An Empirical Remark about Middle Income Trap Problem for Turkey*

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Abstract

This study has been performed to indicate the causality relationship between the middle income trap and the factors which are considered to be reasons for this trap in Turkey. It is expected that revealing this relationship in an empirical way will contribute scientifically to this new concept. Starting from this point of view, the relationship between middle income trap, high technology export and public spending on education has been researched. It is thought that these factors are necessary indicators for Turkey to overcome the trap even though it has been a country of upper middle income group. Time serial analysis made for the years 1983-2013 suggests that Turkey can overcome the middle-income trap if it attaches enough importance for public spending on education.

Key Words: Middle Income Trap, Granger-Causality, High Technology Export, Public Spending on Education.

JEL Classification Codes: O11, O38, O40.

Türkiye'nin Orta Gelir Tuzağı Problemine İlişkin Ampirik Bir Yorum

Bu çalışma, orta gelir tuzağı ve Türkiye'de bu tuzağa sebep olduğu düşünülen faktörler arasındaki nedensellik ilişkisini ortaya koyabilmek amacıyla oluşturulmuştur. Ampirik yoldan bu ilişkinin ortaya çıkartılmasının, bu yeni kavrama bilimsel katkıda bulunacağı ümit edilmektedir. Bundan hareketle, orta gelir tuzağı ile "yüksek teknoloji ihracatı" ve "eğitim için kamu harcamaları" arasındaki ilişki araştırılmıştır. Bu faktörlerin, üst orta gelir grubunda bir ülke olmasına rağmen uzun yıllardır Türkiye'nin içine düştüğü bu tuzaktan çıkması için gerekli belirleyiciler olduğu düşünülmüştür. 1983-2013 dönemi için yapılan zaman serisi analizleri Türkiye'nin, eğitim alanında kamu harcamalarına gerekli önemi verirse, orta gelir tuzağından çıkmasına yardımcı olacağını göstermektedir.

Anahtar Kelimeler: Orta Gelir Tuzağı, Granger Nedensellik, Yüksek Teknoloji İhracatı, Eğitime Yapılan Kamu Harcamaları.

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Introduction

Many of the developed market economies grew rapidly during mid-20th century and first decade of 21st century from low income to middle income level. High income level is the next level which is much more challenging for countries to reach. In its simplest form, middle income trap is the state of inability to go over a certain level of income per capita. This concept has become a frequently-used term in developing countries which entered into a process of recession after reaching a certain income level as well as in the context of international development.

Middle income trap is a newly-emerging concept in the literature of economics. This concept was first introduced in the 2007 "An East Asian Renaissance" report of World Bank, which suggests that middle-income countries will develop at a lower rate than high and low-income countries. On the other hand, in developing countries and international development climates, where the economy falls into stagnation once the income level reaches to a certain level, it has transformed into an influential concept related to economic growth and development. In its simplest definition, it is the situation whereby income per capita cannot rise beyond a certain level. While it is not clear that what certain income level should be considered as middle income level, 20% of the income per capita in United States of America (USA) was accepted as the middle income level in developing countries when this approach was first emerged (Gill and Kharas, 2007 ; Xon et al., 2013; Eğilmez, 2014).

World Bank classifies economies based on per capita income as low-income countries for less then 1.045 dollars, middle-income for between 1.045 – 12.745 dollars, lower-middle-income for between 1.045 – 4.125 dollars, upper-middle-income for between 4.125 – 12.745 dollars and high-income countries for 12.745 dollars or higher for the year 2015. Proceeding from this categorisation, the concept "middle-income trap" defines the countries of 16.700 dollars per capita income in the prices of 2005. Turkey, according to this definition, falls therefore into the group of upper-middle-income countries (World Bank, 2015). Felipe et al. (2012) suggests that if a country is stuck for 28 years or longer in lower-middle-income level, it means it is stuck in lower-middle-income trap. They define upper-middle-income trap as getting stuck in that level of income for 14 or more years and to break free from it, the country must raise its per capita income by at least 3,5%.

While there are many researches on the reasons of middle-income trap from many different perspectives, researches on empirical identification of it are quite limited. Therefore we think that, this research makes a contribution to the literature by examining the causality between the middle-income trap and the factors behind it.

