI per capita at 2014\$), 15,000\$ (GDP per capita at PPP 2005\$) and 8-36% of the USA's GDP per capita at PPP respectively<sup>12</sup>. Hence, according to these middle income definitions, Baltics have already avoided the MIT (except, in 2014 Latvia was still at 35% of the USA's income level).

GDP per capita data for the Baltics is only available since 1993 (for Estonia – since 1990)<sup>13</sup>, when they *entered* the dataset as middle income countries already. Hence, we do not know exactly how long Baltics have been at middle income level, and we cannot compare their time spent as middle income countries to the benchmarks offered by Felipe et.al. (2012), according to which a country should be considered trapped if its income level was between 2,988\$ and 17,557\$ (2005\$ at PPP) for longer than 42 years. However, they specified that there is also “upper MIT”, where country is trapped if its income level is between 10,833\$ and 17,557\$ for longer than 14 years. Both, Estonia and Lithuania were at this income level for 12 years before *graduating* in 2011 and 2014 respectively. In turn, Latvia still must grow with at least 3.5% per year in order to avoid the “upper MIT” (the only period when Latvia fell short of this growth rate is 2008-2010).

Robertson et.al (2013) conditions that a country is trapped if in the long term the difference between certain country's log income and the USA log income is stationary. As long as the data is available, this is not the case for the Baltics, because since 1994, GDP per capita of Estonia, Latvia and Lithuania relatively to the USA has gradually increased by around 25, 17 and 18 percentage points respectively.

Lastly, Eichengreen et.al. (2014) defines MIT as the moment when historical 7-year (t-7) average growth of GDP per capita at PPP has been considerably higher (by at least 2 pp) than future 7-year (t+7) growth rate (conditioning that country's 7-year average (t-7) growth before was at least 3.5% p.a. According to this definition, all three Baltic States were trapped between 2002 and 2007 (Lithuania – since 2003). Note that we cannot say anything about the situation after 2007 because the data set ends at 2014 and we need to calculate (t+7) average growth rate. Such finding may be controversial. Firstly, it is hard to comprehend why should economies be considered to be trapped when they are still growing more than 7% p.a., as was the case in the Baltics between 2002 and 2007. Secondly, since 2010, the 7-year historical average growth of the Baltics economies has been below 3.5%; however, Eichengreen et.al. (2014) conditions that historical (t-7) 7-year average growth must be above 3.5% to experience MIT at time “t”. Hence, Baltics cannot be currently considered to be trapped according to Eichengreen et.al.

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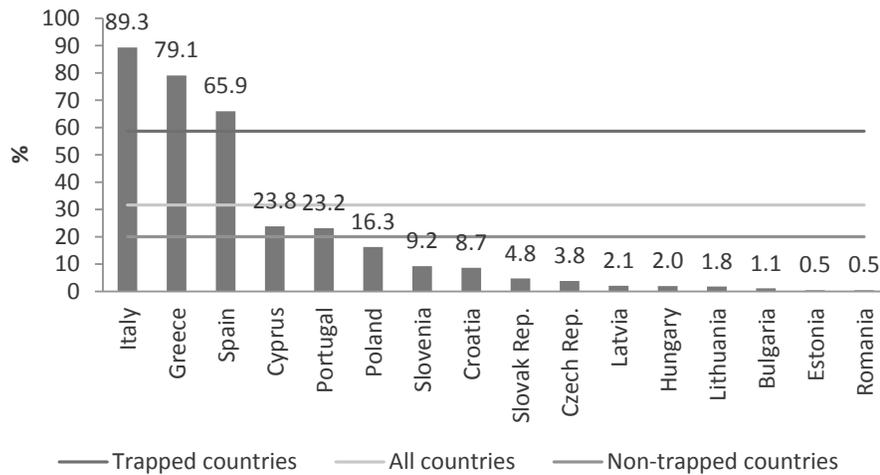
<sup>12</sup> All GDP per capita figures for estimates are acquired from Penn World Tables 7.1 database until 2010, and extrapolated till 2014 using the GDP per capita at PPP growth rates from the World Bank WDI database.

<sup>13</sup> Penn World Tables 7.1 database.

