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Growth Projections:
How far is Turkey from the European Union?

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1 Introduction:

The long accession process of Turkey to the European Union has started with the application for associate membership in the European Economic Community on July 31, 1959. Subsequently, the Ankara Agreement was signed between the Republic of Turkey and the then European Economic Community on September 12, 1963. Almost 40 years later, Turkey has been officially recognised as a candidate for full membership on December 12, 1999 by the European Council. Finally, negotiations for Turkey's accession to the EU have been officially launched on October 3, 2005. There has always been a widespread discussion about a possible EU entry of Turkey to the European Union, especially on the international area. There have been numerous arguments both for and against Turkey's membership, which should be discussed politically, socially and economically in more detail.

The main purpose of this study is to give and assess an aggregate prospective view on Turkey's growth and convergence process concerning the incumbent European Union member states, the Central and Eastern European countries (CEECs)[1] and the enlarged EU. The main questions which will address this study are: Will there be a convergence between the European Union and Turkey? How do the growth and convergence prospects of Turkey look like under different scenarios? How long are these projected convergence times for Turkey regarding the CEEC10 and the enlarged EU?

The methodology of this paper is based on another study which has already been presented by the authors Martin Wagner and Jaroslava Hlouskova. In their paper, „CEEC Growth Projections: Certainly Necessary and Necessarily Uncertain," the authors discuss the necessity of using an indirect approach for the CEEC10, and analyse the growth and convergence prospects of CEEC10 within the enlarged EU. Therefore this study also enables a direct comparison relating to the growth and convergence prospects between the CEECs, the enlarged EU and Turkey.

The first step of this study consists of performing the growth projections for Turkey by using an indirect estimation approach, which means that the growth projections for Turkey are not generated on the basis of its own growth equations, but only on the equations that have been estimated for the incumbent EU member states (EU14)[2] for the period from 1960 until 2001. On this point one can argue that the incumbent EU member states and Turkey are quite different from each other, and the use of data from the EU14 for Turkey's growth projections would not be applicable. The underlying idea of using such an indirect approach for Turkey is based on the standard neoclassical model (Solow, Swan, 1956) which is consistent with convergence property of output across economies as a result of diminishing returns to capital and predicts that a country with a lower initial GDP

[1] The CEECs are namely Slovenia (SVN), the Slovak Republic (SVK), Poland (POL), Lithuania (LTU), Latvia (LVA), Hungary (HUN), Estonia (EST), the Czech Republic (CZE), Bulgaria (BGR) and Romania (ROM). As usual in the literature, these countries are referred to as CEEC10 in this study.

[2] Luxembourg is excluded due to its small size and some problems with its data set so that the incumbent EU member states are referred to the EU14 in the study instead of the EU15.

per capita related to its long-run capital per worker would tend to grow faster than those countries with higher initial GDP per capita.[3] This empirical fact which has been already observed for the incumbent EU member states can also be investigated for Turkey's growth by using data from the EU14, as long as it is used to estimate the long-run growth projections.

In the second step of the study, the *so-called* uncertainty related to the growth and convergence literature will be explicitly analysed for Turkey.[4] The implied uncertainty in the growth and convergence literature stems from two main facts. Firstly, the future economic development of the studied countries will not be known. Secondly, it is not clear which factors will determine the future economic growth. In order to take into account these two main issues indicating the uncertainity in growth literature, the growth projections of Turkey will be performed with respect to eighteen significant growth equations for the economic growth together with seven scenarios based on two economically significant variables, the gross fixed capital formation (GFCF) and the government consumption share (GC). The main purpose here is to get a density of the growth rate projections and the convergence time distributions from the generated 126 growth equations for assessing the so-called uncertainty concerning the growth and convergence projections of Turkey. Consequently, both the distribution and the density estimate of the growth and convergence time projections for Turkey will be shown.

The convergence time distributions of Turkey form the next step in this study. They will be calculated depending on the estimated 126 growth projections and will be performed in respect of the four country groups: the incumbent EU member states (EU14), the EU24 (the EU14 together with the CEEC10), the CEEC10, and the C3 countries (Greece, Portugal and Spain). In order to compute the convergence time projections of Turkey, it is assumed that EU14, the EU24, the CEEC10 and the C3 countries will continue to grow with their average growth rate observed during the time period 1990-2001.[5] Considering the effect of the EU payments in the growth projections and the convergence time distributions forms another step of the study.

The study is organized as follows: Section 2 begins with a brief description about the convergence concepts derived from the neoclassical growth theory. Chapter 3 presents the methodology of the study in detail and provides also a description of the data and their implications regarding the neoclassical growth theory. Chapter 4 presents the estimations of the growth rate equations and analyzes the first results. In Section 5 the growth projections and the convergence scenarios will be simulated, and the results will be presented. The Last section, section 6, offers a detailed conclusion of the study.

[3] Barro (1991).
[4] For an apt description about the uncertainty inherent in the growth and convergence literature see Sala-i-Martin (1997).
[5] Here it is assumed that the average growth rate of real per capita GDP is 1,74 percent for the EU14 and the EU24, the CEEC10, and 2,37 percent for the C3 countries.

2 Convergence Concepts derived from the Neoclassical Growth Theory:

The convergence literature which began with Baumol (1986) and DeLong (1988) has become popular especially as a result of the term β-convergence.[6] The growing substantial attention on the empirical convergence research can be explained by two main reasons: they give rise to important policy implications and they can be used as an approach for testing of the two main growth theories, namely the neoclassical and the endogenous growth theory. Interestingly, the neoclassical growth model (Solow, Swan, 1956) has still been the main reference framework for standard applied empirical convergence studies in the convergence literature. This stems from the obvious fact that the concept of β-convergence, which is derived from an extended neoclassical growth model, achieves significant support from the empirical results.[7]

According to the neoclassical growth theory, if the population remains constant, the long-run growth rate is designated entirely by the rate of technological progress, which is assumed as an exogenous (unexplained) element in the standard neoclassical growth model. The convergence force of the neoclassical growth theory is derived from the fact of diminishing returns to physical capital. Economies with low ratios of capital to labour have higher marginal products of capital, and therefore tend to grow at higher rates than rich ones.[8] Thus the per capita growth rate of a country depends inversely on its initial level of income per person. As a result of diminishing returns to physical capital, there is a point at which the growth rate of per capita income converges to zero. This *so-called* steady state level of per capita output y^* of countries could be either different (conditional β-convergence) or the same (unconditional β-convergence). The underlying assumption of the unconditional β-convergence is that the studied economies are intrinsically the same with respect to the production functions, the saving rates, the population growth rates etc. except for their initial per person income levels[9]. If this is the case, the absolute (unconditional) β-convergence would apply which can be estimated by the following regression form[10]:

$$\frac{1}{t}\log\left(\frac{y_{i,t}}{y_{i,0}}\right) = \alpha + \beta\log\left(y_{i,0}\right) + u_i \qquad (2.1)$$

$$u_i \sim i.i.d.\left(0, I_N, \sigma_u^2\right)$$

[6] The concept of β-convergence is firstly defined by Barro and Sala-i-Martin (1992).

[7] Notice that the term β-convergence is also seen with criticism. For a critical survey about the convergence concept and its limitations see Durlauf and Quah (1999).

[8] Barro (1991).

[9] Other factors which could also affect the steady state level of the countries are government policies, protection of property rights and distortions of domestic and international markets, as defined by Barro (1997).

[10] See Barro (1997).

Here $y_{i,t}$ refers to the real income per capita in year t for country i, while $y_{i,0}$ refers to the real income per capita in the initial year of the period t for country i. If the estimated sign of β-coefficient is significantly different from zero and negative, there is an absolute convergence so that a poor country tends to grow faster than a rich one, and thus the poor country will tend to catch up to the rich one especially through technology transfer.

However, if economies are different in relation to their production functions, saving rates, population growth rates etc., then only the conditional convergence force will have to be considered. This means that a country could achieve high growth rates in relation to its steady state (long- run) positions of capital and output per person, if the country starts far below its own steady state position which depends on the factors like the production function, the saving rate and the growth rate of population etc. It also means that high growth rates of a country could depend on its high investments or low government consumptions. One can conclude that the concept of the conditional β-convergence deals with differences in the steady state levels between countries and investigates the "growth-enhancing factors" by including further explanatory variables (control variables) to the right side of the equation (2.1). These control variables could also be seen as a proxy to investigate *exogenous* technological progress in the neoclassical growth model and can be estimated as follows:

$$\frac{1}{t}\log\left(\frac{y_{i,t}}{y_{i,0}}\right) = \alpha + \beta\log\left(y_{i,0}\right) + \text{control variables} + u_i \qquad (2.2)$$

$$u_i \sim i.i.d.\left(0, I_N, \sigma_u^2\right)$$

The negative sign of estimated β-coefficient of the above equation refers to the conditional β-convergence.