The paper is organized as follows. The following chapter reviews the and the next section describes the data and presents the methodological

framework. It also reveals the exact causality relations between middle income trap and high technology export and public spending on education, which are considered to be important for Turkey to escape middle income trap, by employing time-series analysis for the period between 1983-2013. Final chapter of the study, on the other hand, interprets the results attained and offers recommend.

1. Literature Review

While there is considerable literature on the causes of middle income trap, when the limited literature on the empirical identification of it is analysed, it is noted that there is evidence on the on the basis of different countries and indicators.

Cai (2012), explains that if a country goes through a long period of development at middle-income level and then on reaches high-income level, it would have fallen in middle-income trap. The author also states that middle-income countries are the least benefiting from globalisation since they do not have comparative advantages over technology and labour intensive industries and this causes them to fall into the middle-income trap. In the article he examines the difficulties of determining how to smoothly raise China from middle-income level to high income level through calculating demographic changes, changing resource allocations and growth models. He argues that issues like increasing total factor productivity and human capital stock should be intensified. Moreover, he emphasises that China still has a long way to go before it can acquire relative superiority and international competitive power in technology and labour intensive industries. In a research on estimating the recovery rates of different economies from around the world compared to the economy of USA, Xon et al. (2013) concluded that for countries in whose foreign trade volumes high technology products are a majority, economic stagnation poses a relatively lower risk. They assert that stocking qualified human capital and producing high technology export products lower the risk of falling into the middle-income trap. These findings are compatible with those of Eichengreen et al. (2013) from their analysis on the frequency of stagnations and related factors in middle-income countries during economic growth. They also suggest that the more high technology products in foreign trade volume mean a lower risk of stagnation. Flechtner and Panther (2013), on the other hand, in their theoretical study of middle-income trap from an economical point of view, focus more on the importance of building a high quality education system in order to ensure technological advances to increase innovation so as to escape the trap. Yılmaz (2014) compares Turkey in his research with countries still in the trap and with those who have escaped it, and highlights the importance of capable and highly proficient human capital, and innovative and competitive production capacity to escape the trap. In their study where they discuss the issue of middle income trap by addressing the newly

industrializing Asian economies, Kanchoochat and Intarakumnerd (2014) argue that education must be associated with the national development strategy if it is to support economic growth directly. Moreover, they emphasize that high value-added production and export must be at the heart of policies. In his study, Staehr (2015) concluded that the Baltic countries are at risk of middle income trap due to the fact that the economic growth of the Baltic countries is slow and the process of convergence between the European countries has slowed down. He argues that it is necessary to launch comprehensive programs on education, entrepreneurship, infrastructure and economic management and follow the implementation of these programs closely. Dabus et al.(2016) research the conditions which are likely to drive the open economies into the middle income trap and addresses the Argentina example. The model which is formed within the scope of this study covers the general balance in the open economies which are considered the price takers and the exporters of the main products. It is discussed that the growth shall be stabilized after a certain point with the impact of decreasing income and in the case that there is not a high demand for the exported products the country's economy shall get stuck in the middle income trap.

Research on the countries that escaped the middle-income trap points out the importance of human capital as in the proficiency and capacity of high technology production. Furthermore, it is also apparent that reallocating structural transformation to support high productivity and knowledge-based manufacturing would also help escape the middle-income trap. Although the middle-income trap negatively affects competitiveness in international trade, specialising in low-cost and low-proficiency activities might contribute greatly during this process. When the productivity profits are drained, countries face the trouble of raising the per capita income without giving up on their competitiveness.

2. Data, Variable Definitions and Methodology

The causality between variables firstly entered into the literature with Granger (1969). The causality relationship can be shown by some equations that are also used in this study. However, there are some conditions for conducting these causality equations. One of is; variables should be stationary. If the variables are not stationary then some methods should be applied to overcome this problem. The Phillips-Perron test is one of them that is proposed by Phillips and Perron (1988), which is also preferred in this study. Before explaining methodology, the related data and variable definitions will be handled.

As an endogenous variable the middle income trap is used. The middle income trap in this study is based on 20% of income per capita of USA. However, this ratio corresponding to an exact number but the middle income trap is not a certain number. It is a range between defined intervals. So we

calculated this range dividing Turkey's Gross Domestic Product (GDP) per capita to USA's GDP per capita. The ratio was around 15%. So we accept the middle income trap that the ratios bigger than 15% and lower than 20%. Because it is taught that we can converge the 20% of USA's income definition by this way.