### 3.4. MIT predictions for other EU countries

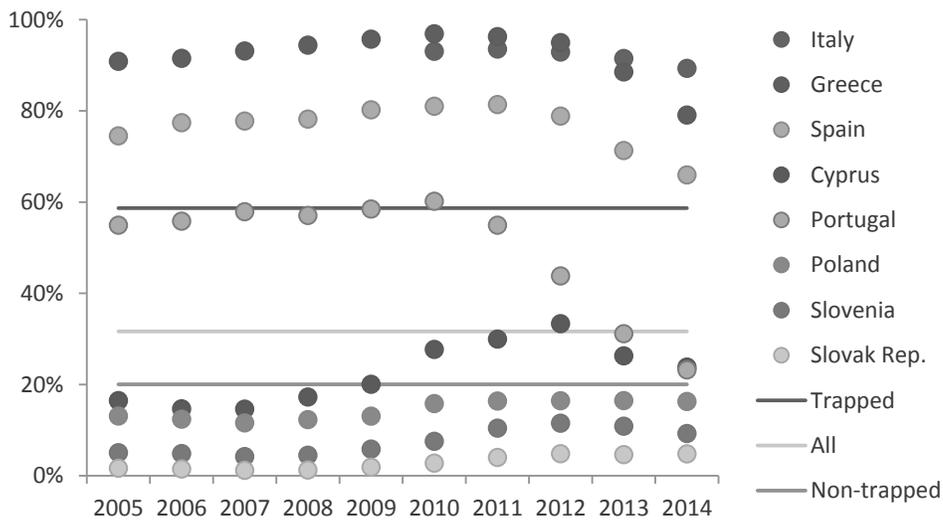
Italy, Greece, Spain, Cyprus and Portugal have the highest predicted MIT probabilities among the EU countries (see Figure 5) and are all identified as trapped (see Figure 3). Interestingly, our prediction model would have indicated structural problems in these countries long before the breakout of the European debt crisis (Figure 6). Structural reforms addressing poor governance that followed bailout and intervention by IMF have lowered MIT probabilities in Greece and significantly improved situation in Portugal (drop in MIT probability from 60% in 2010 to 23% in 2014).

**Figure 5. Predicted MIT probabilities for the EU countries in 2014 (main prediction model)**



Source: created by the authors.

**Figure 6. Predicted MIT probabilities for selected EU countries (main prediction model; 2005-2014)**



Source: created by the authors.

Meanwhile, Italy that has faced income divergence from wealthier European countries and USA (and has fallen back to middle-income in 2010) has not been able to enforce structural reforms and remains trapped with a small decline in prediction caused by decreasing GDP per capita and income relative to trading partners. However, severe problems such as decreasing enrolment in tertiary education, low and declining investment as % of GDP together with rather high price level of capital and very low FDI net inflows are the actual causes behind such high MIT prediction. Italy is an intriguing example, because it shows that the problem is not merely about the middle income level and Baltic countries will have to keep up with reforms and stay competitive also after reaching high-income.

Appendix F shows what have been the MIT predictions since 1977; and it is clearly noticeable that predicted MIT probabilities in Europe are currently relatively low compared to the rest of the world.

### **3.5. Alternative policy scenarios**

Further we test the sensitivity of MIT predictions for Baltic economies by adjusting variables that we consider to be possible to influence by government policies. In positive development scenario (HIC) these factors are adjusted to the level of high-income countries. In negative scenario (MIC) we equalize all adjustable factors with an average level of middle-income countries. Besides providing us with additional robustness check for MIT predictions, it also allows us to analyse the impact of potential catch up or degeneration caused by unsuccessful policies as well as identify factors with largest impact on Baltic economies. When making adjustments, we assume that policy makers have a direct influence over quality of institutions, business environment, tax policy, as well as enrolment rates in tertiary education (e.g. by providing free higher education and equal opportunity for everyone to continue their studies through scholarships). At the same time, we believe that Baltic governments do not have major influence over inflation (significantly affected by ECB and external prices), tariffs, trade openness (being part of EU and WTO), export diversification, and external factors such as current account balance, GDP per capita and relative trading partners' wealth. Full list of variables that we adjust and the extent of adjustment are reported in Appendix G. As can be noted, negative adjustments in scenario "MIC" are substantial (considerably larger than positive adjustments in scenario "HIC") as all Baltic economies are currently much better positioned with regard to these factors when compared to typical middle-income country.

Our results indicate that under positive scenario Estonia would not benefit from catching-up with high-income countries as much as Latvia and Lithuania, reflecting already better institutions in Estonia (see Appendix H). However, it is more sensitive to a negative scenario - on average the MIT probability for Estonia increases from 1.3% to 6.8%; whereas, for Lithuania - from 2.2% to 5.2%. Nevertheless, it is still much below the mean predicted probability of non-trapped observations under all model specifications.

Although deterioration of factors affected by government policies result with higher MIT probabilities, the predictions for Baltics still remain very low (in the main model EE: 2.7%, LV: 4.0%, LT: 3.4%) in comparison to mean prediction for actually trapped

economies (58.7% in the main model, 47.0% on average). Nonetheless, in some specifications MIT probability increase can be substantial (e.g. from 8.4% to 25.7% for Latvia in Model 9).

After examining the underlying values of each factor for the Baltics and taking into account which variables are always kept unchanged, we identify that MIT predictions for Baltic economies are most exposed to changes in governance indicators (control of corruption, government effectiveness, voice and accountability), income inequality, legal system and property rights. Moreover, we find that Latvia can reduce its highest predicted MIT probability in Model 8 from 13.1% to 1.6% by reducing income inequality and corruption to the mean level of high-income countries (GINI index from 35.6 to 31.1 and control of corruption index from 0.2 to 1.8 (this index has values ranging from -2.5 to 2.5)).

