

Some Observations on the Convergence Experience of Turkey

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Abstract

We explore some aspects of the convergence process of Turkey and provide some international comparisons tracking the changes in per capita income figures. Turkey lost ground in the last few decades (1977-2001) of the 20th century. After the lost decades, Turkey had high growth rates during 2002-2007. We argue that the rate of productivity growth will be an important factor for Turkey to converge to per capita income levels in developed countries. Our investigation with different countries and country groups provide motivation for rendering possible comparisons of the similarities in Turkey and Latin America.

Keywords: Turkey, comparative studies of countries, convergence, growth accounting.

JEL classification: N10, O11, O40, O47, O57.

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1. Introduction

Why are some countries rich and others poor? Why do income levels differ among countries? Why do growth rates differ? Why does per capita income increase over time? These questions and some related ones are among the most important questions in economics. In the last decade, these intellectually stimulating questions have become subjects of the public and policy-related discussions in Turkey, since the country has shown high growth rates. Turkey is an upper middle income country with a population around 75 million and a GDP of US\$0.82 trillion, making it the 17th largest economy as of 2013.¹ A comparison within the OECD group reveals that Turkey has the second highest average annual growth rate of GDP (measured in constant local currency) and the fifth highest average annual growth rate of purchasing power parity (PPP)-adjusted per capita GDP among all the OECD countries during 2004-2012 (Üngör and Kalafatçılar, 2014). In fact, Turkey's GDP growth rate in 2010 averaged about 9% ranking it in first place in Europe and it accelerated to 11% in the first quarter of 2011 outpacing China's growth rate.²

This study aims to bring about a better understanding of the convergence experience of Turkey. We do not analyze Turkey's case in isolation but place it in the general context of economic growth and development and the experiences of other economies. We provide some insights, based on international comparisons, to contribute to the understanding of the Turkish growth experience using a relatively theory-free approach. We are aware of that an argument that is not disciplined by a clear theoretical framework would be less illuminating. Having this in mind, we present some facts regarding the growth experience of Turkey. Our work relies on descriptive macro-level statistics and employs a growth accounting framework to decompose growth rates into different factors. This approach, we believe, is still informative and may offer insights for future theoretical as well as empirical work.

First, we delve into the convergence experience of Turkey presenting some international comparisons. We use purchasing power parity (PPP)-adjusted per capita GDP as a measure of economic development and, based on this indicator, compare the performances of different countries with that of the United States. Specifically, we examine different countries and country groups to infer which of them have similar relative per capita income levels/growth rates throughout the time. Our investigation provides motivation for rendering possible comparisons of the similarities in Turkey and Latin America. Specifically, we observe that per capita income levels and growth rates are very similar for Turkey and Brazil.

Second, we examine the sources of growth in Turkey and decompose changes in output per worker into different components. Turkey lost ground in the last few decades of the 20th century. After the lost decades (1977-2001), Turkey had high growth rates during 2002-2007, with an average annual rate of nearly 7%. We study the growth performance of Turkey in the lost decades (1977-2001) and in the high-growth era (2002-2007), within a growth accounting framework, calculating the contributions of capital, labor, education, and total factor productivity (TFP) to growth. According to our findings, TFP actually deteriorated between 1977 and 2001. We find that output per worker grew more than 5% per year during 2002–2007 and TFP growth accounted for around half of this growth on the back of the reforms and structural transformation policies implemented in the post-2001 period. In addition, we report some data for Turkey and Brazil, in comparison with Korea, to see whether these two countries have similarities in their convergence experiences.

Our paper is most closely related to the literature that investigates the growth experience of Turkey in detail in order to enhance our understanding of important factors that affect economic growth. Accordingly, our study complements recent studies of, among some others, Altuğ et al. (2008), Adamopoulos and Akyol (2009), Çiçek and Elgin (2011), Atiyas and Bakis (2014), İmrohoroğlu et al. (2014), Üngör and Kalafatçılar (2014). Turkey had high

growth rates during 2002-2007 with sound economic governance and institutional reforms increasing aggregate productivity. Central Bank independence that was granted by Law in 2000; the introduction of free-floating exchange rate regime in 2001; and inflation-targeting regime in 2002 were key steps (Yılmaz, 2008). The reforms also included attaining fiscal discipline, strengthening the banking system; improving the investment climate; speeding up the privatization (OECD, 2006, 2012; Gürsel, 2011; Aysan et al., 2013). This does not mean that growth in the short-run guarantees sustainability in the long-run.