Following the major convergence literature based on the neoclassical growth theory, the growth and convergence projections of Turkey will also be performed with respect to the growth equations derived from the neoclassical growth theory. In the next section conditional correlations concerning the long-run economic growth between the EU and Turkey will be investigated by means of growth and convergence equations.

Another concept which is often used in empirical studies is σ-convergence.[11] This concept predicts that the dispersion of real per capita income level declines across the economies over time. In other words, income differences between the economies decrease through time. The important point is here not to confuse the two concepts. As Barro and Sala-i Martin (1992) have argued, β-convergence is required for σ-convergence, but it is not enough for its existence because income

[11] See Barro and Sala-i-Martin (1992).

differences across countries can increase, while poor economies may develop faster at the same time.

3 Methodology and Variables:

As already explained in the introduction, the applied indirect approach for getting the long-run growth projections of Turkey will be based on the estimated growth equations of the incumbent EU member states (EU14) over the period from 1960 to 2001. For the purpose of studying determinants of the long-run growth in the EU14 and Turkey, equation (2.2) is broadened by inclusion of further explanatory variables which are relevant to economic growth, and then 18 diversified economically meaningful growth equations are estimated. The specifications of the growth equations are taken from Wagner and Hlouskova (2005) which were chosen by following the recommendation of Berg et al. (1999).[12] For estimating growth regressions, panel data methods are used, which allow to identify country-specific effects explicitly in the growth regressions, and thus eliminate unobservable initial heterogeneity of technical progress across countries.[13] The data set from the sample period will be divided into four subperiods (1960-69, 1970-79, 1980-89, 1990-2001). The length of each period of about 10 years can be considered reasonable for studying long-term growth properties in the literature. All the growth equations are pooled and estimated with seemingly unrelated regression (Period SUR). This estimation method (Period SUR) allows for error correlation and period heteroscedasticity in the residuals of a given cross-section, and restricts residuals in different cross-sections to be uncorrelated. By estimating the growth rate equations two different ways will be followed. Most of the growth equations, namely 14, are performed as usual in the literature by taking subperiod-average values from explanatory variables to the estimations, while the remaining other four are estimated with respect to the initial values over the first year of the independent variables of each subperiod (identified with in). The specification of taking initial values of the independent variables in the regressions could negotiate potential endogenity problems caused by using period-average values especially concerning investment and trade variables.

A typical regression model of a growth or convergence equation is of the form:

$$\Delta \log GDP_i = \beta_1 + \beta_2 \log GDP_{0,i} + \beta_3 GC_i + \beta_4 GFCF_i + \beta_5 PRIM_i + \beta_6 TT_{ii}$$

$$+ \beta_7 POPG_i + \beta_8 X_i + u_i \qquad (3.1)$$

Where $\Delta \log GDP_i$ is the dependent variable and represents the average annual growth rate of real per capita GDP (in constant PPP) in the studied subperiod. GDP_0 is the (log) initial level of real per capita GDP of the related subperiod. GC refers to the average ratio of the government consumption in GDP for the

[12] I estimated all the growth equations for the EU14 again. The estimated results of the growth equations are almost the same computed by Wagner and Hlouskova (2005).

[13] For the advantages of using panel data methods compared to cross-country regressions see Islam (1995).

investigated subperiod. $GFCF$ indicates the average share of investment (gross fixed capital formation) in GDP, while $PRIM$ is an indicator of the average rate of the gross primary school enrolment. TT provides the average sum of total trade (export and import) in GDP. $POPG$ is a variable showing the average population growth rate from the related subperiod. Lastly, X is the average ratio of exports in GDP. The error term of the equation is defined by u, while i denotes the country index as usually used in the literature.

As one can see, all the inspected variables are important for the analysis of the determinants of the long-term economic growth. Therefore, from the economic theory provided implications of these variables can be investigated on the long-run growth process in the estimated growth and convergence regressions.

According to the neoclassical model the predicted coefficient for the (log) initial level of per capita GDP is negative so that growth is negatively related to initial GDP per capita level, indicating an evidence of the β-convergence. It is equivalent to the statement that holding all the other explanatory variables constant, this coefficient gives the conditional convergence rate of an economy to its long run-position.[14] The negative expected sign of government consumption indicates a negative link between government consumption and growth. Barro (1991, 1997) argues that government spending has a negative impact on growth as long as they are not carried out for improving productivity. The correlation between the investment share and growth is predicted to be positive by the neoclassical growth model. As a result of setting the exogenous saving rate equal to the ratio of investment to output, for a closed economy is the level of the steady state output per worker raised by a higher saving rate and so is the investment rate. Barro (1991) also argues that a positive coefficient of the investment ratio in the growth equation would reflect the positive relation concerning growth opportunities and investment for an open economy. The variable for human capital is entered into the model in the form of education defined by the primary gross school enrolment. The prediction of the primary gross school enrolment is also positive on growth,[15] since human capital together with physical goods as a part of an extended capital concept in the neoclassical model has to be considered.[16] The positive expected coefficient of the total trade demonstrates that trade promotes the economic growth as well and could have an important influence especially on developing countries. As already mentioned in section 2, according to the neoclassical model the long-run economic growth is explained entirely by technological progress only on holding a constant population. That is why the expected sign of the population growth rate on growth is negative. Adding export to the equation separately from total trade is based on investigating so called export-led growth and their importance. Hence the sign of this variable is expected to be positive.

The next line of the research consists of generating growth projections from the estimated growth regressions of the EU14 for Turkey. The growth projections will be carried out by combining estimated growth equations together with seven

[14] See Barro (1991).
[15] However, there was some evidence found by Barro (1997), which implies that primary schooling is negatively related to growth.
[16] See Barro (1997).

scenarios for two important policy-relevant variables, namely the government consumption share (GC) and the gross fixed capital formation (GFCF). All the other variables with their actual period-average values will be inserted to the growth computations of Turkey over the period 1992-2003. Combining the estimated eighteen growth equations with the 7 scenarios gives 126 growth rate projections for Turkey. The population growth rate of Turkey is assumed to be 0,11 percent in the growth calculations corresponding to the projected population growth rate performed by Turkish Republic Prime Ministry State Planning Organisation (2004).[17] However, a further analysis based on taking into consideration existing significant positive population growth rate of Turkey will be assessed in the growth projections of Turkey in contrast to the study of Wagner and Hlouskova (2005).[18] Therefore, an additional analysis for Turkey will be carried out by estimating growth and convergence projections with respect to three various assumed growth rates. In a further step, the effect of the EU payments in the case of the full membership for Turkey will be discussed concerning Turkey's convergence time projections.

The convergence time calculations of Turkey are based on the assumption that the target countries will grow at the same average growth rate that has been observed over the period 1990-2001 and so the annual growth rate of real per capita GDP for the EU14, the EU24, and the CEEC10 is 1,74 percent, for the C3 countries 2,37 percent. The population growth rate of the target countries is assumed to stay constant at their 2001 levels.

4 The Empirical Investigations:

4.1 Estimations and results of the growth equations:

Before presenting the estimated growth equations for the EU14, there is one more point which needs to be introduced. Wagner and Hlouskova (2005) dealt with three dummy variables in the growth equations of the EU14. The first D_1 indicates a dummy variable for the period 1960-69. Since the incumbent EU member states (EU14) achieved an annual growth rate of real per capita GDP of 4,10 percent in this period, D_1 shows the effect of this period on average annual growth rate of the EU14. The second D_{IRL} is a dummy variable for Ireland referring to the sample period 1960-2001. Including a dummy for Ireland to some regressions is explained by the reason of its high average growth rate of 4,11 percent over the sample period. The third and last dummy variable is used for aggregate Germany, D_{GER} for the last subperiod 1990-2001.

The estimation results in Table 1 show that independent from the chosen regression's specification, all the expected signs of the explanatory variables exist corresponding to the predictions of the neoclassical growth theory. It confirms the

[17] For more information about the projected population growth rate of Turkey see the study "the likely effects of Turkey's membership upon the EU", performed by T.R. Prime Ministry State Planning Organisation (2004).