While for middle income trap calculations GDP per capita, with constant 2005 US$ time series is used. And for the probable determiners of escaping from this trap "public spending on education", "high technology export" and "GDP per capita" are used.

In order to investigate whether there is a causal relationship between the middle income trap and public spending on education, high technology export, GDP per capita of Turkey, yearly data covering the period 1983-2013 are used. All the data are extracted from the World Bank. The missing years are obtained from Eurostat, Turkish Statistical Institute (TurkStat) and Repuclic of Turkey Ministry of National Education's web site.

In this study, the term "Middle Income Trap" is abbreviated as "Trap". For the calculation of Trap the GDP per capita with constant 2005 US$ time series is used. For determining the causality between Trap and some explanatory variables, bidirectional equations are used first. Here the explanatory variables for Trap are "Public Spending on Education (PS)", "High-technology Exports (HE)", "GDP per capita (GDP)". In here it is important to note that in all calculations in equations seen below the logarithm of GDP is considered. Four equations of Granger-causality test in the standard form can be seen below[1]:

$$\Delta Y_t = \alpha_{11} + \sum_{i=1}^{L_{11}} \beta_{11i} \Delta Y_{t-i} + \varepsilon_{11t} \quad (1)$$

$$\Delta Y_t = \alpha_{12} + \sum_{i=1}^{L_{11}} \beta_{11i} \Delta Y_{t-i} + \sum_{j=1}^{L_{12}} \beta_{12j} \Delta X_{t-j} + \varepsilon_{12t} \quad (2)$$

$$\Delta X_t = \alpha_{21} + \sum_{i=1}^{L_{21}} \beta_{21i} \Delta X_{t-i} + \varepsilon_{21t} \quad (3)$$

$$\Delta X_t = \alpha_{22} + \sum_{i=1}^{L_{21}} \beta_{21i} \Delta X_{t-i} + \sum_{j=1}^{L_{22}} \beta_{22j} \Delta Y_{t-j} + \varepsilon_{22t} \quad (4)$$

The symbol Δ represents difference. Y_t and X_t are Trap and the factors that are affecting Trap (PS, HE, and GDP). L, represents the variables' lag

[1] The detailed information about theoretical background can be found in Granger (1969), Yang (2000). The methodology in Yang (2000) is followed in this study.

count, and α and β are the parameters that will be estimated. Lastly, ε_t represents term of error. We compare equation (1) and equation (2) and after this comparison, we check the final prediction errors (FPEs). If equation (2)'s FPE is smaller than equation (1)'s, we understand that the added variable to equation (1) is Granger-cause of equation (1)'s dependent variable. The same procedure is applied for equation (3) and equation (4), but this time the variables are taken as reversely (Yang, 2000).

As it is also said in (Yang, 2000), for the case of variables are co-integrated, some other tests such as; error correction model, can be applied for detailed analysis (Engle and Granger, 1987). Choosing the optimal lag numbers for exogenous variables are important. Otherwise, there can be biased results about causality relationships. At this stage, Hsiao's (1981) method that combines FPE with Granger's causality test can be chosen for optimal lag selection (Akaike, 1969; Yang, 2000).

3. Empirical Results

Before showing and discussing the empirical results three graphs below can be analyzed. If we focus on these figures, it is seen that they will shed light on what is happening in the years between 1883 and 2013 about Trap and PS, HE and GDP in Turkey. In Figure 1 we see the relationship between Trap and PS with the raw data. It gives us some clues about the relationship by just looking to graph. We can say that in the duration of Trap PS increases. However, there are some exceptional cases as it is seen.