The initial reforms of the 2002-2007 period should be deepened over time with productivity-enhancing policies. This argument is in line with Rodrik (2005), who states that sustaining growth requires more extensive institutional reform and the key to longer-term convergence is to develop institutions that maintain productivity growth. The findings suggest that policies should be targeted to increase the overall productivity growth. In addition, uncovering the determinants of TFP growth may shed light on government policies, since some of these policies may affect the economy by influencing TFP growth. Our results are consistent with those of Hall and Jones (1999), Parente and Prescott (2002), Caselli (2005), Hsieh and Klenow (2010), Jones and Romer (2010), who argue that most of the differences in international incomes are results of differences in TFP.

The rest of the paper is organized as follows. Section 2 explores the convergence experience of Turkey presenting international comparisons. Section 3 studies the economic performance of Turkey using a growth accounting framework that provides a breakdown of growth into components associated with changes in factor inputs and a residual that reflects technological progress and other elements. We also take a close look at the development experiences of Brazil and Turkey in comparison with Korea. Concluding remarks are presented in Section 4.

2. Convergence Experience of Turkey

We start with an international comparison of growth rates using real GDP per capita for 96 countries. Figure 1(a) plots the average annual growth rates of GDP per capita over the period 1950-2013 against the per capita GDP relative to the U.S. in 1950 (see Appendix A.1 for the list of the countries). Data are from the 2014 version of the *Conference Board Total Economy Database*. Data are in PPP-adjusted units to account for differences in relative price levels between countries. Figure 1(a) reveals a great dispersion in growth rates and suggests the absence of any strong correlation between initial relative income and growth in the post-war world. The growth rates in Figure 1(a) range from a low of -0.56% per annum in Madagascar to a high of 5.40% per annum in Korea.³ Figure 1(b) shows the selected countries from Figure 1(a). Relative income was 15.2% in Turkey and 15.7% in Brazil in 1950. On the other hand, it was only 7.9% in Korea. Brazil and Turkey have experienced average growth rates of less than 3%, whereas Korea has experienced average growth rates of more than 5% during 1950-2013.