After performing a robustness check by comparing MIT predictions for Baltics with other European countries, using 8 alternative models covering different economic factors and time periods (starting from 1967, 1977 or 1993 - depending on data availability), and adjusting factors that can be affected by policy makers accordingly to a positive and a negative development scenario, we conclude that there is robust evidence that none of the Baltic countries is currently threatened by MIT. All Baltic economies are fundamentally in much healthier condition than it would be expected from a typical middle-income country. However, MIT probabilities can be further decreased by combating corruption (especially in Latvia), income inequality and improving institutions (particularly in Latvia and Lithuania). Provided that economic policy makers make no drastic reversals and consider following proposed recommendations, we expect to see further convergence with the EU average income levels.

## 6. CONCLUSIONS

After seeing handful of economists referring to the Baltic States in the context of possible middle income trap, we tested the appropriateness of such speculations. This paper has supplemented the existing literature in numerous ways. We propose and apply our own definition of middle income trap which captures all characteristics of a *good* MIT definition by using country-specific benchmarks that successfully identify economic slowdowns that we believe can be characterized as middle income traps. By using the most extensive dataset that includes all factors that previous literature has mentioned to have a significant impact on the probability of middle income trap we, firstly, assess which factors have a significant and robust impact on the probability of MIT and, secondly, construct a multivariate panel data logit prediction model and quantitatively estimate the probability of each of the Baltic State to be facing middle income trap.

We find that 32% of middle income countries have historically been caught in a middle income trap, with the highest frequency of traps occurring in Latin America. None of the Baltic States are currently trapped; however, among the EU Member States Italy, Greece, Cyprus, Portugal, Spain, Croatia and Slovenia are currently trapped. Importantly, our model has shown increased MIT probabilities for these countries well before the trap has actually occurred.

And notably, European countries that are found to be trapped (e.g. Greece, Italy, Spain) are in fact currently finding it hard to coordinate their economic policies with the EU, supporting our thesis that MIT may hinder further European economic integration.

By employing numerous prediction models we find robust evidence that the probability of Baltic countries currently facing MIT is rather low (below 10%). Moreover, we test our prediction models by adjusting some of the factor values for the Baltic States and see that no significant change in the predicted probability of MIT can be expected in the nearest future. We find that the lowest probability of getting trapped exists for Estonia; whereas, the highest – for Latvia. Additionally, we show that according to all MIT definitions offered in previous literature, Baltic countries cannot be considered to be in the MIT.

We find that the recipe for avoiding middle income trap consists of strong public sector with abilities to implement structural reforms, low corruption, income equality, business friendly and free economy, strong institutions, sound macroeconomic environment with low inflation, advanced and equally available tertiary education, business-friendly regulations and taxation, highly sophisticated yet diversified exports, and economic structure with small government and large share of investments.

In addition to bringing attention to over 100 economic indicators that have significant impact over MIT likelihood; we have challenged the presumption of middle income trap in Baltics. Nevertheless, with increasing absolute income level and income level relatively to trading partners, the probability of Baltic States facing the trap will increase; hence, continuous structural reforms are necessary in order to maintain the MIT probability low also in the future.

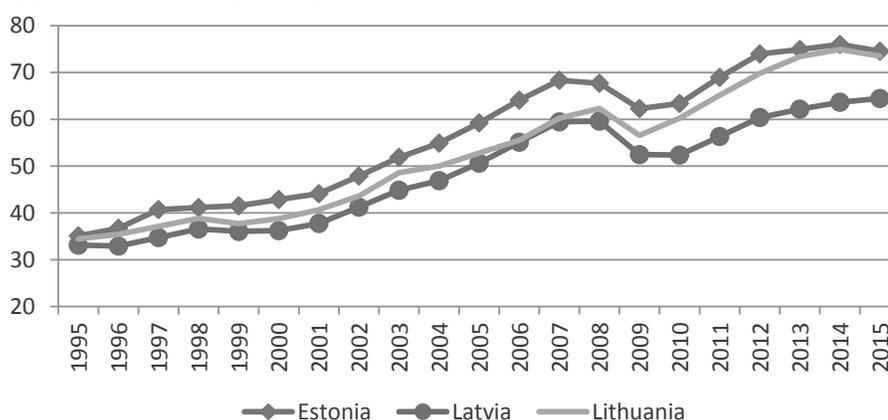
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### Appendix A. GDP per capita PPS of the Baltic States (index; EU28 = 100)



Source: Eurostat data. Graph created by authors.

### Appendix B. All middle income level countries identified between 1960 and 2014.

Country	# of observ.	% trapped	Country	# of observ.	% trapped	Country	# of observ.	% trapped
Albania	3	0	Mauritius	29	17	Lebanon	43	40
Austria	11	0	Serbia	17	18	Iran, Islamic Rep.	48	40
Belarus	13	0	Ireland	39	18	Croatia	24	42
China	3	0	Slovak Rep.	25	20	Uruguay	55	44
Finland	21	0	Thailand	18	22	Greece	55	45
France	9	0	Italy	21	24	Macedonia, FYR	23	48
Hong Kong SAR	32	0	Hungary	44	25	Guatemala	35	49
Japan	16	0	Colombia	53	26	New Zealand	32	50
Korea, Rep.	39	0	Bulgaria	37	27	Algeria	36	53
Latvia	21	0	Brazil	55	27	South Africa	20	55
Lithuania	21	0	Costa Rica	55	27	Jordan	16	56
Malaysia	34	0	Turkey	55	27	Peru	36	58
Montenegro	5	0	Ukraine	7	29	Nicaragua	21	62
Tunisia	3	0	Mexico	55	29	Equatorial Guinea	12	67
Dominican Rep.	41	2	Poland	44	30	Jamaica	55	67
Macao SAR	30	3	Portugal	55	31	Venezuela, RB	55	67
Malta	44	9	Spain	55	31	Argentina	51	69
Panama	49	12	Romania	41	32	Ecuador	26	69
Czech Republic	24	13	UK	22	32	Barbados	11	100
Singapore	31	13	Cyprus	55	33	Bolivia	11	100
Israel	55	15	Russian Fed.	24	33	Djibouti	4	100
Estonia	24	17	Suriname	44	34	El Salvador	27	100
Slovenia	24	17	Chile	55	35			