[18] They assumed that the differences in terms of population growth rates between the CEEC10 and the EU14 would be not permanent. Thus the assumed population growth rate of those countries is equal to zero in the growth projections.

satisfying description of the growth and convergence process in the incumbent EU member states by the neoclassical growth theory.[19] The predicted negative correlation between the (log) initial level of GDP and subsequently growth exists in all growth equations. The negative effect of the government consumption on growth is proven by the resulting negative coefficient, if performed government spending is not canalized to improve the productivity. This result is in line with previous findings by Barro (1991, 1997), Levine and Renelt (1992). The positive neoclassical implication concerning the investment share on growth is already present in the estimation results which was also found by Barro (1991), Levine and Renelt (1992). The expected growth-enhancing effect of the primary gross school enrolment on growth also receives demonstrative support from the estimation results concurring with a founding by Levine and Renelt (1992). Notice that this result is not consistent with the negative effect of the primary schooling on growth founded by Barro (1997). Variables referring to both total trade and export have a positive effect on growth as expected and imply that improvements in terms of total trade and export stimulate an expansion of per capita output. This result was also found by Levine and Renelt (1992). The sign of the population growth rate also turns out negatively as it has been expected which is also confirmed by Levine and Renelt (1992).

The obtained high values of the $Adj.R^2$ attract attention which reports that more than 95 percent of the total variation in the average annual growth rate of real per capita GDP can be accounted for by the explanatory variables in the growth regressions of the EU14. The two dummy variables which are included for the first period of the EU14 and Ireland have a considerable positive effect on the average annual growth rate. The dummy variable for aggregate Germany has a lower, compared to the others, however positive effect on the annual average growth rate. It can also be seen that there are no significant differences in the results of the growth regressions estimated by taking period-average values of the explanatory variables or using the initial values over the first year of each subperiod. The null hypothesis for the equal coefficients of the average annual growth rates across the growth equations can be rejected for the EU14 countries indicated by the p-values (0,000) of the 18 growth regressions.

The good fitted values from the 18 growth equations over the four subperiods concerning the actual growth rates can be also confirmed by calculating the implied growth rates for the EU14 with the estimated growth equations. A calculation of the average growth rate of C3 countries, namely Greece, Spain and Portugal over the period 1990-2001 shows good agreement. The calculation is carried out by taking the (log) real GDP per capita values from 2001 and the population growth rates in 2001 into the regressions. For the other explanatory variables the average values over the period 1990-2001 are inserted into the regressions. The growth rate of the C3 countries over the period 1990-2001 is obtained by averaging the estimated growth rates from the 18 growth equations. The implied growth rate of the C3 countries from the estimated growth regressions is found 2,66 percent over the period 1990-2001, where the actual average growth rate of the C3 countries is 2,37 percent in this period.

[19] For a graphical proof see Wagner and Hlouskova (2005).

Table 1: Estimation results of growth regressions for the EU14.

	const	$\log GDP_0$	GF	GFCF	PRIM	TT	X	POPG			Adj.
1	0.050 (3.109)	-0.004 (-2.318)	-0.089 (-6.985)	0.057 (4.811)	0.093 (1.795)	0.003 (2.333)			0.012 (3.692)		0.994
1in	0.095 (7.144)	-0.007 (-4.882)	-0.084 (-6.407)	0.028 (2.823)	0.004 (1.142)	0.002 (1.461)			0.011 (3.578)		0.093
2	0.069 (4.188)	-0.005 (-3.320)	-0.074 (-6.296)	0.053 (4.108)	0.008 (1.355)						0.093
2in	0.107 (7.993)	-0.008 (-5.824)	-0.072 (-6.654)	0.030 (2.928)	0.005 (1.198)						0.092
3	0.061 (3.724)	-0.005 (-3,078)	-0.074 (-6,291)	0.057 (4,383)	0.008 (1.451)				0.012 (3.651)		0.094
4	0.064 (4.566)	-0.003 (-2.341)	-0.091 (-2.765)	0.048 (4.050)		0.003 (2.079)			0.012 (3.648)		0.094
5	0.080 (5.157)	-0.006 (-3.637)	-0.052 (-5.396)	0.059 (4.804)				-0.277 (-2.247)		0.009 (8.936)	0.091
6	0.052 (3.611)	-0.004 (-3.298)	-0.064 (-7.458)	0.065 (6.238)	0.009 (2.241)	0.003 (3.462)		-0.203 (-2.051)	0.012 (3.648)	0.010 (10.651)	0.096
7	0.064 (4.325)	-0.005 (-4.123)	-0.063 (-7.725)	0.061 (6.090)	0.007 (1.812)	0.003 (4.093)				0.012 (14.923)	0.096
8	0.054 (3.409)	-0.004 (-2.686)	-0.087 (-6.878)	0.057 (4.751)	0.009 (1.789)		0.006 (2.253)		0.012 (3.662)		0.094

Table 2: (con.) Estimation results of growth regressions for the EU14.

	const	logGDP_0	GF	GFCF	PRIM	TT	X	POPG				Adj.
8in	0.097 (7.463)	-0.007 (-5.197)	-0.083 (-6.481)	0.028 (2.825)	0.004 (1.192)		0.004 (1.429)		0.011 (3.567)			0.992
9	0.068 (4.932)	-0.004 (-2.674)	-0.090 (-7.206)	0.048 (4.004)			0.005 (2.010)		0.011 (3.619)			0.093
9in	0.098 (7.864)	-0.007 (-4.747)	-0.085 (-6.733)	0.024 (2.408)			0.004 (1.406)		0.011 (3.622)			0.093
10	0.069 (4.513)	-0.006 (-4.411)	-0.061 (-7.369)	0.060 (5.857)	0.007 (1.788)		0.006 (3.856)			0.012 (14.187)		0.096
11	0.032 (2.476)	-0.002 (1.429)	-0.077 (-6.362)	0.067 (6.773)	0.015 (2.971)		0.003 (1.577)	-0.507 (-5.334)			0.004 (0.912)	0.097
12	0.033 (2.485)	-0.003 (-2.109)	-0.070 (-5.900)	0.074 (7.403)	0.017 (3.307)		0.003 (1.537)	-0.546 (-5.437)	0.013 (4.358)			0.097
13	0.032 (2.285)	-0.003 (-1.888)	-0.071 (-5.917)		0.017 (3.297)			-0.537 (-5.396)	0.013 (4.360)			0.097
14	0.050 (3.109)	-0.004 (-2.318)	-0.089 (-6.985)	0.057 (4.811)	0.009 (1.795)	0.003 (2.333)					0.003 (3.041)	0.094

Note: Δ log GDP is the dependent variable showing the average real per capita GDP growth rate in the regressions. The t-values in brackets of the regressions are heteroscedasticity corrected.

4.2 Simulations of growth and convergence scenarios:

In this section the generated growth and convergence time projections for Turkey based on the already estimated growth equations of the EU14 are presented. For this purpose, some assumptions referring to the explanatory variables are needed. By generating the growth projections, seven scenarios are simulated for two chosen explanatory variables, the government consumption share (GC) and the gross fixed capital formation (GFCF). The reasons for basing scenarios on these two variables are both their policy and economic relevance. By combining the estimated 18 growth regressions in the previous section with the 7 scenarios for GC and GFCF, 126 growth rate projections for Turkey are obtained. The main purpose here is to get a density of the projected growth rates and the convergence time distributions for assessing the so-called uncertainty concerning the growth and convergence projections of Turkey. The Table 3 presents the simulated seven scenarios for the growth and convergence projections for Turkey.[20]

Table 3: Scenario values for government consumption and investment share.

		GC	GFCF
1	The average current values of Turkey over the period (1992-2003)	13.00	22.45
2	Fischer, Sahay and Vegh (1998b)	10.00	30.00
3	ESP, GRC, PRT (1960-80)	11.38	28.42
4	ESP, GRC, PRT (1987-2001)	16.79	23.87
5	ESP, GRC, ITA, IRL, PRT (1961-79)	11.90	26.80
6	South East Asia (1980-95)	10.80	29.20
7	IRL (1987-2001)	16.20	19.36

Note: South East Asia indicates Indonesia, Japan, South Korea, Malaysia, and the Philippines.