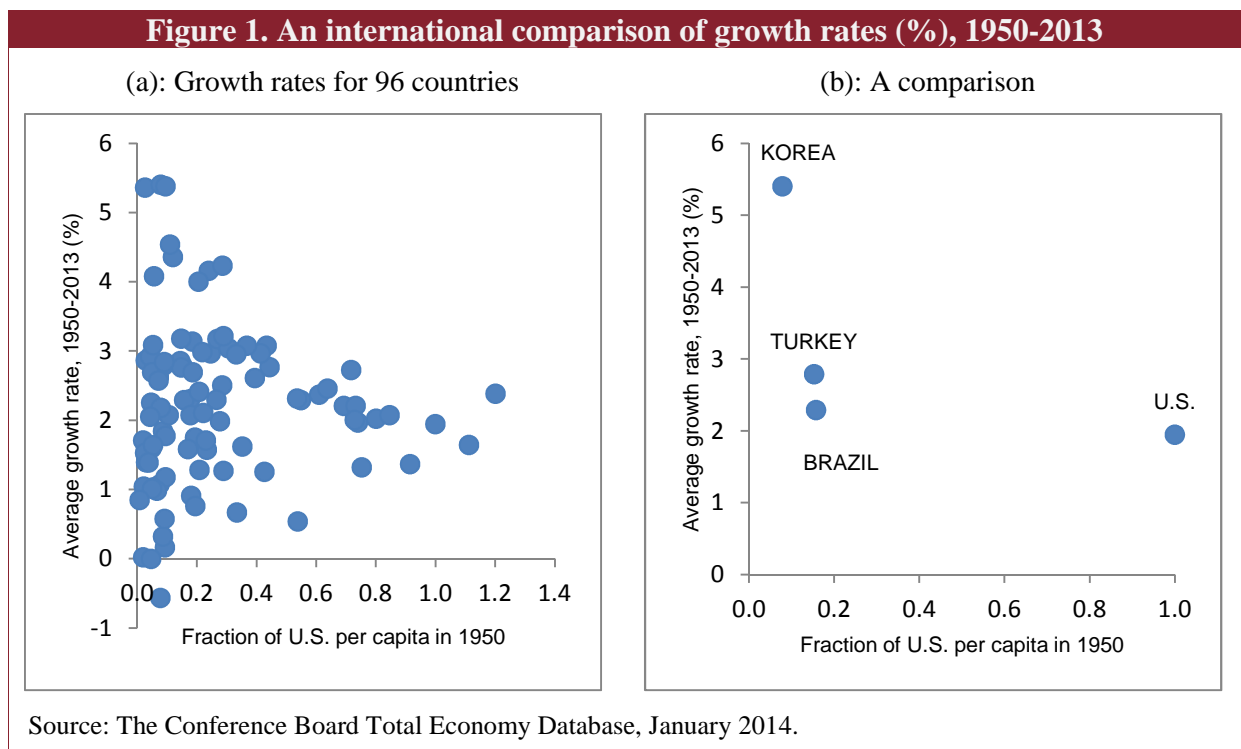
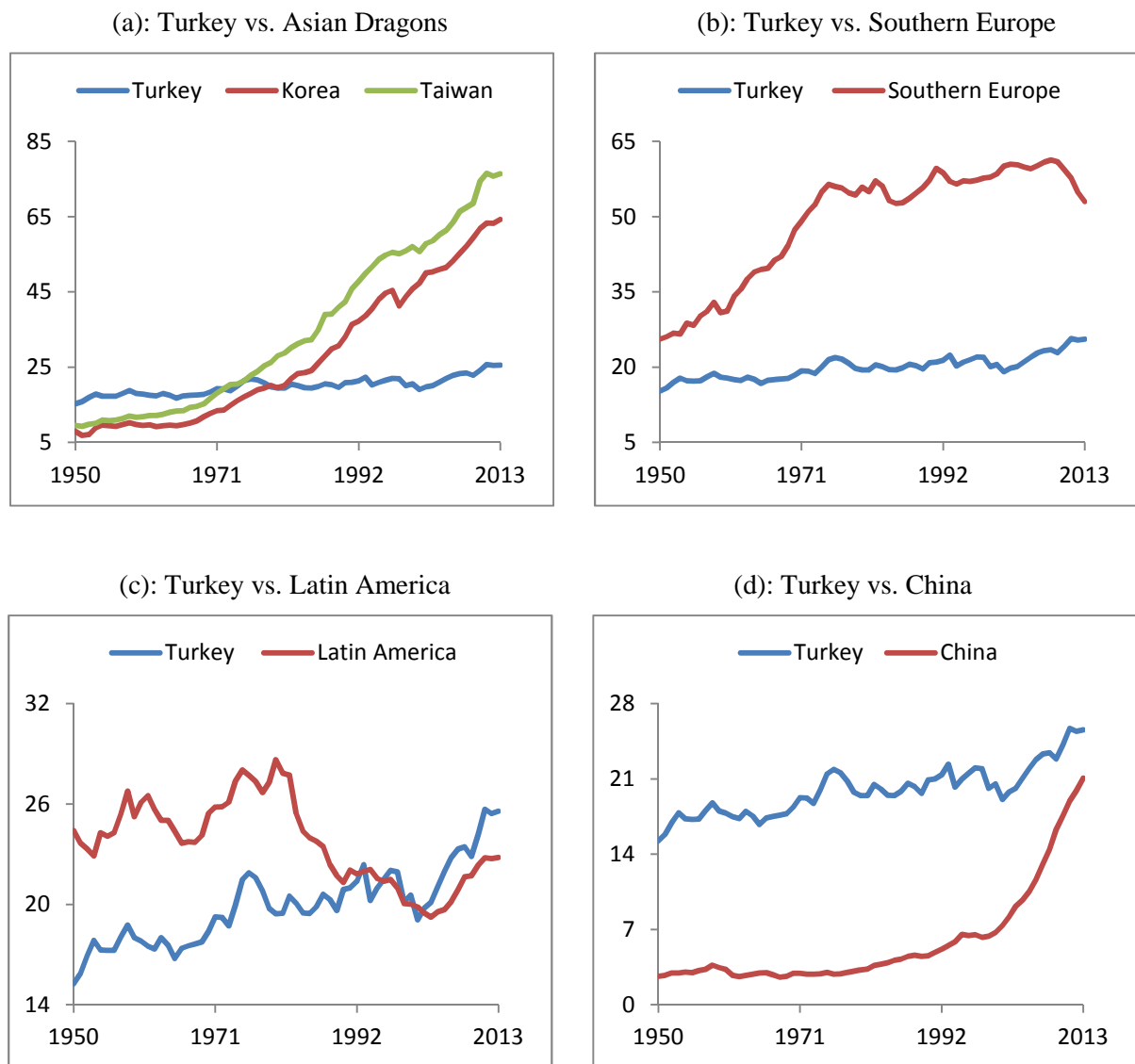