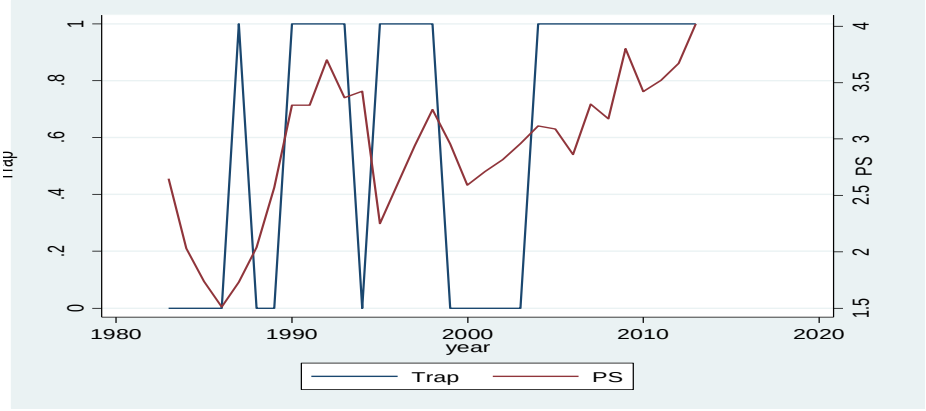

Figure 1- The Relationship between Middle Income Trap and Public Spending on Education in Turkey

Figure 2 and Figure 3 repeats the same procedure. In Figure 2 the relationship between Trap and HE becomes ambiguous as a whole and it also seems weak.

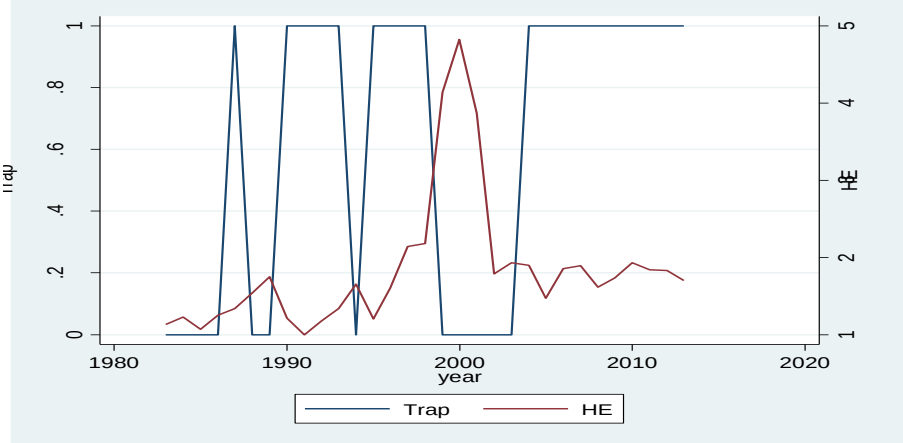

Figure 2- The Relationship between Middle income Trap and High Technology Export in Turkey

In Figure 3 the relationship between Trap and GDP is more obvious but, it is important to note that there is a continuing increase trend in GDP so it is not easy which variable affects the other. Therefore we need detail econometric analyses for the direction and magnitude of the relation.

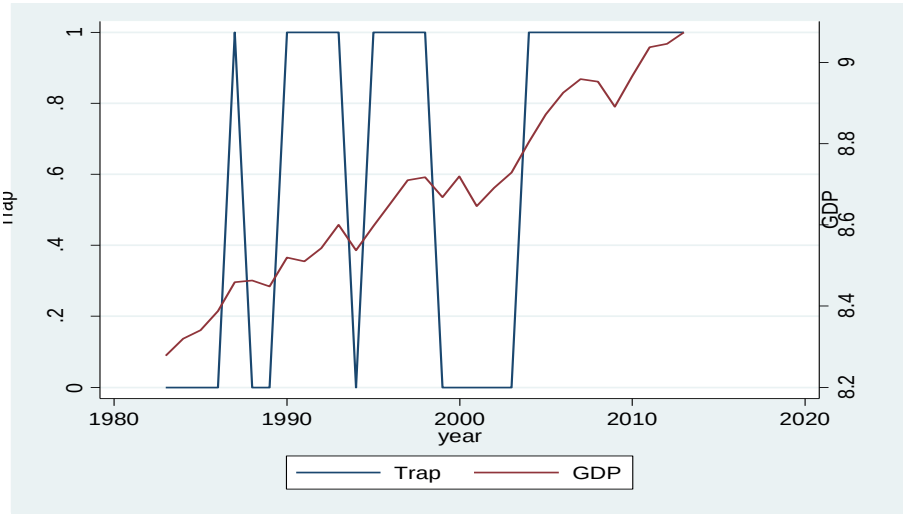

Figure 3- The Relationship between Middle income Trap and GDP per Capita in Turkey