In Scenario 1 the actual average values of Turkey for the two variables GC and GFCF over the period 1992-2003 are used in the growth projections, while the identical values described by the other six scenarios concerning the GC and the GFCF are simulated in the growth projections of Turkey. Scenario 2 presents the values defined by Fischer et al. (1998b), which are almost the same as the in scenario 6 presented average values of the GC and the GFCF based on the South East Asian countries[21] over the period 1980-95. Scenario 6 indicates the rapid growth performance of the South East Asian countries, which is mainly realised by factor accumulation in that period, thus one can conclude that these two scenarios draw particular attention to the analysis of factor intensive growth performance in the growth projections. These two scenarios can also be considered as optimistic with respect to the lower government consumption share and the

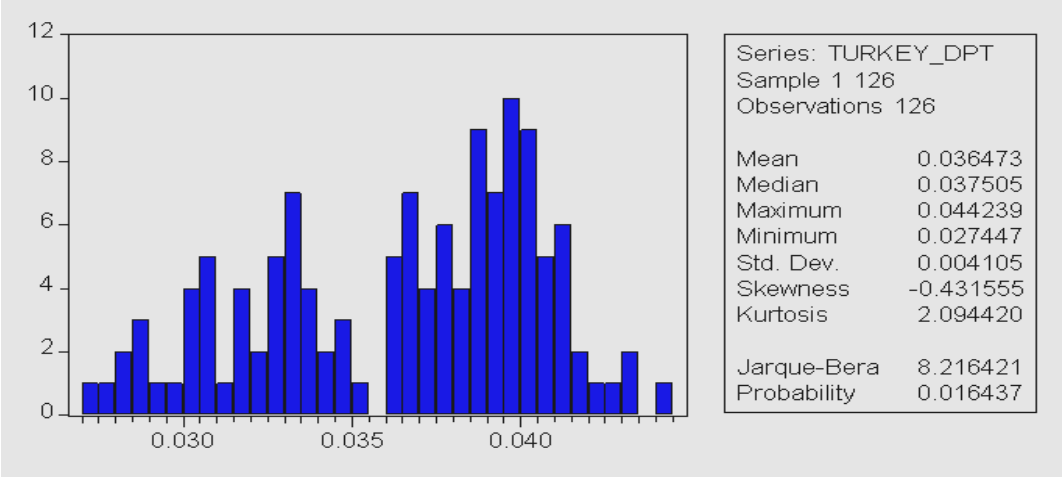
[20] All these scenarios had been already used in the growth projections of the CEEC10 by Wagner and Hlouskova (2005).

[21] These are namely Indonesia, Japan, South Korea, Malaysia, and the Philippines.

higher investment share compared to the others. Scenarios 3, 4 and 5 consist of the observed average values from the related EU member states within different periods. These are the countries which grew at higher average growth rates compared to the other incumbent EU members in the related periods. As the neoclassical growth theory has indicated, if Turkey tends to grow faster than the EU14, these scenarios can also be realistic and could imply the *so-called* catching-up process of Turkey towards the EU14 as observed for those countries. Lastly, scenario 7 is derived from the observed values of Ireland in the period 1987-2001. It should be noted that in contrast to the South East Asian countries the Irish growth performance presents another growth strategy realised by a relatively low investment share and a relatively high government consumption share.

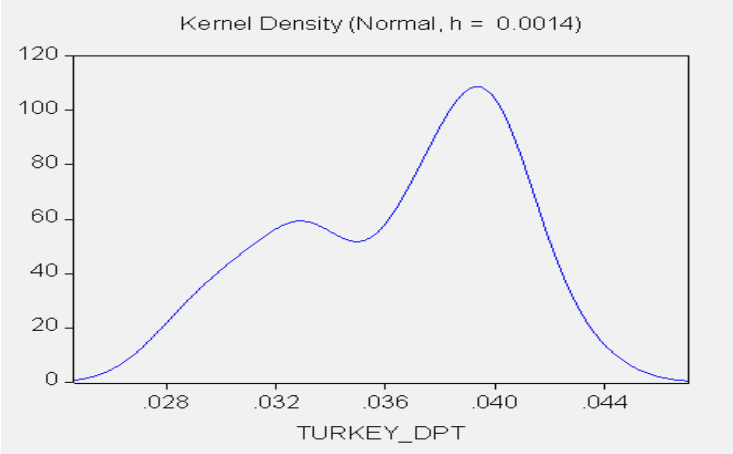
As already introduced, the annual population growth rate of Turkey is assumed to be 0,11 percent corresponding to the projected population growth rate which is estimated by Turkish Republic Prime Ministry State Planning Organisation (2004) for the time period up to 2040-2050. It should be noted that this assumption influences only 5 equations in the growth projections where the impact of the population on growth process is taken into account. Although this assumed value of the annual population growth rate lies apparently under the actual value of the annual population growth rate of Turkey over the period 1992-2003, namely 1,76 percent, it will be used in the growth and convergence projections of Turkey. This is done for two reasons: Firstly, looking at the development of the annual population growth rate on Turkey's data set shows a permanent decrease of the annual population growth rate over the period 1992-2003. Therefore, it is more realistic that the annual population growth rate in Turkey continues this tendency in the future. Secondly, as a result of estimating long-run growth projections, it can be seen as a fair proxy. However, to investigate how big the effect of a given higher population growth rate on Turkey's growth performance is, the growth projections are computed in addition with respect to the average population growth rate of Turkey (1,76 percent) over the period 1992-2003, with the period-end value (2003: 1,54 percent), and with another value based on a smaller value than the period-end value of Turkey (1,04 percent). The results of the growth rate projections from the 126 growth equations of Turkey are presented in histogram 1.

Histogram 1: The annual real per capita GDP growth rate projections of Turkey with an assumed annual population growth rate of 0,11 percent.



The mean projected growth rate for Turkey is 3,64 percent with a standard deviation of 0,41 percent growth per year indicating the so-called uncertainty on the growth process. The projected growth rates are mostly distributed in the vicinity of 4 percent. The highest growth projection for Turkey is 4,42 percent. It can be seen that the distribution of the growth projections of Turkey is not normally distributed, indicated also by the significant value of the Jarque-Bera test. The null hypothesis of equal growth rate prediction resulting from the scenarios can be rejected for Turkey. The estimated negative value of skewness also implies that the distribution of the projected growth rates has a long left tail. For the purpose of showing the distributions of the growth projections better, the density of the projected growth rates is estimated.[22]

Figure 1: Density estimate of the annual real per capita GDP growth projections with an assumed annual population growth rate of 0,11 percent for Turkey.



The density estimate is performed by putting less probability weight on the projected growth rates which are far from the evaluated growth rate with the larger probability indicating the higher growth rate. It can be clearly seen that the density of the projected growth rates of Turkey is bi-modal. There have been two peaks where the distributions are mostly piled up. It should be emphasized that the mean projected growth rate, 3,64 percent, of Turkey is also the highest mean growth projection resulting from the 126 growth regressions compared to the CEEC10 computed by Wagner and Hlouskova (2005). They found the highest mean growth projection with 3,52 percent for Romania across the CEEC10.[23] However, this mean projected growth rate of Turkey should be interpreted with caution because of the bi-modal density estimate of the growth rate projections. As a result of rejecting the null hypothesis of equal growth rate prediction across the scenarios, the observed Bi-modality of the growth rate distributions can be explained by the simulated scenarios.

This founding can also be confirmed by computing the mean growth projection for each scenario separately with respect to the 18 growth equations. The results are

[22] The density estimate of the projected growth rates is carried out by basing on Gaussian kernels with the selection of bandwidths due to the Silverman's rule of thumb.

[23] For a comparison concerning the growth and convergence projections of the CEEC10 see Wagner and Hlouskova (2005).

not surprising and they confirm the clear link between growth projections and scenarios again.[24] The highest mean growth projection for Turkey results from scenario 2, and the second highest mean growth projection is obtained from scenario 6. These are the two scenarios drawing on the lower government consumption and higher investment share. The lowest mean growth projection is gained from scenario 7 for Turkey. The second lowest mean growth projection for Turkey is derived from Scenario 1 based on its actual values for GC and GFCF. These two scenarios simulate the effect of the case on its subsequent growth, if Turkey has higher public spending and a low amount of public investment. The scenarios 3, 4, and 5 provide a medial growth performance of Turkey. One can conclude that the observed significant correlation between the chosen scenarios and subsequent growth performance emphasizes the importance of the future fiscal policy of Turkey on its growth process, and furthermore implies a necessary factor intensive growth strategy of Turkey as defined in scenarios 2 and 6 to catch up to the EU countries.