Figure 1(b) motivates two questions: (i) How does GDP per capita in Turkey relative to the U.S. evolve? (ii) Which countries can be classified as peer countries of Turkey in terms of the behavior of per capita income? Figure 2 suggests possible answers to these questions. Figure 2 shows GDP per capita in Turkey and in a set of different countries, relative to the U.S. during 1950-2013. Historically, per capita GDP in Turkey does not show a catching up. For example, GDP per capita in Turkey increased from 15.2% of the U.S. level in 1950 to around 21.9% in 1976. Turkey experienced a relative deterioration starting with 1977 on as the GDP per capita shrank to 19.1% of the U.S. level in 2001. There has been an upward trend after the economic crisis of 2001 and the relative GDP per capita in Turkey reached to 25.6% in 2013.

Panel (a) presents a comparison of Turkey and two of the so-called Asian Dragons: Korea and Taiwan.⁴ The remarkable catching up of East Asia is visible, since per capita income in Korea (Taiwan) reached to 64.3% (76.4%) of the U.S. level by 2013. Panel (b) displays a comparison of Turkey and the region of Southern Europe (Greece, Portugal, and Spain).⁵ Relative income in Southern Europe was 25.6% of the U.S. level in 1950 and reached to about 53.0% in 2013. This region had caught up significantly with the U.S. by the mid-1970s, while Turkey had remained relatively stagnant.

Panel (c) in Figure 2 exhibits a comparison of Turkey and Latin America (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, and Venezuela). Relative income in Latin America was less than 25% of the U.S. level of per capita income in 1950. Latin America experienced a relative deterioration from 1980 on as the per capita income of the group decreased to around 22.8% of the U.S. level in 2013. Panel (c) is consistent with the argument of Rodrik (2012, p. 158) that the very last decade in Latin America shows the process of convergence, but the gap between the average income levels in Latin America and in the U.S. is wider now than it was in the 1970s.

Figure 2. GDP per capita relative to the U.S. (%), 1950-2013



Source: The Conference Board Total Economy Database, January 2014.

It is worthwhile to report data for China, since China has been the fastest growing country after 1978. Panel (d) shows that per capita GDP in China was less than 3% of the U.S. level in 1950. Economic reforms, which started in 1978, have driven a rapid transition from central planning toward a market-oriented system integrating with the world economy. China experienced a stupendous growth rate of 7.4% during 1978-2013 as compared to 2.6% during 1950-1977.

In sum, Figure 1 and Figure 2 show that there are high growth countries (such as Korea) and low growth countries (such as African countries); countries that took off around 1980 (such as China) and countries that experienced collapses in growth rates in the last decades of the 1980s (such as Turkey and Latin American countries).

3. Sources of Growth in Turkey

Section 2 suggests that explaining growth performances across different periods is informative to develop a better understanding of Turkish economic growth experience. This section studies the sources of economic growth in Turkey, relying on an accounting framework to decompose changes in output into two portions: one due to the changes in factor inputs and the other due to the changes in efficiency with which these factors are used. We, separately, examine two sub periods: (i) 1972-2001 and (ii) 2002-2010.

We have a common framework for both periods and we consider the following aggregate production function:

$$Y = AK^\alpha(Lh)^{1-\alpha}, \quad (1)$$

where Y represents real gross domestic product (GDP), K is real physical capital and Lh is the “quality adjusted” workforce, namely the number of workers L multiplied by their average human capital h , while α and $(1 - \alpha)$ are the elasticities of output with respect to capital and labor, respectively. The term A tells us how productively the economy uses all the factors of production. For this reason, A is called total factor productivity, or TFP. In per-worker terms the production function can be rewritten as

$$y = Ak^\alpha h^{1-\alpha}, \quad (2)$$

where y is the output per worker $y \equiv Y/L$, and k is the capital-labor ratio $k \equiv K/L$. We take logarithms of this expression and decompose the average annual growth rate of output per worker over a number of years, z , (from time t to time $t+z$) as follows:

$$\frac{\log(y_{t+z})-\log(y_t)}{z} = \frac{\log(A_{t+z})-\log(A_t)}{z} + \alpha \frac{\log(k_{t+z})-\log(k_t)}{z} + (1 - \alpha) \frac{\log(h_{t+z})-\log(h_t)}{z}. \quad (3)$$

This expression decomposes changes in output per worker into changes in TFP (the first term on the right hand side), changes in physical capital per worker (the second term on the right hand side), and changes in human capital per worker (the last term on the right hand side).