The test results related with unit-root and co-integration tests are shown in Table 1 and Table 2. Table 1 shows the unit-root tests in yearly period between 1983-2013 for the middle income trap, public spending on education (% of GDP), high-technology exports (% of manufactured exports), GDP per capita (constant 2005 US$) variables. Phillips-Perron test for unit-roots and stationary are used in this study. As it is also seen in Table 1's first column, all variables' Phillips-Perron test value is greater than the -4.334 (critical value) at the level of 1% significance. This finding shows that the variables are not stationary.

Besides, when all the variables of series converted to their first difference at the 5% significance level, the non-stationary condition can be rejected. The first difference is supplied at %5 significance level because HE variable still greater than the critical value at the 1% significance level. Therefore, Granger-causality models for the 1983-2013 years can be predicted with first differenced data at the 5% significance level (the critical value at this significance is -3.58).

Table 1: Unit-Root Tests

Variables	Level Phillips-Perron value	First difference Phillips-Perrron value
Trap	-3.393	-7.829*
PS	-2.731	-5.447*
HE	-2.090	-4.044*
GDP (Log of GDP)	-2.996	-6.310*

Note: The critical value of the Phillips-Perron statistic at the ***10% level: -3.228, at the **5% level:-3.580, at the *1% level: -4.334.

Testing for co-integration is necessary, for the Trap-PS, Trap-HE, and Trap-GDP before performing the causality tests. In the case of existence co-integration between variables error-correction modeling should be applied. And after the application of error-correction there can be still a chance for continuing with causality tests. As it is shown in Table 2; the co-integration tests for Trap and explanatory variables are reported. Since The Phillips-Perron value for Trap and PS (-3.47) less than the critical value of -3.43 at the 5% significance level, therefore the null hypothesis of no cointegration is rejected. This implies that the Trap and PS are cointegrated[2]. The statistical

[2] For Trap-PS regression, the H_0 hypothesis is rejected, since $t > t_{critical}$ there is no co-integration cannot be accepted.

tests imply the opposite of this for Trap-HE and Trap-GDP variables. Therefore both of them are can be accepted as not co-integrated.

Table 2: Tests for Co-integration

Co-integration regressions	Series: 1983-2013 (yearly)	Error Correction Model
Trap-PS	-3.47	-3.31
Trap-HE	-2.75	no need
Trap-GDP (Log of GDP)	-2.96	no need

Note: The test described above in Table 2, is called as the Engle-Granger test. Regress dependent variable (Trap) on independent variables (PS, HE and GDP), save the residual then use these in Augmented Dickey-Fuller (ADF) regression. The critical value at the 5% significance level:-3.43, (the critical value of ADF(1) for lower than 50 observations (see.. Sjö, 2008).

Tests for causality relationships can be applied by using the equation (1)-(4) for the Granger-causality between Trap and HE or GDP. On the other hand, the error correction model should be applied for the Trap and PE variables. Therefore we applied the error correction model. After calculations, the t value for Trap and PS was -3.31 as it is seen from Table 2, which is now smaller than the -3.43 critical value. According to this finding; PS variable is also not co-integrated with Trap variable and the application of Granger's causality test is possible by using the equation (1)-(4) for the Granger-causality between Trap and PS also.

4. Tests Results from Granger's Causality

As stationary condition is considered, all the series that are used in this study are not satisfying the condition. Therefore, time series are converted to their stationary level by taking their differences. First difference is enough for the satisfaction condition. According to the results that are also shown in Table 3a, for the prediction of Trap-PS, since $3.8\ e^{-33} > 8.4\ e^{-34}$, the hypothesis that PS is Granger-cause of Trap is accepted. Likewise, since $1.5\ e^{-33} > 4.6\ e^{-34}$, it

can be expressed as Trap is also Granger-cause of PS. In addition to this, as also indicated in the last column of Table 3a, Trap-PS equation is statistically significant so it can be said that, there is uni-directional causality between Trap-PS from Trap to PS, because the reverse relationship is statistically insignificant.