Table 4 presents the growth projections for Turkey computed in respect of various assumed population growth rates, if someone believes that the assumed annual population growth rate of 0,11 percent does not reflect the likely case with respect to the future development of Turkey's population.

Table 4: The annual real per capita GDP growth projections in respect of various assumed population growth rates of Turkey.

	Population growth = 1.758 percent	Population growth = 1. 547 percent	Population growth = 1. 047 percent
Mean	0.034645	0.034888	0.035503
Median	0.035871	0.036319	0.036499
Maximum	0.044239	0.044239	0.044239
Minimum	0.018581	0.019713	0.022519
Std. Dev.	0.005613	0.005324	0.004631
Skewness	-0.745708	-0.692786	-0.495306
Kurtosis	3.102380	3.023746	2.560443
Jarque-Bera	11.73272	10.08196	6.166239
Probability	0.002833	0.006467	0.045816

Inserting the period-average value of the annual population growth rate to the growth regressions yields a mean projected growth rate of 3,46 percent with a standard deviation of 0,56 percent growth per year for Turkey, which indicates a decrease of 0,18 percent in the previous mean projected growth rate. Despite this fact, Turkey still achieves with this mean projected growth rate of 3,46 percent the second highest mean growth projection compared to the CEEC10 after 3,52 percent in Romania computed by Wagner and Hlouskova (2005). Computing the growth projections with the period-end value of the annual population growth rate of Turkey generates a mean projected growth rate of 3,48 percent with a standard deviation of 0,53 percent growth per year. In this case, Turkey achieves

[24] Almost the same ranking regarding to the scenarios is found for the CEEC10 by Wagner and Hlouskova (2005).

the second highest mean growth projections of 3,48 percent in comparison to the CEEC10. If it is assumed that the future population growth rate of Turkey would be in the vicinity of one percent, namely 1,04, the resulting mean growth projection is 3,55 percent with a standard deviation of 0,46 percent growth per year. This mean projected growth rate of Turkey is also the highest mean growth projection compared to the CEEC10. Hence it is equivalent to saying that an assumed population growth rate about one percent for Turkey would result in the highest mean growth projection compared to the CEEC10.

As a next step of the study the convergence time distributions of Turkey depending on the above estimated growth projections are presented. The convergence time projections of Turkey are computed with respect to various country groups, like the EU14, the EU24, the C3 countries and the CEEC10 concerning different income levels. As already mentioned, the computing of convergence times is based on the assumption that the target countries will grow at the same average growth rate over the period 1990-2001 and so the annual growth rate of GDP per capita of the EU14, the EU24, the CEEC10 is 1,74 percent, for the C3 countries 2,37 percent. Furthermore, the population growth rate of the target countries is held constantly at their 2001 level. The method of the convergence time computation is based on the following facts:[25]

The economic growth of a country can also be investigated in the form

$$\log y_t = \log y_{t-1} + \Delta y_t \qquad (4.2.1)$$

Where $\log y_t$ is the (log) real GDP per capita of a country in the year t, $\log y_{t-1}$ is the (log) real GDP per capita of the country in the year $t-1$ and Δy_t is the growth rate of real GDP per capita in the year t indicating the relative changes in the real per capita income level during the time period t. This equation can be written for both the EU14 and Turkey as follows

$$\log y_t^{EU14} = \log y_{t-1}^{EU14} + \Delta y_t^{EU14} \qquad (4.2.2)$$

$$\log y_t^{TR} = \log y_{t-1}^{TR} + \Delta y_t^{TR} \qquad (4.2.3)$$

For the EU14 countries the annual growth rate of real GDP per capita $\left(\Delta y_t^{EU}\right)$ is assumed to be equal 1,74 percent by the convergence time computations, where for Turkey the annual growth rate of real GDP per capita $\left(\Delta y_t^{TR}\right)$ from the 126 growth projections are inserted to the convergence time computations (Δy^{TR} = *projected growth rate 1,……, projected growth rate 126*). As we know that the growth rate is defined exponentially, we can write the above equation for the EU14 as shown

$$y_t^{EU14} = y_{t-1}^{EU14} e^{0.0174t} \qquad (4.2.4)$$

[25] Here special thanks for his valuable recommendation to Univ. Prof. Dr. Jesús Crespo-Cuaresma.

and in the same way for Turkey

$$y_t^{TR} = y_{t-1}^{TR} e^{(\Delta y^{TR})_t} \qquad (4.2.5)$$

If we compute the convergence time projection of Turkey to a level of 80 percent of real per capita GDP of the EU14, we will have to equal 80 percent income level of EU14 real per capita GDP with Turkey's real per capita GDP in the way of the following equation

$$0.8\,(y_t^{EU14}) = (y_{t-1}^{EU14} e^{0.0174t}) \qquad (4.2.6)$$

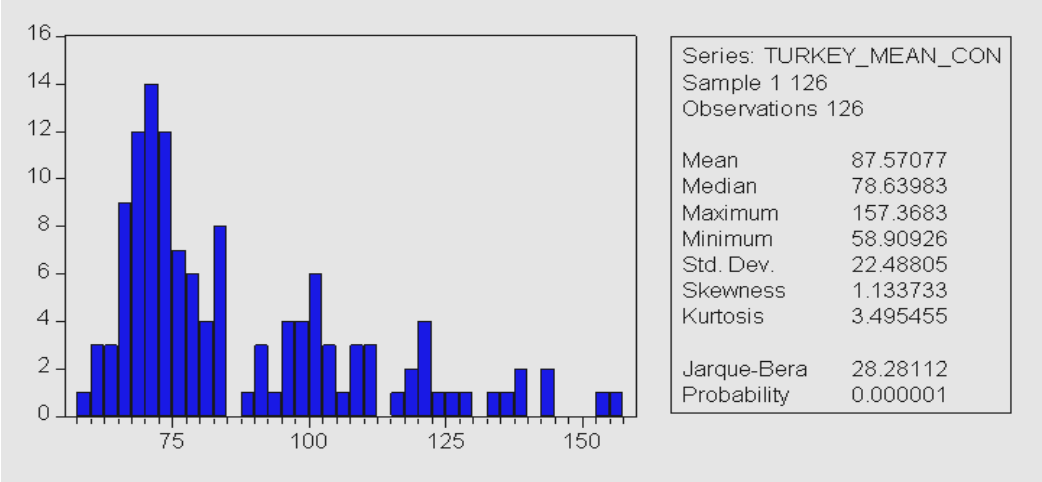
$$0.8\,(y_{t-1}^{EU14} e^{0.0174t}) = y_{t-1}^{TR} e^{(\Delta y^{TR})_t} \qquad (4.2.7)$$

Solving the equation (4.2.7) with respect to the time period t gives the form of convergence time computation that shows how long Turkey needs before it will achieve 80 percent of the EU14 real per capita GDP as defined below

$$t = \left(\frac{\log 0.8 + \log y_{t-1}^{EU} - \log y_{t-1}^{TR}}{\left(\Delta y^{TR} - 0.0174\right)} \right) \qquad (4.2.8)$$

The first results of the convergence time projections for Turkey concerning 80 percent of the EU14 real per capita GDP are presented below.

Histogram 2: The convergence time projections (in years) of Turkey to 80 percent of EU14 real per capita GDP with an assumed annual population growth rate of 0,11 percent.

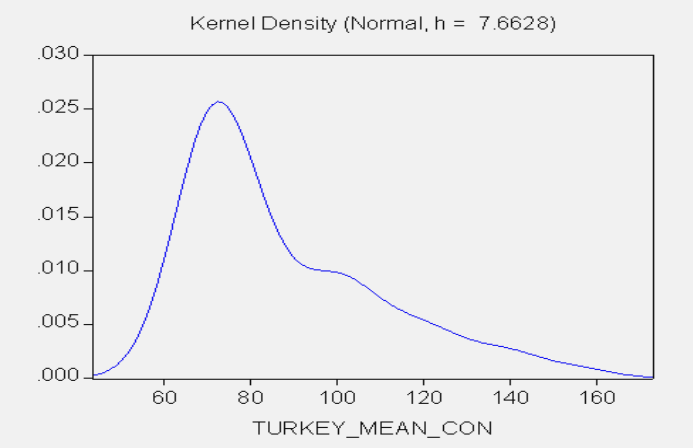


As the histogram shows that Turkey converges to 80 percent of the EU14 real per capita GDP in approximately 70 years. The mean convergence time of Turkey is 87,5 years with a standard deviation of 22,4 years. This is the largest mean

convergence time projection compared to the CEEC10 computed by Wagner and Hlouskova (2005). They found the largest mean convergence time for Romania with 71,4 years and a standard deviation of 18,9 years.[26] In the best case of all the 126 convergence projections, Turkey needs about 58 years to achieve 80 percent of the EU14 real per capita GDP, while in the worst case a convergence time of 157 years is needed for Turkey.