3.1. Sources of Growth in the Lost Decades

Here, we study the 1972-2001 period using the data from Saygılı et al. (2005) on Turkey. Saygılı et al. (2005) provide a detailed study with data on physical capital and GDP (both in 1990 prices) as well as number of employed people between 1972 and 2003. We need data on human capital in addition to the Saygılı et al. (2005) dataset. Human capital is constructed using information on average years of schooling in the population over 15. Data on average years of schooling are from the June 2014 update of the Barro-Lee dataset (<http://www.barrolee.com/>). These are converted into human capital, following Caselli (2005), using the formula $h = e^{\varphi(s)}$, where s is average years of schooling, and the function $\varphi(s)$ is piecewise linear with slope 0.134 for $s \leq 4$, 0.101 for $4 < s \leq 8$ and 0.068 for $s > 8$ [see Caselli (2005) for details]. Data in the Barro-Lee dataset are constructed at 5-year intervals from 1950 to 2010 (see Barro and Lee, 2013). We use linear interpolation in between years ending in 0 and 5, to estimate missing observations. To calculate TFP, given series for Y , K , L , and h , we need to choose a value for α .

The single parameter that is used in growth accounting exercise is the capital (or labor) share. There has been a tradition arguing that the factor shares in the national income are roughly constant over time. The reference for this argument is based on Kaldor's stylized facts for the United States (see Kaldor, 1961). Gollin (2002) argues that factor shares adjusted for self-employed income and sectoral composition are remarkably constant across both time and countries, however, and that the capital shares cluster around 0.35. Chen et al. (2010), among many other studies, use 0.5 as the labor share for developing economies, because labor is cheap compared to advanced countries, leading to a lower labor share. Recent studies on Turkey, such as Altuğ et al. (2008), Ismihan and Metin-Ozcan (2009), and Tiryaki (2011), are in line with Chen et al. (2010). In what follows, we set the capital income share, $\alpha = 0.5$.

Table 1. Sources of growth in Turkey (average annual changes, %) , 1972-2001

Period	Output per worker	Contribution of:		
		Physical capital per worker	Human capital per worker	Total factor Productivity
1972-1976	4.61	3.68	0.68	0.25
1977-2001	1.66	1.54	0.69	-0.57

Source: The Barro-Lee dataset (<http://www.barrolee.com/>), Saygılı et al. (2005), Author's calculations.

Table 1 reports the growth rate of each of these factors for two sub periods between 1972 and 2001. During 1972-1976, output per worker grew at 4.61% per year, and physical capital per worker growth accounted for around 80% of this growth. That growth rate until 1977 was attributable to the import-substituting industrialization strategy of development and to increased foreign borrowing and remittances of more than a half million Turkish workers in the European countries, mainly in West Germany in addition to the public sector growth. The ending of foreign lending, in the end of 1976, and subsequences caused large disrupts in domestic production. The import substitution policies were implemented until 1980. On January 24, 1980, the Turkish government announced a major stabilization and structural adjustment program (see, e.g., Aricanli and Rodrik, 1990; Şenses, 1994). The Turkish

economy used to experience boom-and-bust cycles throughout the 1980s and 1990s. The economic crisis in 2001 was the low point of this period, when real GDP contracted more than 5%.

Striking differences before and after 1977 can be found in Günçavdı et al. (1998). Table 2, following Günçavdı et al. (1998), presents a comparison of selected macroeconomic indicators for the periods 1971-76 and 1977-80. From 1977 to 1980, growth collapsed virtually to zero and inflation accelerated. Controls on nominal interest rates caused extreme financial repression in this period, with the real interest rate averaging minus 43%. Another important problem in the lost decades was the public deficit. Demir (2004) notes that the share of total public sector borrowing requirement reached 16.4%, while the share of interest payments in the consolidated budget increased to 23% of GNP by 2001 from around 4.7% and 0.5% in 1975, respectively.