Source: created by the authors

## Appendix C. Prediction models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
GDP per capita x1000	0.147**	0.313***		0.131*		1.340***	0.197***		
Investment % of GDP	-0.088***	-0.052***		-0.057**	-0.035**		-0.060**		
Gov. % of GDP	0.135***	0.215***	0.155***	0.115***	0.202***	0.801**	0.233***	0.330***	0.359***
(Relative) Trade openness	-0.026***	-0.032***	-0.040***					-0.028***	-0.030***
(Relative) Freedom to trade internationally	-0.014**			-0.020***	-0.019***				
(Relative) Legal System & Property Rights	-0.016**		-0.020***	-0.018**	-0.013***				
Tertiary edu.enrol.	-0.047***	-0.029***		-0.031***					
FDI net inflows (% of GDP)	-0.086**		-0.126**						
Current Account	-0.081***		-0.069**	-0.059**					
Price lev. of cap. stock	1.022*			1.802***					
Inflation	0.007***		0.009***	0.008***		0.075***			
(Relative) Relative TP wealth	3.622***		3.796***	2.657*	3.568***			5.551**	5.595**
(Relative) Extensive Margin	0.012***								
(Relative) Credit market regulations	-0.010*								
Legal System & Property Rights		-0.242**							
Regulation		-0.262**							
Freedom to trade internationally		-0.251***							
(Relative) Tertiary edu.enrol.			-0.009**						
Consumption % of GDP			-0.054**						
(Relative) Price lev. of cap. stock			0.010**						
Export Diversification			0.548**		0.367*				
Economic Complexity			-0.690*	-0.684*					
Trade openness				-0.042***			-0.026***		
(Relative) Sound Money					-0.013***				
(Relative) Exports % as of GDP					-0.026***				
TP growth					-45.88***				
Price of investment						0.116***		0.032**	0.036**
Size of Government						-1.424**			
Protection of property rights						-1.717**			
Credit market regulations						-1.504***			
GINI index (World Bank estimate)						0.512***		0.133**	0.138**
(Relative) Researchers in R&D (per million people)						-0.002***			
Tariff rate, applied, simple mean, all products (%)						0.822***			
Cash surplus % of GDP						-0.395*			
Taxes on income, profits and capital gains (% of revenue)							0.059**	0.053*	0.063**
Taxes on goods and services (% of revenue)							-0.090***	-0.057*	-0.053*
Government Effectiveness (estimate)							-1.793***		
Control of Corruption (estimate)								-1.030*	
Lending interest rate								0.008**	
Voice and Accountability (estimate)									-1.330*
Interest rate spread (lending rate minus deposit rate, %)									0.025**
Observations	1143	1420	1078	1096	1564	471	768	583	578

\*\*\*, \*\*, \*: statistically significant at 1, 5 and 10 significance level respectively.

Model 1 is the main MIT prediction model.

Source: created by the authors

## Appendix D. Cross-correlations table of the variables used in a main prediction model

	GDP per capita	Investment (% of GDP)	Government (% of GDP)	Trade openness	Freedom to trade internationally	Legal system & property rights	Enrolment in tertiary education	FDI, net inflows (% of GDP)	Current account balance	Price level of capital stock	Inflation	Inc. level relative to trading partners	Extensive trade diversification	Credit market regulations
GDP per capita	1.00													
Investment (% of GDP)	0.04	1.00												
Government (% of GDP)	0.43	0.00	1.00											
Trade openness	0.01	0.17	0.19	1.00										
Freedom to trade internationally	0.30	-0.02	0.19	0.16	1.00									
Legal system & property rights	0.55	0.12	0.29	0.09	0.42	1.00								
Enrolment in tertiary education	0.64	0.02	0.25	-0.02	0.12	0.22	1.00							
FDI, net inflows (% of GDP)	0.18	-0.04	0.10	0.25	0.08	0.14	0.14	1.00						
Current account balance	-0.01	-0.17	-0.10	-0.01	-0.09	-0.06	0.02	-0.19	1.00					
Price level of capital stock	0.50	-0.08	0.16	0.10	0.06	0.12	0.38	0.14	-0.15	1.00				
Inflation	-0.12	-0.01	0.00	-0.09	-0.11	-0.14	-0.04	-0.07	0.04	-0.10	1.00			
Inc. level relative to trading partners	0.91	0.07	0.45	-0.08	0.33	0.55	0.52	0.06	-0.02	0.38	-0.09	1.00		
Extensive trade diversification	-0.15	-0.12	-0.14	-0.01	-0.22	-0.24	-0.12	0.14	0.00	0.21	-0.02	-0.22	1.00	
Credit market regulations	0.00	-0.09	-0.27	0.20	0.36	0.03	-0.09	0.02	-0.02	0.04	-0.28	-0.01	-0.01	1.00