The density of the convergence time projections for Turkey is presented in figure 2. The in the growth projections observed bi-modality can be seen in the convergence time projections as well, but to a lesser extent caused by the large standard deviation indicating the uncertainty inherent in Turkey's convergence time projections.

Figure 2: Density estimate of the convergence time projections to 80 percent income level of the EU14 with the assumed annual population growth rate of 0,11 percent for Turkey.



The bi-modal density estimate of the convergence time distributions resulting from the bi-modal growth projections can be considered as two possible growth paths for Turkey which will be determined by the decisions for the future fiscal policy. In the case of pursuing an economy policy based on lower government consumption and higher investment share, the distribution of the convergence time projections will be shifted to the left which means a shorter convergence time for Turkey. Choosing scenario 2 for Turkey implies a mean projected convergence time of 66 years averaged over the 18 growth equations concerning to 80 percent income level of the EU14, while the realisation of the scenario 7 entails a definitely longer mean convergence time of 120 years for Turkey. This notable difference between the optimistic and the pessimistic scenarios resulting from the 18 growth equations can be traced back to the given scenarios indicating *so-called* uncertainty in the growth literature which is also considerable in the projections which have been used.

In exactly the same way, the convergence time projections for Turkey regarding the various EU country groups with different per capita income levels had been

[26] For more information relating the convergence time projections of the CEEC10 see Wagner and Hlouskova (2005).

calculated and are presented in Table 5. This table shows that a possible convergence of Turkey is still a long-term perspective concerning high income levels of the EU14, the EU24[27], the C3 and even the CEEC10. The mean convergence time projection for Turkey is 85 years before the 100 percent income level of the enlarged EU (EU24) will be attained. The necessary time for Turkey to converge towards the C3 countries concerning 100 percent income level is on average 136,5 years. The reason for the required longer mean convergence time of Turkey regarding the C3 countries can be explained by the higher mean growth rate of real GDP per capita, namely 2,37 percent compared to the average growth rate of the EU14 with 1,74 percent observed in the period 1990-2001. The mean convergence time projection for Turkey concerning 100 percent income level of the CEEC10 turns out to be 53,9 years.

Table 5: The mean convergence time projections (in years) for Turkey concerning various EU country groups with different income levels.

Country Groups	Mean Convergence Time
EU14, 80 % of p.c. income level	87.57
EU24, 100 % of p.c. income level	85.09
EU14, 100 % of p.c. income level	99.88
C3, 100 % of p.c. income level	136.5
CEEC10, 100 % of p.c. income level	53.96

Note: The assumed population growth rate for Turkey is 0.11 percent.

Returning to the discussion with respect to the assumed population growth rates of Turkey, convergence time projections are also calculated with respect to them showing the effect of growing population on its convergence projections. Table 6 presents these convergence time projections of Turkey.[28]

Table 6: The mean convergence time projections (in years) for Turkey concerning EU country groups with various assumed population growth rates.

Convergence time to	Assumed population growth, 1.758 percent	Assumed population growth, 1.547 percent	Assumed population growth, 1.047 percent
EU14, 80 % of p.c. income level Mean	125	110	96
EU24, 100 % of p.c. income level Mean	122	107	94
CEEC10, 100 % of p.c. income level Mean	77	68	59

[27] The EU24 indicates the EU14 together with the CEEC10.
[28] See table 4 above.

Note: The first assumed population growth rate, 1.758 percent, indicates the average population growth rate of Turkey over the period 1992-2003, while the second implies the period end value, 1.547 percent. The last assumed value of the population growth rate is based on a smaller value than the period end value, 1.047 percent.

The realisation of the case which implies the continuation of the observed average population growth rate of Turkey over the period 1992-2003 causes an increase of about 37 years in the mean convergence time projection with respect to 80 percent income level of the EU14 and 100 percent income level of the EU24. Continuing this tendency means 23 additional years to the mean projected convergence time for Turkey concerning 100 percent income level of the CEEC10 as well. Considering the convergence time projections due to the period-end value of the population growth rate, Turkey still needs 22 additional years to achieve 80 percent income level of the EU14 and 100 percent income level of the EU24. In this case, the mean convergence time of Turkey relating to 100 percent income level of the CEEC10 would be extended by 14 years. In the third column, the assumed population growth rate of 1,047 percent is assessed implying a decrease of 0,5 percent in the period-end value of Turkey's population growth. This possibility generates a necessarily longer convergence time of 8,5 years for Turkey referring 80 percent income level of the EU14 and 100 percent income level of the EU24. In this case, the mean convergence time of Turkey concerning 100 percent income level of the CEEC10 would be extended by 5 years.

All these considerations with respect to various population growth rates show the negative impact of a growing population for a country on its subsequent growth process. This is due to the fact defined by the neoclassical growth model that as a result of growing population the ceteris paribus GDP must be divided between a larger population. The results confirm that every positive higher population growth rate than the assumed value of 0,11 percent affects the growth projections negatively and therefore causes longer necessary convergence times for Turkey so that the future growth performance and hence the convergence time of Turkey to the EU will also significantly depend upon the development of the population growth.

The last step of the study consists of investigating the possible effects of the EU structural funds payments in the convergence time projections for a given case of the full membership of Turkey. The effects of the EU payments are estimated by the European Commission to be ranging from 0,4 to 1,2 percent additional annual growth for the less developed countries. These EU contributions could be a significant factor for the growth process of the member countries and these estimated effects could be taken into account in the convergence time projections by adding 0,4 and 1,2 percent annual growth to the previously estimated growth rates. Table 7 shows the results of the mean convergence time projections allowing for the possible effects of the EU payments.

Table 7: The projected mean convergence times (in years) for Turkey concerning different EU country groups with respect to the possible effects of the EU payments.

Convergence time to	mean convergence time projection	+0.4 %	+1.2%
EU14, 80 % of p.c. income level	87.57	70.94	51.66
EU24, 100 % of p.c. income level	85.09	68.92	50.20
C3, 100 % of p.c. income level	136.5	96.91	84.63

Note: The first column displays the mean convergence time projection of Turkey based on the assumed population growth rate of 0.11 percent. The second and third lines indicate the mean convergence time distributions showing the possible effects of the EU payments by adding 0.4 and 1.2 percent to the already estimated 126 growth rate projections. The assumed growth rate of real per capita GDP is for the EU14 and the EU24 1.74 percent, while for the C3 countries it is assumed to be 2.37 percent.

The assumption based on 0,4 percent additional annual growth reduces the mean convergence time for Turkey by 19 percent with respect to 80 percent income level of the EU14 and 100 percent income level of the EU24. Inserting this additional annual growth into the convergence time projections means a decrease by 29 percent in the mean convergence time of Turkey concerning the C3 countries. If the EU payments would lead to a higher positive effect on growth process, namely 1,2 percent, this causes a decline of 41 percent in the mean convergence time of Turkey regarding 80 percent income level of the EU14 and 100 percent income level of the EU24. In this case, the mean convergence time of Turkey concerning the C3 countries is reduced by 38 percent.

As already shown, the effects of the EU payments on growth process of a country are considerable. In a current empirical study performed by Crespo-Cuaresma, Dimitz and Ritzberger-Grünwald (2002), a positive and asymmetric effect of being an EU member is found on long-term economic growth. They also showed that the resulting significant positive effect of the EU membership on economic growth is relatively higher for poorer countries.[29] Hence it is possible to expect such higher positive effects for Turkey from the EU payments depending on the assumption of the full EU membership.

Another interesting point which should be mentioned is the largest mean predicted convergence time of Turkey in spite of the highest mean projected growth rate compared to the CEEC10 computed by Wagner and Hlouskova (2005). A visual inspection on the original data set of the CEEC10 shows that such a result is not surprising for some of the Central and Eastern European countries. There have been considerable differences especially concerning the already existing income levels of real GDP per capita with respect to Slovenia, the Czech Republic and Hungary in comparison to Turkey. These are the three countries, which are projected to achieve 80 percent income level related to the EU14 with the lowest

[29] For a detailed analysis see Crespo-Cuaresma, Dimitz and Ritzberger-Grünwald (2002).

mean convergence times.[30] In order to understand the reason for the largest mean predicted convergence time for Turkey except the existing real GDP per capita levels, it is necessary to analyse the situation of Turkey in more detail. However, such an analysis in spite of its importance is not the scope of the study, which gives an aggregate prospective view on Turkey's growth and convergence process compared to the EU old and new member states.

