

DEVELOPMENT GAP OF TURKEY FROM VARIOUS PERSPECTIVES

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Abstract

For a developing country in a competing world, economic growth and development is not adequate. In other words, a backward country has targets to catch-up with and then forging ahead to the developed countries. This means that a developing country is willing to grow rapidly than developed countries. Thus, a developing country will be able to catch-up with and then forging ahead to the developed countries, under certain conditions. According to the literature, these conditions are related to institutional conditions of that country, social capability of that country, degree of backwardness of that country, techno-economic paradigm shift, etc. Apart from how can it be possible to catch-up with developed countries; this study is a simple attempt to measure the development gap among Turkey, United States of America, Germany, Russia and China. According to the results of the study, Turkey is able to catch-up with the United States of America and Germany. However, it will take long time for Turkey. If Turkey can achieve 5% of per-capita rate of growth, this process will become faster. As per-capita rate of growth of 5% is admitted as the natural rate of growth for Turkey, this means that it is important for Turkey achieving its potential rate of growth of per-capita. Besides, thanks to its rapid economic growth, China is going to catch-up with Turkey in 4 years and the United States of America in 34 years, in terms of per-capita. Finally, China will catch up with the United States in terms of total output in 6 years.

Key Words: Development gap, economic growth, catching-up, falling behind, forging ahead.

INTRODUCTION and THEORETICAL BACKGROUND

If there is a development gap this means that there is per-capita output gap of that country with respect to a leader country. Poor countries tend to have greater rate of growth since rate of return of investment is higher than the rich countries (Barro, 1991). If a group of country converge a common steady-state path of per-capita output, then there will be convergency. This is called neoclassical conditional convergency (Mankiw, Romer and Weil, 1992). If a country tends to reach a leader country's per-capita output, there will be catching-up (Szirmai, 1993). This is called catching-up rather than convergency. How can catching-up be happen? This may depend on social capability of a country (Abramovitz, 1986), initial technological level of a country (Abramovitz, 1986), techno-economic paradigm shift periods (Perez, 1983) and institutional conditions of a country

(Gerschenkron, 1962). Thus, a backward country is able to catch-up with the leader country, under certain conditions.

A country's development gap is the per-capita output gap of that country with respect to a leader country. We expand and add total output to that definition. Then, a country's development gap is the per-capita or *total* output gap of that country with respect to a leader country. Let us define a country which has an output level less than the leader country. Then, that country is able to catch-up with the leader if it has a greater rate of growth of output. However, it will fall behind if it grows slower than the leader. Turkey's annual average rate of growth of total and per-capita output are 4.28% and 2.54%, respectively, over the period 1970-2019, according to the UNCTAD statistics. In 2019, Turkey produced 1.1779% of the total world output, while China, Russia, Germany and the United States produced 16.9035%, 1.7184%, 4.2806 and 23.9014%, respectively. Thus, there is a development gap. Then, how many years are required in order to close that gap under certain conditions? Is there also a gap in terms of *per-capita* output? If so, how many years are required in order to close that gap under certain conditions? This study simply aims to answer these questions.

PURPOSE

The purpose of the study is to calculate the development gap of countries under different leader country definitions.

SCOPE

The study is limited by the UNCTAD database (UNCTAD, 2021)¹ covering the period 1970-2019. Total gross domestic product (GDP) and per-capita GDP data of the United States of America, Germany, Russia, China and Turkey are used for the analysis.

METHOD

How many years are required to achieve a targeted output level?

Let us define equation 1 in order to answer that question:

$$Y_{F,R} = Y_{I,R}e^{g_R t} \quad (1)$$

where $Y_{F,R}$ is the final level of per-capita or total output of the country R , $Y_{I,R}$ is the initial level of per-capita or total output of the country R , e is the base of natural logarithm, g_R is the annual average rate of growth of per-capita or total output of the country R , t denotes time.

Rearranging:

$$\frac{Y_{F,R}}{Y_{I,R}} = e^{g_R t} \quad (2)$$

¹ UNCTAD (2021). <https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx> (Accessed date: 02.01.2021, 06.02.2021)

$$\ln \frac{Y_{F,R}}{Y_{I,R}} = t g_R \quad (3)$$

$$\frac{\ln \frac{Y_{F,R}}{Y_{I,R}}}{g_R} = t \quad (4)$$

Thus one can calculate the time as years in order to achieve a targeted level of output using equation 4.

How many years are required to achieve the output level of a leader country?

Let us define equation 5 in order to answer that question:

$$Y_{F,O} = Y_{I,O} e^{g_O t} \quad (5)$$

where $Y_{F,O}$ is the final level of per-capita or total output of the country O , $Y_{I,O}$ is the initial level of per-capita or total output of the country O , e is the base of natural logarithm, g_O is the annual average rate of growth of per-capita or total output of the country O , t denotes time.

Rewriting 1:

$$Y_{F,R} = Y_{I,R} e^{g_R t} \quad (6)$$

Rearranging:

$$Y_{F,R} = Y_{I,O} e^{g_O t} \quad (7)$$

$$Y_{I,O} e^{g_O t} = Y_{I,R} e^{g_R t} \quad (8)$$

$$\frac{Y_{I,O}}{Y_{I,R}} e^{g_O t} = e^{g_R t} \quad (9)$$

$$\frac{Y_{I,O}}{Y_{I,R}} = e^{t(g_R - g_O)} \quad (10)$$

$$\ln \frac{Y_{I,O}}{Y_{I,R}} = t(g_R - g_O) \quad (11)$$

$$\frac{\ln \frac{Y_{I,O}}{Y_{I,R}}}{g_R - g_O} = t$$

Thus one can calculate the time as years in order to achieve the output level of a leader country using equation 12.