Source: created by the authors

## Appendix E. Example of individual regressions

Logit regressions	Model 1	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10	Model 2	Model 3	Model 4	Model 5
Population growth	25.17	-2.666	-7.444	8.312	-4.402	37.26**	0.392	-2.973	-0.041	4.683	-2.337	2.467	33.21	18.72	3.653
GDP per capita x1000	0.145**	0.214***	0.273***	0.278***	0.262***	0.184***	0.160***	0.283***	0.245***	0.227***	0.267***	0.311***		0.125*	
Investment (% of GDP)	-0.087***	-0.070***	-0.051***	-0.046**	-0.050***	-0.067***	-0.070***	-0.062***	-0.065***	-0.068***	-0.047**	-0.056***		-0.057**	-0.026
Government (% of GDP)	0.137***	0.253***	0.253***	0.248***	0.249***	0.228***	0.240***	0.224***	0.254***	0.271***	0.230***	0.216***	0.163***	0.118***	0.202***
(Relative) Trade openness	-0.027***	-0.033***	-0.036***	-0.043***	-0.040***	-0.031***	-0.031***	-0.036***	-0.032***	-0.029***	-0.036***	-0.032***	-0.040***		
Enrolment in tertiary education	-0.045***	-0.039***	-0.045***	-0.041***	-0.035***	-0.037***	-0.043***	-0.034***	-0.041***	-0.049***	-0.040***	-0.038***		-0.028**	
(Relative) Freedom to trade internationally	-0.013**		-0.023***									-0.017***		-0.019***	-0.018***
(Relative) Legal system & property rights	-0.015**			-0.024***								-0.018**		-0.017**	-0.012***
Foreign direct investment, net inflows (% of GDP)	-0.082**				-0.146***							-0.104**			
Current account balance	-0.077**					-0.020						-0.060*		-0.057*	
Price level of capital stock	1.058*						1.399***							1.856***	
Inflation	0.007***							0.012***							
Income level relative to trading partners	3.517***								-1.406				3.550***	2.466*	3.591***
(Relative) Extensive trade diversification	0.012***									0.009***					
(Relative) Credit market regulations	-0.011**										-0.018***				
Legal system & property rights												-0.286***			
Regulation												-0.288**			
Private consumption (% of GDP)													-0.055**		
Trade openness														-0.041***	
(Relative) Enrolment in tertiary education													-0.009**		
(Relative) Price level of capital stock													0.010**		
Export diversification													0.400		0.422**
Economic Complexity Index													-0.643*	-0.607*	
(Relative) Exports (% of GDP)															-0.025***
(Relative) Access to Sound Money															-0.014***
Trading partners growth															-46.87***
_cons	0.618	-2.142**	-0.572	-0.277	-2.128**	-1.837**	-2.053**	-3.203***	-1.811**	-3.521***	-1.048	1.791	1.587	1.453	0.528
N	1146	1650	1529	1473	1553	1375	1650	1463	1650	1645	1522	1413	1081	1099	1543

Source: Authors' calculations.

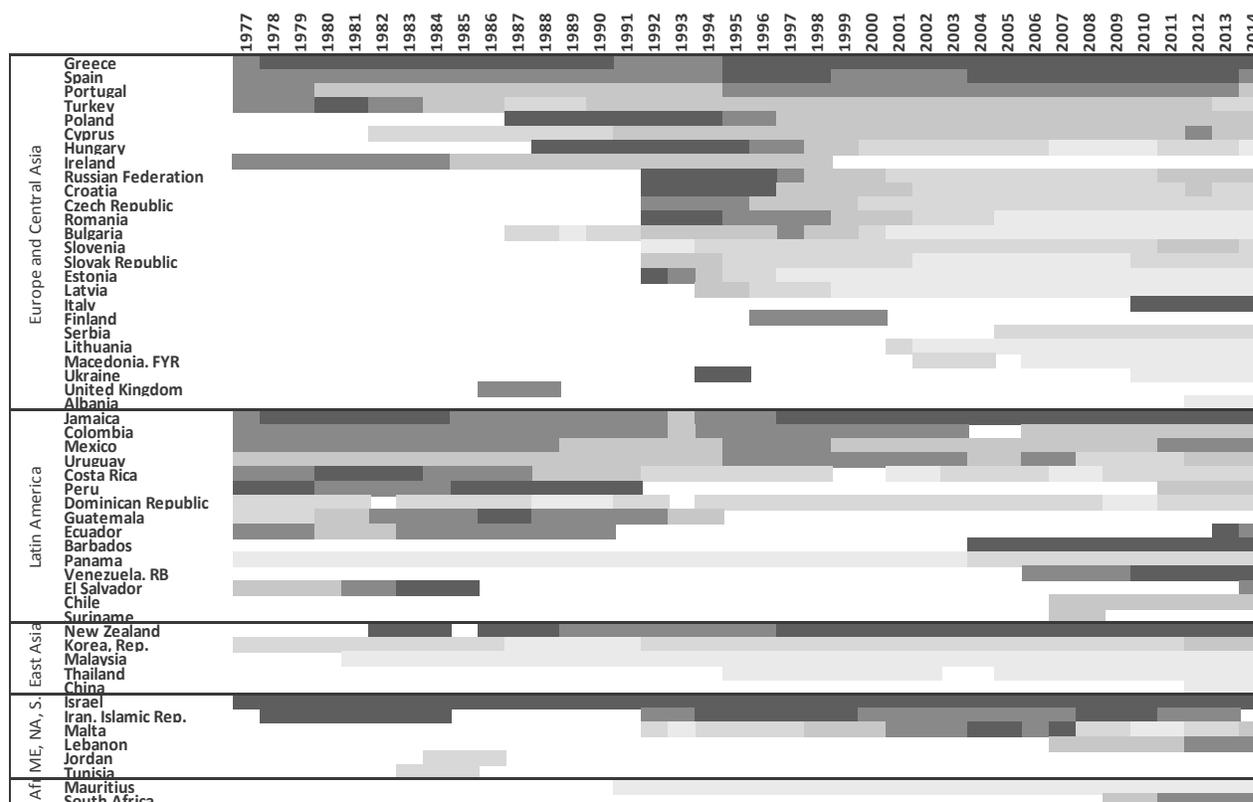
\* Statistically significant at the 10% level.