5 Conclusions:

This study analyses the growth and convergence prospect of Turkey with respect to the incumbent EU member states (EU14), the Central and Eastern European countries (CEEC10) and the enlarged EU (EU24). The methodology of the study follows another study performed by the authors Martin Wagner and Jaroslava Hlouskova, titled „CEEC Growth Projections: Certainly Necessary and Necessarily Uncertain. "

The growth and convergence time projections of Turkey have been generated by using an indirect approach based on the estimated growth equations of the EU14. This is done by means of the convergence property derived from the neoclassical theory which also predicts that a country for example Turkey with a lower initial income per capita would tend to grow faster than the others like the EU14 with higher initial income per capita. The convergence prediction of the neoclassical theory can be investigated for Turkey by using data from EU incumbent member states as long as it is used to estimate the long-run growth projections.

Another issue which is assessed in this study is the so-called uncertainty in the growth projections of Turkey. The uncertainty related to the generated growth projections of Turkey have been quantified by estimating eighteen various growth equations significant to the long-run economic growth with seven plausible scenarios for two chosen important variables, the gross fixed capital formation share and the government consumption share, which provided at last 126 growth rate projections for Turkey. The obtained empirical density estimate of the 126 projected growth rates allows for specifying the uncertainty in the growth projections of Turkey. The assumed annual population growth rate in Turkey's projections is 0,11 percent corresponding to the projected population growth rate performed by Turkish Republic Prime Ministry State Planning Organisation (2004). However, due to the significant positive population growth rate of Turkey in 2003, an additional analysis for this variable was found to be necessary. For this purpose, additional growth projections are computed with respect to the average population growth rate of Turkey over the period 1992-2003 (1,76 percent), the period-end value (2003: 1,54 percent), and another value based on a smaller value than the period-end value of Turkey (1,04 percent).

According to the assumed population growth rate of 0,11 percent, the estimated uncertainty in Turkey's growth projections is found to be 0,41 percent growth per

[30] Wagner and Hlouskova (2005) found that the projected mean convergence time of Slovenia is 9,4 years with a standard deviation of 4,3 years, for the Czech Republic 21,1 years with a standard deviation of 7,1 years, and for Hungary 30,8 years with a standart deviation of 9,9 years.

year. The uncertainty in the mean growth rate projection of Turkey has grown from 0,41 percent growth per year to 0,52 percent resulting from the estimations based on three higher growth rates of Turkey's population. The distributions of the projected growth rates for Turkey are bi-modal as a consequence of the given scenarios based on the GC and the GFCF. The highest mean projected growth rate for Turkey results from scenario 2 drawing on the lowest government consumption share and the highest investment share and implies a necessary factor intensive growth strategy of Turkey to catch up to the EU countries. The lowest mean growth projection is gained from scenario 7 for Turkey based on the highest government consumption share and the lowest investment share. The second lowest mean growth rate is obtained from scenario 1 depending on the actual average values of Turkey. The scenarios 3, 4, 5 consisting of the medial average values of the GC and the GFCF provide a mean growth performance for Turkey. Therefore it is equivalent to saying that the resulting Bi-modality puts a particular importance to the in the future chosen economic policy of Turkey and hence on its growth process.

The mean annual growth rate for Turkey has been projected to be 3,64 percent based on the assumption that the annual population growth rate is 0,11 percent. This is the highest mean growth projection compared to the CEEC10 computed by Wagner and Hlouskova (2005).[31] However, this result has to be interpreted carefully because it relies on the bi-modal density estimate of the growth rate projections. Assuming that the period-average value of the population growth of Turkey (1,76 percent) has reduced the mean growth projection by 0,18 percent whereas this projected growth rate of 3,46 percent is still the second highest mean growth projection in comparison to the CEEC10 after Romania. Considering the period- end value of the population growth of Turkey has produced a mean growth projection of 3,48 percent which indicates the second highest mean growth projection for Turkey after Romania with 3,52 percent across the CEEC10. By a given value of the population growth rate, that is 1,04 percent, the mean growth projection has been calculated to be 3,55 percent with a standard deviation of 0,46 percent growth per year. This is also the highest mean growth projection compared to the CEEC10. It also means that an assumed population growth rate about one percent for Turkey would produce the highest mean growth projection compared to the CEEC10. As already shown, the future growth performance of Turkey will also significantly depend upon the development of the population growth.

The convergence time distributions of Turkey depending on the growth projections had been calculated in respect to four country groups: the EU14, the EU24, the CEEC10 and the C3 (Portugal, Spain, Greece) to different income levels. The density estimate of the convergence time projections is also bi-modal, but to a lesser extent caused by the large standard deviation indicating the uncertainty inherent in the growth projections. This fundamental Bi-modality of the convergence time distributions could be seen as two possible growth paths for Turkey which will be determined by the chosen future economic policy. If Turkey pursued an economy policy based on very low government consumption and relatively higher investment share, the distribution of the convergence time

[31] They found the highest growth projection for Romania with 3,52 percent across the CEEC10.

projections will be shifted to the left which means a shorter convergence time for Turkey towards the EU countries.

It was found that convergence for Turkey is, relative to the high income levels of the EU members, still a long-term prospect and the convergence times are longer than expected. The mean predicted convergence time for Turkey to 80 percent of the EU14 real GDP per capita is 87,5 years with a standard deviation of 22,4 years based on the assumed population growth rate of 0,11 percent. This is the largest mean predicted convergence time compared to the CEEC10. The mean projected convergence time for Turkey is 85 years with respect to 100 percent of the EU24 real GDP per capita. The mean time which would be necessary for Turkey to converge towards the C3 countries to 100 percent of the income level is 136,5 years, while the mean convergence time to 100 percent of the CEEC10 real per capita GDP requires 53,9 years for Turkey.

Assuming that the period-average value for the population growth of Turkey is 1,76 percent, this would increase the mean predicted convergence time of Turkey by 37 years with respect to 80 percent of the EU14 real GDP per capita and 100 percent of the EU24 real GDP per capita. This assumed population growth rate means 23 additional years in the mean predicted convergence time of Turkey concerning 100 percent income level of the CEEC10. Computing the convergence time according to the population growth rate with the period-end value requires 22 additional years for Turkey to achieve 80 percent income level of the EU14 and 100 percent income level of the EU24. This assumed population growth rate would result in 14 additional years for Turkey in the mean predicted convergence time relating 100 percent income level of the CEEC10. The given value of the population growth rate, 1,04 percent, produces an additional convergence time of 8,5 years referring to the EU14 and the EU24. This assumed value of the population growth would extend the mean projected convergence time of Turkey by 5 years concerning the CEEC10. As one can see, as a result of growing population every increase of assumed population growth rate causes longer mean convergence times for Turkey because the ceteris paribus GDP must be divided between a larger population defined by the neoclassical growth model.

Other issues which are investigated in this study are the possible effects of the EU structural funds payments on the growth process of the member countries. However, such an analysis would make sense for Turkey only in the case of full membership. The effects of the EU payments estimated by the European Commission are ranging from 0,4 to 1,2 percent additional annual growth for the less developed countries. The case implying an additional annual growth of 0,4 percent would mean a reduction in the mean projected convergence time of 19 percent of Turkey with respect to 80 percent income level of the EU 14. Adding 1,2 percent annual growth causes a decline by 41 percent in the mean predicted convergence time of Turkey before it reaches 80 percent income level of the EU 14 indicating a considerable positive effect of the EU payments.

Finally, a brief inspection on the original data set of the CEEC10 countries shows that the reason of the longer mean predicted convergence time for Turkey compared to the CEEC10 could be explained to an important extent by

considerable differences of the already existing real GDP per capita levels with respect to Slovenia, the Czech Republic and Hungary.