Table 2. Selected macroeconomic indicators (period averages) (%)

	1971-1976	1977-1980
GNP growth rate	7.7	1.3
Inflation Rate ^a	18.1	61.9
Nominal Interest Rate ^b	8.7	18.5
Real Interest Rate	-9.4	-43.4
User cost of capital	-4.1	-35.0

^a Change in wholesale price index; ^b End of period value of nominal 12-month deposit rate.

Source: Günçavdı et al. (1998, Table 1).

Table 1 shows that from 1977 to 2001, output per worker grew at a rate of 1.66%. During this second sub period, physical capital per worker grew by 1.54% but was offset by negative contribution of TFP growth. Low growth rate of physical capital per worker and negative contributions of TFP growth are the main reasons for the low output per worker growth between 1977 and 2001. The years between the late 70s and 2001 have been known as the lost decades for Turkey.

The argument of “the lost decades in Turkey” has been stated, among some others, by Demir (2004), İmrohoroğlu et al. (2009) and Çiçek and Elgin (2011). Demir (2004) studies the 1974-2000 period and discusses the importance of contemporaneous relationship between external debt flows and capital flight; and the role of public sector together with the domestic banking as factors behind the economic crisis in the Turkish economy during the sample period. İmrohoroğlu et al. (2009) and Çiçek and Elgin (2011), using the Kehoe and Prescott (2007) methodology, look at the historical growth experience of Turkey analyzing the evolution of the detrended output per working age person. Çiçek and Elgin (2011) argue that the Turkish economy experienced a depression from the end of 1976 to 1984. İmrohoroğlu et al. (2009) state that the 1977-2001 period can be described as a period of significant stagnation in Turkey. Recently, the Governor of the Turkish Central Bank labels the period from 1974 to 2003 as “the 30 lost years”; and argues that, in 2011, GDP per capita in Turkey (at current US\$) would have been around 31% of the U.S. per capita income (instead of the actual 22% of the U.S. level) if annual inflation rate had averaged 5% during 1974-2003 (Başçı, 2012a, b).

Turkey experienced a period with chronically high inflation rate. The average inflation rate in Turkey during 1974-2003 was 56%. Dibooglu and Kibritcioglu (2004) list five factors that could have been responsible for the high and persistent inflation rates in this period: (i) high public sector deficits; (ii) monetization of public sector deficits; (iii) increases in prices of major imported inputs (crude-oil prices); (iv) inflationary effects of rising exchange rates via increases in prices of imported goods; and (v) persistent inflationary expectations of economic agents.⁶

3.2. Sources of Growth in the Post-2001 Period

Our purpose is to provide a perspective on the sources of economic growth in Turkey in the post-2001 period, which is a high-growth era compared to the 1977-2001 period (see Figure 2). We use the updated data for Turkey to account for the revisions to the national accounts. The Turkish Statistical Institute released the revision to GDP data in 2008. The main reason for this revision was to account for the structural changes in the economy since 1987 and to harmonize Turkey's GDP estimates with the European System of Accounts (ESA 95). This revision updates the base year to 1998 from 1987, and includes both changes in methodology and coverage. With this revision, historical GDP series, both in real and nominal terms, as well as key macroeconomic ratios of Turkey such as shares of expenditure components in GDP have changed significantly (World Bank, 2008; Aldan and Üngör, 2012; Üngör, 2014).

Üngör and Kalafatçılar (2014) bring together a dataset that is consistent with the recent national accounts and labor market statistics revisions in Turkey. We follow them constructing the dataset for the 2002-2010 period. Specifically, GDP data are obtained from the Turkish Statistical Institute's "Expenditure on the Gross Domestic Product (at 1998 prices)" table. We use the capital services index of Demiroğlu (2012) for the Turkish economy. That index properly weighs different types of capital in accordance with their marginal product, and thereby provides an appropriate measure of physical capital. Human capital is constructed following the procedure we describe Section 3.1. Data on employment are from the Ministry of Development of Turkey, Economic and Social Indicators (1950-2010), Table 8.7.⁷ TFP is calculated as the residual and we set the capital income share, $\alpha = 0.5$.

Table 3 presents the result of the decomposition presented in Equation (3). Since 2001, Turkey has put in place a structural reform agenda, coupled with sound monetary and

fiscal policies, to establish stability and to improve the business environment. Atiyas (2012) argues that until the crisis of 2000-2001, economic policy making was centralized and the discretionary powers of the government increased. Since then, there has been a move towards a more rule-based form of governance. Aysan et al. (2013) present an account of Turkey's experience in dealing with various institutional and structural challenges during the last decade (see, also, Saygılı and Cihan, 2008; Ismihan and Metin-Özcan, 2009; Atiyas and Bakis, 2014 for some of the recent detailed studies).