\*\* Statistically significant at the 5% level.

\*\*\* Statistically significant at the 1% level.

Source: created by the authors

## Appendix F. Estimated MIT probabilities using the main prediction model for all countries in specific year



Created by the authors. Five tones of the orange colour represent our estimated probability for country being in middle income trap in specific year. The darker the colour, the higher is our main regression model's estimated probability. Colours are divided into five equal quintiles.

## Appendix G. Scenario adjustments

Factors	Current values					Adjustment (HIC)			Adjustment (MIC)		
	HIC	MIC	EE	LV	LT	EE	LV	LT	EE	LV	LT
Investment (% of GDP)	21.7	23.2	28.0	24.6	19.8	0.0	0.0	2.0	-4.9	-1.4	3.4
Government (% of GDP)	18.5	16.4	19.1	18.6	17.3	-0.5	-0.1	0.0	-2.6	-2.2	-0.9
(Relative) Freedom to trade internationally	107	100	112	110	104	0.0	0.0	3.7	-11.7	-9.7	-3.7
(Relative) Legal system & property rights	140	100	129	115	113	11.2	25.0	26.9	-29.1	-15.3	-13.4
Enrolment in tertiary education	69.2	58.3	76.9	66.3	72.6	0.0	2.9	0.0	-18.5	-7.9	-14.3
(Relative) Credit market regulations	108	100	119	108	113	0.0	0.0	0.0	-19.5	-8.5	-12.8
Freedom to trade internationally	7.9	7.3	8.2	8.0	7.6	0.0	0.0	0.3	-0.9	-0.8	-0.3
Legal system & property rights	7.9	5.6	7.3	6.5	6.4	0.6	1.4	1.5	-1.7	-0.9	-0.8
Regulation	7.8	6.9	7.8	7.5	7.8	0.0	0.3	0.0	-0.9	-0.6	-0.9
(Relative) Private consumption (% of GDP)	51.5	61.7	50.2	60.6	63.0	1.3	0.0	0.0	11.5	1.1	-1.3
(Relative) Enrolment in tertiary education	119	100	132	114	125	0.0	5.0	0.0	-32.4	-14.2	-25.1
Economic Complexity Index	1.3	0.4	0.8	0.6	0.7	0.5	0.6	0.6	-0.4	-0.3	-0.3
GINI index	31.1	39.2	33.0	35.6	34.5	-2.0	-4.6	-3.5	6.1	3.6	4.7
(Relative) Size of government	5.7	6.4	6.0	5.8	7.1	0.0	0.0	0.0	0.5	0.7	-0.7
Protection of property rights	8.0	5.3	7.0	5.7	5.4	1.1	2.3	2.6	-1.7	-0.4	-0.1
Credit market regulations	9.0	8.3	10.0	9.1	9.4	0.0	0.0	0.0	-1.6	-0.7	-1.1
Researchers in R&D (per million people)	4718	1714	3384	1858	2792	1334	2860	1926	-1669	-144	-1077
Government budget balance (% of GDP)	-0.4	-3.1	0.7	-1.5	-0.7	0.0	1.1	0.3	-3.8	-1.6	-2.4
Taxes on income, profits and capital gains	31.5	22.4	8.7	8.5	8.6	0.0	0.0	0.0	13.7	13.9	13.8
Taxes on goods and services (% of revenue)	27.3	32.9	40.4	35.5	36.3	0.0	0.0	0.0	-7.5	-2.6	-3.4
Government effectiveness	1.6	0.3	1.0	0.8	0.8	0.6	0.8	0.8	-0.7	-0.5	-0.5
Control of corruption	1.8	0.1	1.1	0.2	0.3	0.7	1.5	1.4	-1.0	-0.2	-0.3
Voice and accountability	1.1	0.3	1.1	0.8	0.9	0.0	0.4	0.2	-0.9	-0.5	-0.7