As it is shown in Table 3b, according to the yearly calculated data that consist 1983-2013 period, for the equation of Trap-HE, since $3.8\ e^{-33} > 1.7\ e^{-33}$, we accept the hypothesis that HE is Granger-cause Trap. Likewise, for the HE-Trap equation, since $2.9\ e^{-34} > 2.0\ e^{-34}$, we can accept the hypothesis that Trap is Granger-cause of HE. In addition to this, as also indicated in the last column of Table 3b, Trap-HE equation is not statistically significant at any significance level and HE-Trap equation is also statistically not significant at any significance level. This means that there is not any bi-directional or uni-direcacartional causality between Trap-HE both from Trap to HE and from HE to Trap.

As it is shown in Table 3c, according to the yearly calculated data that consist 1983-2013 period, for the equation of Trap-GDP, since $3.8\ e^{-33} < 3.9\ e^{-28}$, we do not accept the hypothesis that GDP is Granger-cause Trap. Conversely, for the GDP-Trap equation, since $3.0\ e^{-76} > 1.0\ e^{-108}$, we can accept the hypothesis that Trap Granger-cause of GDP. In addition, as also indicated in the last column of Table 3c, Trap-GDP equation is not statistically significant at any significance level and GDP-Trap equation is also not statistically significant at any significance level therefore there is not any a bi-directional or uni-directional causality for Trap-GDP both from Trap to GDP and GDP to Trap.

Table 3: Tests for Granger's Causality between Trap[1] and Trap Determiners[2]

a) Regressions: 1983-2013 period yearly data for Trap-PS test	FPE	F-value
$\Delta Trap_t = \alpha_{11} + \sum_{i=1}^{2} \beta_{11i}\ \Delta Trap_{t-i} + \varepsilon_{11t}$	$3.8\ e^{-33}$	1.23
$\Delta Trap_t = \alpha_{12} + \sum_{i=1}^{1} \beta_{11i}\ \Delta Trap_{t-i} + \sum_{j=1}^{1} \beta_{12j}\ \Delta PS_{t-j} + \varepsilon_{12t}$	$8.4\ e^{-34}$	
$\Delta PS_t = \alpha_{21} + \sum_{i=1}^{1} \beta_{21i}\ \Delta PS_{t-i} + \varepsilon_{21t}$	$1.5\ e^{-33}$	1.19^{***}
$\Delta PS_t = \alpha_{22} + \sum_{i=1}^{1} \beta_{21i}\ \Delta PS_{t-i} + \sum_{i=1}^{1} \beta_{22i}\ \Delta Trap_{t-j} + \varepsilon_{22t}$	$4.6\ e^{-34}$	
b) Regressions: 1983-2013 period yearly data for Trap-HE test	FPE	F-value
$\Delta Trap_t = \alpha_{11} + \sum_{i=1}^{2} \beta_{11i}\ \Delta Trap_{t-i} + \varepsilon_{11t}$	$3.8e^{-33}$	1.26
$\Delta Trap_t = \alpha_{12} + \sum_{i=1}^{1} \beta_{11i}\ \Delta Trap_{t-i} + \sum_{j=1}^{1} \beta_{12j}\ \Delta HE_{t-j} + \varepsilon_{12t}$	$1.7e^{-33}$	
$\Delta HE_t = \alpha_{21} + \sum_{i=1}^{2} \beta_{21i}\ \Delta HE_{t-i} + \varepsilon_{21t}$	$2.9e^{-34}$	0.55
$\Delta HE_t = \alpha_{22} + \sum_{i=1}^{1} \beta_{21i}\ \Delta HE_{t-i} + \sum_{j=1}^{1} \beta_{22j}\ \Delta Trap_{t-j} + \varepsilon_{22t}$	$2.0e^{-34}$	
c) Regressions: 1983-2013 period yearly data for Trap-GDP test	FPE	F-value
$\Delta Trap_t = \alpha_{11} + \sum_{i=1}^{2} \beta_{11i}\ \Delta Trap_{t-i} + \varepsilon_{11t}$	$3.8e^{-33}$	1.29