Table 3. Sources of growth in Turkey (average annual changes, %), 2002-2010

Period	Output per worker	Contribution of:		
		Physical capital per worker	Human capital per worker	Total factor Productivity
2002-2007	5.3	2.2	0.5	2.6
2008-2010	-1.3	-0.1	0.6	-1.8

Source: The Barro-Lee dataset (<http://www.barrolee.com/>), Demiroğlu (2012), TurkStat, Ministry of Economy, Author's calculations.

Table 3 shows that output per worker grew at 5.3% per year, and TFP growth accounts for around 50% of this growth between 2002 and 2007. Our findings are consistent with those of Atiyas and Bakis (2014). They find that, in the period 2002-2010, among the 98 countries for which complete data is available, Turkey ranks 7th in terms of TFP growth calculated through the Solow residual. These results based on aggregate data are supported by the firm-level analysis as well. For example, Saliola and Seker (2011), covering manufacturing firms in 80 countries of the World Bank's Enterprise Surveys, calculate aggregate productivity for developing countries, where firms' productivity levels are weighted by their output shares in order to compute aggregate productivity. They find that Turkey has the second highest aggregate productivity (after Indonesia) among the countries that were surveyed in 2008-2009 (and that had at least 100 firms for which TFP could be estimated).

Notice that we focus on output per worker since it provides an indicator of labor productivity and because scaling by number of workers brings it closer to a measure of income per capita, which is a typical indicator of living standards. We provide two different alternative decomposition strategies in Appendix A.2.1. In addition, in Appendix A.2.2, we compare our calculated TFP growth rates with the ones reported by the Conference Board Database.

Ismihan and Metin-Özcan (2009) list four factors that could have been responsible for the speed-up in TFP: (i) successful reduction of the inflation rate, fiscal discipline, and the stable macroeconomic environment; (ii) institutional reforms to the central bank and to the financial sector; (iii) the relatively stable political and external environment; and (iv) the prospect of possible European Union (EU) membership. The statement of relatively stable political government deserves an explanation.

Turkey had many coalition governments for a long time before 2002. For example, the coalition government that was in power during 1999-2002 consisted of three political parties. Turkey has a single party government since 2002 and the high growth rate she experienced during 2002-2007 corresponds to the single party period (Eken and Schadler, 2012; Günçavdı and Küçük, 2013). Moreover, during this time the Turkish government has had a stronger preference for market orientation and privatization than the previous government. Atiyas (2009) reports that a number of large enterprises were privatized and more than \$26 billion were raised in privatization revenues between 2005 and 2008. In relation to the productivity growth, privatization was observed in industries (such as telecommunications and electricity) with problems of imperfect competition and low productivity (see Atiyas and Dogan, 2009).

A related aspect is the increased role of foreign direct investment (FDI) in economic activity. Sayek (2007) provides some observations regarding FDI flows to Turkey and notes

the regulatory changes that entered into force as of June 2003. With the legislative changes, investment climate has been made more favorable for the entries of foreign firms. Sharp increase in FDI inflows is attributable to acquisitions by multinational companies of large stakes in major Turkish companies, especially in finance, telecommunications.