FINDINGS

Calculation results are shown in Tables 2, 3, 4 and 5. Table 1 shows the data of the selected countries.

Table 1. Data of the selected countries

Countries	Total GDP (1970) (US dollars at constant (2015) prices, in millions)	Total GDP (2019****) (US dollars at constant (2015) prices, in millions)	Per-capita GDP (1970) (US dollars at constant (2015) prices)	Per-capita GDP (2019****) (US dollars at constant (2015) prices)	Annual rate of growth of total output (%) (1970-2019)	Annual rate of growth of per-capita output (%) (1970-2019)
United States of America	5,217,224	20,067,506	24,585	60,426	2.694	1.799
Germany	1,396,391*	3,593,959	17,771*	43,033	1.891*****	1.769*****
Russia	951,892**	1,442,793	6420**	9,891	1.485***	1.544***
China	231,347	14,192,047	280	9,898	8.233	7.134
Turkey	116,211	988,929	3,332	11,854	4.282	2.538

Source: UNCTAD (2021) and author's own calculations.

*: 1970, Federal Republic of.

** : 1992.

*** : 1992-2019.

**** : Estimation of UNCTAD.

***** : 1970-1989, Federal Republic of.

Turkey's annual average rate of growth of total GDP is 4.282% for the period 1970-2019 and its level of total GDP is 988,929 million \$ (see Table 1). Then, applying 4, it requires 16 years for Turkey to achieve 2,000,000 million \$ of total GDP (see Table 2).

Table 2. Required years in order to achieve the targeted *total* GDP (US dollars at constant (2015) prices, in millions)

Countries	$Y_F = 1,250,000$	$Y_F = 1,500,000$	$Y_F = 2,000,000$	$Y_F = 3,000,000$	$Y_F = 5,000,000$
Turkey	5	10	16	26	38

Source: UNCTAD (2021) and author's own calculations.

Turkey's annual average rate of growth of per-capita GDP is 2.538% for the period 1970-2019 and its level of per-capita GDP is 11,854 \$ (see Table 1). Then, applying 4, it requires 21 years for Turkey to achieve 20,000 \$ of per-capita GDP (see Table 3).

Table 3. Required years in order to achieve the targeted *per-capita* GDP (US dollars at constant (2015) prices)

Countries	$Y_F = 15,000$	$Y_F = 20,000$	$Y_F = 30,000$	$Y_F = 35,000$	$Y_F = 40,000$
Turkey	9	21	37	43	48

Source: UNCTAD (2021) and author's own calculations.

Table 4 reports the calculation results of the equation 12 in terms of total GDP, by using the data which are shown in Table 1. According to Table 4, United States of America will stay being ahead of Germany and Russia, in terms of total GDP. However, United States of America will fall back from China and Turkey. China is going to catch-up with the United States of America in 6 years, in terms of total GDP. Turkey is going to catch-up with Russia in 14 years, Germany in 54 years, and United States of America in 190 years, in terms of total GDP.

Table 4. Required years in order to achieve the other country's *total* GDP

Countries	United States of America	Germany	Russia	China	Turkey
United States of America	...	will stay being ahead of *	will stay being ahead of *	will fall back from	will fall back from
Germany	is falling back from *	...	will fall back from **	is falling back from*	will fall back from *
Russia	is falling back from **	465**	...	is falling back from **	will fall back from **
China	6	will stay being ahead of *	will stay being ahead of *	...	will stay being ahead of *
Turkey	190	54*	14**	is falling back from	...

Source: UNCTAD (2021) and author's own calculations.

*: 1970-1989, Federal Republic of.

** : 1992-2019.

Table 5 reports the calculation results of the equation 12 in terms of per-capita GDP, by using the data which are shown in Table 1. According to Table 5, United States of America will stay being ahead of Germany and Russia, in terms of per-capita GDP. However, United States of America will fall back from China and Turkey. China is going to catch-up with the United States of America in 34 years, in terms of per-capita GDP. Turkey will stay being ahead of Russia, in terms of per-capita GDP. Turkey is going to catch-up with Germany in 168 years, and United States of America in 220 years, in terms of per-capita GDP. Finally, Turkey will fall back from China.

Table 5. Required years in order to achieve the other country's *per-capita* GDP

Countries	United States of America	Germany	Russia	China	Turkey
United States of America	...	will stay being ahead of *	will stay being ahead of **	will fall back from	will fall back from
Germany	will fall back from *	...	will stay being ahead of **	will fall back from *	will fall back from *
Russia	will fall back from **	will fall back from **	...	will fall back from **	will fall back from **
China	34	27*	will stay being ahead of **	...	4
Turkey	220	168*	will stay being ahead of **	will fall back from	...

Source: UNCTAD (2021) and author's own calculations.

*: 1970-1989, Federal Republic of.

** : 1992-2019.

CONCLUSION

As a developing country, Turkey will fall behind from China within 4 years, in terms of per-capita GDP. China is going to catch-up with the United States of America and Germany, within 34 and 27 years, respectively. Turkey's growth performance points out that Turkey is going to catch-up with the United States of America and Germany. However, it will take a long time under today's conditions. If Turkey's per-capita output grows 5% annually Turkey is going to catch-up with the United States of America within 51 years. Note that per-capita rate of growth of 5% can be admitted as the natural or potential rate of growth for Turkey. As a consequence, this means that it is important for Turkey achieving its natural or potential rate of growth of per-capita.

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