Source: created by the authors

**Appendix H. Probability of Middle Income Trap for the Baltic States with “Higher-income country” and “Middle-income country” scenario adjustments**

	Model									
	1	2	3	4	5	6	7	8	9	Average
Estonia	<b>0.5</b>	4.0	0.9	0.9	2.8	0.0	1.2	1.0	0.7	1.3
Estonia - HIC	<b>0.4</b>	3.1	0.5	0.5	2.2	0.0	0.4	0.3	0.5	0.9
Estonia - MIC	<b>2.7</b>	11.0	1.0	4.0	3.5	12.3	12.5	7.5	6.6	6.8
Latvia	<b>2.1</b>	6.0	4.5	4.4	8.3	0.1	2.6	13.1	8.4	5.5
Latvia - HIC	<b>1.2</b>	3.7	1.7	1.7	6.0	0.0	0.7	1.6	2.9	2.2
Latvia - MIC	<b>4.0</b>	8.6	5.4	8.4	8.2	0.4	11.6	24.6	25.7	10.8
Lithuania	<b>1.8</b>	4.7	1.7	2.5	4.2	0.0	2.2	1.8	0.8	2.2
Lithuania - HIC	<b>1.0</b>	2.8	0.7	0.9	2.6	0.0	0.5	0.3	0.4	1.0
Lithuania - MIC	<b>3.4</b>	7.8	3.1	4.8	4.0	0.1	10.4	7.4	6.3	5.2
Mean MIT probability:										
Trapped observations	<b>58.7</b>	43.6	51.3	54.6	42.1	54.1	37.3	41.7	39.6	47
All observations	<b>31.6</b>	28.9	29.5	30.2	26.5	20.8	22.2	20.3	19.5	25.5
Non-trapped observations	<b>20.0</b>	22.8	20.3	20.1	20	10.6	16.9	13.8	13.7	17.6

*Source: created by the authors*

**Appendix I. Predicted MIT probabilities for all countries in 2014**

Country	MIT probability	Country	MIT probability
Albania	0.35	Macedonia, FYR	0.65
Barbados	93.50	Malaysia	0.03
Bulgaria	1.12	Malta	27.50
Chile	14.86	Mauritius	0.78
China	0.46	Mexico	30.19
Colombia	16.49	New Zealand	96.03
Costa Rica	5.56	Panama	2.47
Croatia	8.67	Peru	16.85
Cyprus	23.82	Poland	16.26
Czech Republic	3.85	Portugal	23.20
Dominican Republic	4.58	Romania	0.45
Ecuador	68.28	Russian Federation	13.69
El Salvador	67.24	Serbia	5.89
Estonia	0.46	Slovak Republic	4.77
Greece	79.06	Slovenia	9.23
Hungary	1.96	South Africa	41.08
Israel	90.12	Spain	65.95
Italy	89.30	Thailand	0.13
Jamaica	94.27	Turkey	6.86
Korea, Rep.	13.79	Ukraine	1.59
Latvia	2.06	Uruguay	16.20
Lebanon	46.66	Venezuela, RB	85.89
Lithuania	1.82	Macedonia, FYR	0.65