$\Delta Trap_t = \alpha_{12} + \sum_{i=1}^{2} \beta_{11i}\ \Delta Trap_{t-i} + \sum_{i=1}^{2} \beta_{12i}\ \Delta GDP_{t-j} + \varepsilon_{12t}$	$3.9e^{-28}$	
$\Delta GDP_t = \alpha_{21} + \sum_{i=1}^{3} \beta_{21i}\ \Delta GDP_{t-i} + \varepsilon_{21t}$	$3.0e^{-76}$	0.09
$\Delta GDP_t = \alpha_{22} + \sum_{i=1}^{1} \beta_{21i}\ \Delta GDP_{t-i} + \sum_{i=1}^{1} \beta_{22i}\ \Delta Trap_{t-j} + \varepsilon_{22t}$	$1.0e^{-108}$	

Note: [1]Trap: Middle income trap for Turkey, [2]Trap Determiners; PE: Public spending on education for Turkey, HE: High technology export for Turkey, GDP: Gross Domestic Product per capita for Turkey in the form of logarithm. Akaike (1969) presents Final Prediction Error (FPE). * 1%,** 5%, *** 10% presents the significance levels.

Concluding Remarks

An empirical observation is made on the existence of middle income trap for Turkey in this study. Time series techniques are used for the direction of causality for the years between 1983 and 2013. While the middle income trap is abbreviated as "Trap", the indicators of middle income trap are abbreviated as PS, HE and GDP. Here, PS stands for the public spending on education. HE stands for the high technology export, and GDP stands for the gross domestic product per capita for Turkey. Having applied Granger-causality tests to these abbreviated variables a unidirectional causality relationship has been found out between Trap and PS from Trap to PS in Turkey. In addition to this, the relationship is strong since the F value is significant.

It has further been found out that there is a causality relationship between Trap and HE both from Trap to HE and from HE to Trap in Turkey. However, both equations with those variables that the statistical theory mentions are not significant when the F value is concerned. So it can be concluded that there is a bi-directional causality between Trap and HE. But it is weak. Lastly, some causality relationship has been found out between Trap and GDP from Trap to GDP in Turkey. However, the opposite is not true. On the other hand, when the F value is concerned, both equations are not significant. So it can be concluded that there is a uni-directional causality between Trap and GDP from Trap to GDP. But it is weak.

Further growth predictions in rapidly growing countries which reached high income from middle income have failed in Romania, South Africa, Syria, Venezuela, Algeria, Bolivia, Chili, Ecuador, El Salvador, Fiji, Jordan, Malaysia, Mexico, Namibia, Panama, Paraguay, Peru, Philippines and Turkey. These countries achieved middle income level long ago but failed to reach high level ever since. These countries, which reduced poverty and

made great progresses then entered into economic recession and downturn, are considered to have fallen in middle income trap while Cyprus, Greece, Portugal, Hong Kong, Japan, Korea, Singapore and Taiwan were able to escape middle income trap and resumed their economic growth.

Experiences of the countries which have overcome the middle income trap are role models for the countries in the trap like Turkey. Overcoming the middle income trap is possible with a sustainable and qualified growth. Experiences of the countries which have overcome middle income trap indicate the importance of accumulated human capital in the form of ability and capacity for producing technologically developed goods. Meanwhile, canalizing structural transformation through supporting activities of high productivity and information-based production may contribute positively to this. In creating high productivity and information-based production, human capital is considered to be the most important factor.

If Turkey gives considerable importance to public spending on education this will help to overcome the middle income trap. On the other hand, high technology export and GDP per capita increase do not seem to be healthy for Turkey. Although these two variables seem to be important indicators to overcome middle trap income in literature, Turkey is not using properly the advantages of exporting high technology and growth. But it is important to note that these findings are not satisfactory for clear policy implications. They can only be taught as a screen shot for the last three decades of Turkey. A more detailed analysis should be done by setting up a whole economic model that contains all the development components for a country.

As a conclusion, Turkey stays in the middle income trap with its current economic performance; she is in the group of candidate countries who will overcome this problem. With this aspect, Turkey is one of the strict followers of developed countries. It is taught that, the way that Turkey overcomes the middle income trap goes through its investments on education. Without an effective education system a country cannot export technological goods and services and also cannot grow in an healthy way. Although it is known from accounting records, this study shows the ineffectiveness of the high technology export by using causality analysis. Producing high technological goods depends on educated and qualified labor force. Therefore, to raise high technology export and to overcome middle income trap Turkey's education system should work more effectively.

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