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APPENDİX:

Appendix A:

Abstract

This study investigates the growth and convergence prospects of Turkey regarding the incumbent EU member states, the Central and Eastern European Countries (CEEC10) and the enlarged EU by means of panel data methods. The methodoly of the following study has been previously used for growth projections of the CEEC10 by Wagner and Hlouskova (2005). The growth projections of Turkey will be generated by basing on the estimated growth equations of the incumbent EU member states. The uncertainity concerning the generated growth projections of Turkey will be quantified by estimating different kinds of growth equations significant to the economic growth together with various scenarios for two explanotary variables, government consumption and investment share. The necessity of a further analysis in this study is given by the significant positive value of the population growth rate of Turkey.

The mean projected growth rate of Turkey has been found to be 3,64 percent based on the main assumption of an annual population growth rate of 0,11 percent. The implied uncertainity in the projected growth rates of Turkey is found to be 0,41 percent growth per year. This is the highest mean projected growth rate in comparison to the CEEC10 computed by Wagner and Hlouskova (2005). It has been presented that the empirical density estimate of Turkey both for growth and convergence projections is bi-modal as a result of given scenario. The fundamental Bi-modality of the convergence time distributions could be seen as two possible growth paths for Turkey which will be determined by the decisions for the future fiscal policy, furthermore it implies a necessary factor intensive growth strategy of Turkey for a possible convergence towards the EU countries.

It was found that independent from the assumed population growth rates in the study, a convergence for Turkey towards the EU is still a long-term prospect and

the projected convergence times are longer than expected. The mean convergence time of Turkey to 80 percent of the EU14 real GDP per capita is projected to be 87,5 years with a standard deviation of 22,4 years based on the assumed population growth rate of 0,11 percent. This is the largest mean predicted convergence time compared to the CEEC10. One more point which has become clear in this study is how significant effects a growing population of Turkey would have on its economic growth. It has been shown that the future growth performance and hence the predicted convergence time of Turkey to the EU will decisively depend on the development of the population growth as well.

Appendix B:

Abstract in German

Diese Studie untersucht die Wachstums- und Konvergenzaussichten der Türkei in Bezug auf die alten EU-Mitgliedsstaaten (ausgenommen Luxemburg, EU14), die neuen EU-Mitgliedsstaaten (CEEC10) und die erweiterte Europäische Union (EU24). Die Methodik der Arbeit richtet sich nach der Studie „ Growth Projections: Certainly Necessary and Necessarly Uncertain.“ von Jaroslava Hlouskova und Martin Wagner, in der die Wachstums- und Konvergenzperspektiven für die Mittel- und Osteuropaischen Lander in Bezug auf die alten EU-Länder geschatzt und analysiert werden.

Die Wachstums- und Konvergenzzeitprojektionen der Türkei wurden mittels einer indirekten Methode geschätzt, in der die Wachstumsgleichungen der EU14 auch für die Türkei verwendet werden. Um die Ungewißheit der durchgeführten Wachstumsprojektionen in Bezug auf die Türkei zu quantifizieren, wurden 18 unterschiedliche ökonomisch sinnvolle Wachstumsgleichungen mit sieben Szenarien für zwei wichtige Erklärungsvariablen, nämlich den staatlichen Konsumanteil und den Investitionsanteil, simuliert, wodurch 126 Prognosen für die Wachstumsrate erhalten wurden. Die jährliche Bevölkerungswachstumsrate der Türkei wurde in den Projektionen mit 0,11Prozent angenommen, was dem Wert der vom türkischen Statistikamt prognostizierten Bevölkerungswachstumsrate für den Zeitraum 2040-2050 entspricht. Eine weitere Analyse wurde in der Arbeit aufgrund der signifikant positiven Bevölkerungswachstumsrate der Türkei im Unterschied zu den EU-Mitgliedsstaaten durchgeführt. In dieser wurden für die Projektionen der Wachstumsraten der Türkei die durchschnittliche Bevölkerungswachstumsrate über den Zeitraum 1992-1993 (1,76 Prozent), die letzte Bevölkerungswachstumsrate dieser Periode (2003: 1,54 Prozent) und eine kleiner als die Bevölkerungswachstumsrate des Jahres 2003 angenommene (1,04 Prozent) verwendet.

Die durchschnittliche prognostizierte Wachstumsrate der Türkei wurde zu 3,64 Prozent mit einer Standardabweichung von 0,41 Prozent geschätzt, was ebenso die größte durchschnittliche Wachstumsprojektion – verglichen mit den Mittel- und Osteuropäischen Ländern – ist. Es wurde gezeigt, dass sowohl die empirische Dichte der künftigen Wachstumsraten als auch die Konvergenzzeiten der Türkei bi-modal sind, was sich durch die simulierten Szenarien erklären lässt. Die beobachtete bi-modale Verteilung der Konvergenzzeitprojektionen könnte als

Möglichkeit zweier Wachstumswege für die Türkei interpretiert werden, welche durch die künftige Fiskalpolitik der Türkei bestimmt werden.

Weiters wurde in der Arbeit gezeigt, dass unabhängig von den angenommenen Bevölkerungswachstumsraten, eine mögliche Konvergenz der Türkei zu den hohen Einkommensniveaus der EU14, der EU24 und der Mittel- und Osteuropäischen Länder noch eine langfristige Perspektive ist und die projizierten Konvergenzzeiten länger als erwartet sind. Die durchschnittliche Konvergenzzeit der Türkei zu 80 Prozent des Einkommensniveaus der EU14 wurde als 87,5 Jahre mit einer Standardabweichung von 22,4 Jahren projiziert, was auch die längste durchschnittliche projizierte Konvergenzzeit – im Vergleich zu den Mittel- und Osteuropäischen Ländern – ist. Ein weiterer Punkt, welcher in dieser Arbeit behandelt wurde, beschäftigt sich mit der Frage, wie groß die Auswirkungen einer größeren als in den Prognosen verwendeten Bevölkerungswachstumsrate der Türkei auf ihr wirtschaftliches Wachstum wären. Es hat sich herausgestellt, dass die künftige Wachstumsrate und daher die projizierte Konvergenzzeit der Türkei zu den EU-Ländern entscheidend von der künftigen Entwicklung ihres Bevölkerungswachstums abhängt.

Appendix C:

Data and sources

- GDP: Real GDP per capita, in constant dollars (PPP, base year 1985) is taken from World Development Indicators 2003 for Turkey, World Bank. For the growth regressions of the EU14 and comparisions of the CEEC10, the computed data for real GDP per capita, in constant dollars (PPP, base year 1985) by Wagner and Hlouskova (2003) is used which is based on GDP per capita, constant 1999 US$ (EKS PPP) taken from Groningen Growth and Development Center, University of Groningen.

- GC (% of GDP): General government final consumption expenditure, taken from World Development Indicators 2003, World Bank.

- GFCF (% of GDP): Gross fixed capital formation, taken from World Development Indicators 2003, World Bank.

- PRIM (% gross): Primary school enrollment is the share of children of any age that are enrolled in primary school. In countries where many children enter school late or repeat a grade the PRIM can exceed 100 percent. PRIM is also taken from World Development Indicators 2003, World Bank.

- TT (% of GDP): Total Trade, taken from World Development Indicators 2003, World Bank.

- X (% of GDP): Exports of goods and services, taken from World Development Indicators 2003, World Bank.

Appendix D:

Curriculum Vitae

Personal

Name:	Hilal Esina-Müller
Date of Birth:	01.03.1979
Place of Birth:	Tunceli, Turkey
Citizenship:	Turkey
Marital Status:	Married

Education:

08/ 2001 - 04/ 2008	Economics, University of Vienna
Focuses:	Applied econometrics, applied economics, financial science, labour economics, industrial economics.
Master Thesis:	Growth Projections: “How far is Turkey from the European Union?”
Advisor:	Prof. Dr. Jesús Crespo-Cuaresma
08/ 1996 - 06/ 2000	Bachelor of economics degree, University of Dumlupınar, Kütahya, Turkey.

Practical Trainings:

03/ 2002 - 06/ 2002	Practical training in econometrics I, University of Vienna. (Regression analysis) Subject: The Gender Wage Gap in the USA.
10/ 2002 - 03/ 2003	Practical training in econometrics II, University of Vienna. (Regression and time series analysis) Subject: Analysis of earnings profiles with respect to work experience.

Language Skills:

Turkish	Mother tongue
German	Fluent
English	Fluent

Seminars and Excursions:

02/ 2002	Participation in the Excursion to Warsaw, with the University of Vienna. Subject: Economical transformation of Poland.
04/ 2004	Participation in the Osterseminar, with Austrian Orient Society and the Afro Asiatic Institution, Passau, Germany. Subject: “Economics and poverty”