*Source: created by the authors*

## Appendix J. Data sources.

	Descriptions	Sources	Start	End	# of obs.		Descriptions	Sources	Start	End	# of obs.
Economic Development	Extensive trade diversification	IMF	1962	2010	2149	Governance	Cooperation in labor-employer relations	WEF	2006	2014	419
	Enrolment in tertiary education	WDI	1970	2014	1760		Diversion of public funds	WEF	2006	2014	419
	Domestic credit by financial sector (% of GDP)	WDI	1997	2014	420		Wastefulness of government spending	WEF	2006	2014	419
	Pay and productivity	WEF	2006	2014	419		Burden of government regulation	WEF	2006	2014	419
	Education expenditure (% of GDP)	WDI	1970	2014	1575		Voice and accountability	WGI	1996	2014	973
	Government exp. on education (% of GDP)	WDI	1970	2014	1575		Government efficiency	WEF	2006	2014	419
	Compensation of employees (% of expense)	WDI	1990	2013	871		Control of corruption	WGI	1996	2014	973
	GDP per capita	WDI	1955	2014	2154		Legal system & property rights	EF	1970	2013	1627
	Prevalence of foreign ownership	WEF	2006	2014	419		Government effectiveness	WGI	1996	2014	973
	Availability of financial services	WEF	2006	2014	270		Resource efficiency	BTI	2004	2014	389
	Domestic credit to private sector	WDI	1997	2014	420		Protection of property rights	EF	1995	2013	826
	Credit market regulations	EF	1970	2013	1751		Market Economy Status Index	BTI	2004	2014	389
	Technological adoption	WEF	2006	2014	270		Ethical behavior of firms	WEF	2006	2014	419
	PCT patents, applications/million pop	WEF	2006	2014	184		Corporate ethics	WEF	2006	2014	419
	Innovation and business sophistication	WEF	2006	2014	380		Insitutions	WEF	2006	2014	419
	Economic Freedom Index	EF	1970	2013	1661		Ethics and corruption	WEF	2006	2014	419
	Self-employed (% of total employed)	WDI	1980	2014	1165		Efficiency of legal framework in settling disp.	WEF	2006	2014	308
	Health expenditure (% of GDP)	WDI	1995	2013	1004		Effect of taxation on incentives to invest	WEF	2006	2014	142
	Export diversification	IMF	1962	2010	2149		Anti-corruption policy	BTI	2004	2014	389
	Global Competitiveness Index	WEF	2006	2014	380		Rule of law (WGI)	WGI	1996	2014	973
	Total Factor Productivity	PWT	1955	2011	1912		Efficient use of talent	WEF	2006	2014	419
	Economic Complexity Index	OEC	1964	2013	1912		GINI index	WDI	1981	2013	1022
	Researchers in R&D (per million people)	WDI	1996	2014	744		Judicial independence (WEF)	WEF	2006	2014	419
	Labor force with tertiary education (% of total)	WDI	1982	2014	901		Black market exchange rates	EF	1970	2013	1776
	Quality of overall infrastructure	WEF	2006	2014	419		Policy coordination	BTI	2004	2014	389
	Urban population (% of total)	WDI	1960	2014	2154		Political and social integration	BTI	2004	2014	389
	Population growth	PWT*	1954	2014	2097		Organization of the market and competition	BTI	2004	2014	389
	Market capitalization to GDP	WDI	1975	2014	1020		Welfare regime	BTI	2004	2014	389
	Government (% of GDP)	PWT	1960	2014	2031		Civil rights	BTI	2004	2014	389
	Investment (% of GDP)	PWT	1960	2014	1987		Accountability	WEF	2006	2014	419
	Agriculture (% of GDP)	WDI	1960	2014	1537		No. of days to start a business	WEF	2006	2014	401
	Trade openness	PWT	1955	2009	2147		Organization of the market and competition	BTI	2004	2014	389
	Regulatory trade barriers	EF	1995	2013	830		Public institutions	WEF	2006	2014	419
	Tariffs	EF	1970	2013	1712		Flexibility of wage determination	WEF	2006	2014	419
	Imports (% of GDP)	WDI	1960	2014	2033		BTI Status Index (democracy and market)	BTI	2004	2014	389
	Freedom to trade internationally	EF	1970	2013	1714		Rule of law (BTI)	BTI	2004	2014	389
	Mean tariff rate (%)	WDI	1988	2013	1116		Social capital	BTI	2004	2014	389
Exports (% of GDP)	WDI	1960	2014	2033	Regulation	EF	1970	2013	1614		
Price level of imports	PWT	1955	2011	2097	Country capacity to retain talent	WEF	2006	2014	142		
Current account balance	WDI	1980	2015	1531	Irregular payments and bribes	WEF	2006	2014	270		
Price level of exports	PWT	1955	2011	2097	Taxes on goods and services (% of revenue)	WDI	1990	2013	855		
Inflation	WDI	1961	2014	1851	Stateness (BTI)	BTI	2004	2014	389		
Government budget balance (% of GDP)	WDI	1990	2013	857	Regulatory Quality	WGI	1996	2014	973		
Price level of capital stock	PWT	1955	2011	2097	Country capacity to attract talent	WEF	2006	2014	142		
FDI, net inflows (% of GDP)	WDI	1970	2014	1738	Judicial independence (EF)	EF	1995	2013	821		
Macroeconomic environment	WEF	2006	2014	419	Taxes on income, profits and capital gains	WDI	1990	2013	862		
Standard deviation of inflation	EF	1970	2013	1761	Steering capability	BTI	2004	2014	389		
Access to Sound Money	EF	1970	2013	1772	Undue influence	WEF	2006	2014	419		
Interest rate spread (%)	WDI	1960	2014	1367	Top marginal tax rate	EF	1970	2013	1516		
Money growth	EF	1970	2013	1717	Labor market regulations	EF	1970	2013	1070		
Employment of population (%)	PWT*	1955	2014	2077	Impartial courts	EF	1995	2013	933		
Region GDP growth	WDI*	1960	2014	2154	Ease of access to loans	WEF	2006	2014	419		
Real effective exchange rate	Bruegel	1960	2015	2097	Resolving insolvency	EODB	2003	2015	479		
Income level relative to trading partners	WDI &	1960	2014	2147							

\*Compiled by authors using data from given source.

Data gathered from the World Bank, World Development Indicators (WDI), Penn World Tables (PWT), Economic Freedom of the World by the Fraser Institute (EF), Global Competitiveness Report by World Economic Forum (WEF), Bertelsmann Stiftung Index (BTI), Bruegel datasets, Ease of Doing Business (EODB) and World Governance Indices (WGI). As BTI surveys are conducted over two years before reporting, we lag all data by two years to more appropriately correspond to the year of possible trap. Similarly, we lag all GCR variables by one year because of many variables that actually correspond to previous years.

Source: created by the authors