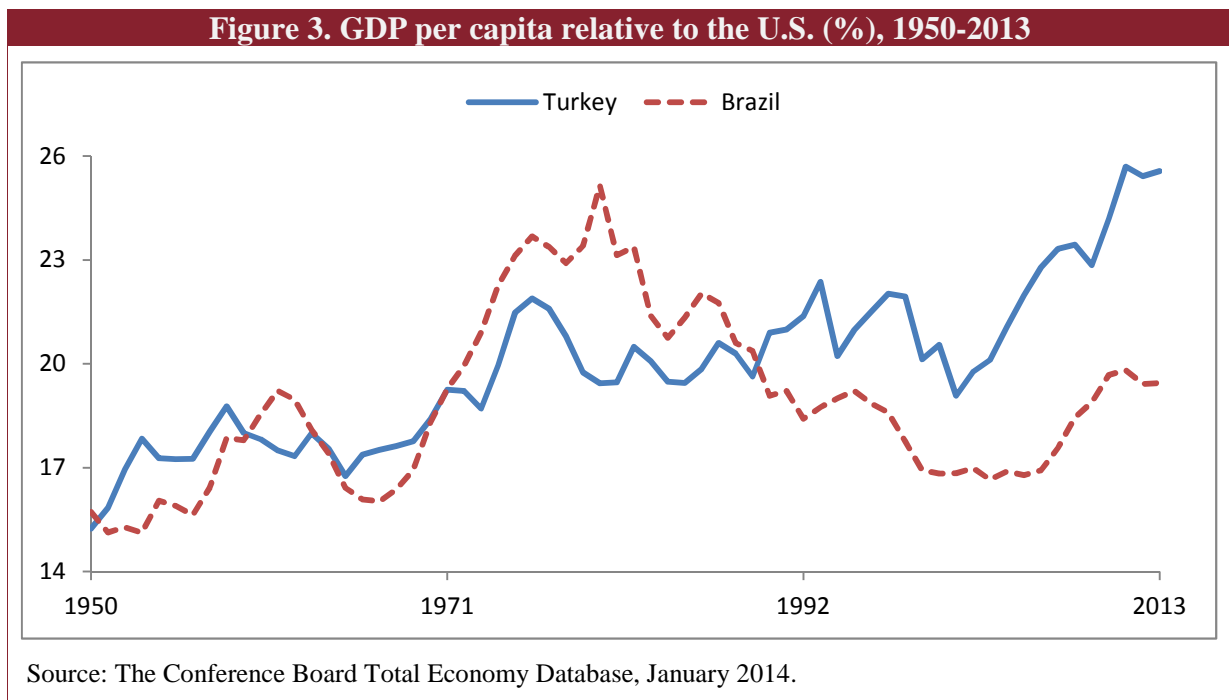
Akyurek and Kutan (2008) note that, as between 2002 and mid-2005, foreign ownership of bank shares increased from 3.1% of the total to 12.3%. Uctum and Uctum (2011) state that in 2005, growth continued its strong pace and was further aided by the accession talks of Turkey to the EU; FDI reached 2.4% of GDP. Although this is a small number by comparison to other major emerging economies, since 2004 the current account deficit was fully financed by foreign capital inflows with an increasing share of FDI. İnal and Akçabelen (2013) argue that technology transfer has a major role in determining the level of GDP per worker in Turkey and the country could benefit more from FDI in terms of knowledge spillovers.

When examined in isolation, the 2002-2007 period in Turkey stands out as a high growth period. However, the relative performance of Turkey in this period is much weaker compared to China, the fastest growing emerging giant. Between 2002 and 2007, real GDP per worker grew by 9.6% per year in China and that figure was 5.3% in Turkey (see Appendix A.2.3 for details). Table 3 also shows that the global crisis of 2007-2009 had a negative impact and growth accounting indicates that most of this fall in GDP per worker was due to a fall in TFP.

3.3. Comparisons with Brazil and Korea

Our analysis in Section 2 suggests that the time-path of real per capita income in Turkey, in comparison with other country groups, looks like the one observed in Latin America as a group. Figure 3 plots the relative per capita income in Turkey and in Brazil. Although

Turkey's per capita income has been higher than that of Brazil since 1990, we observe that per capita income levels are comparable in these two countries.⁸ Figure 4 provides some international comparisons for Brazil, Turkey and Korea, illustrating notable similarities between Brazil and Turkey. Consistent with the previous analysis, we focus on three variables: (i) human capital levels relative to the U.S.; (ii) capital-output ratios; and (iii) aggregate productivity (TFP) relative to the U.S.



Panel (a) in Figure 4 shows relative human capital levels (based on average years of schooling) in Brazil, Korea, and Turkey. The average level of human capital, following the procedure we describe in Section 3.1, is constructed using the average schooling years reported in the Barro and Lee dataset. Korea's human capital increased from around 63% of the U.S. level in 1960 to 92.6% of the U.S. level in 2010. The starting points in 1960 and the time-paths observed in Brazil and Turkey have similarities. Brazil's human capital increased from 50.8% of the U.S. level in 1960 to 69.5% in 2010; and Turkey's human capital increased from around 46% of the U.S. level in 1960 to around 64% in 2010.

Panel (b) depicts purchasing power parity (PPP)-adjusted physical capital-output ratios in these countries between 1960 and 2000. Data are from Hsieh and Klenow (2010). They use a measure of the capital stock at common international prices (constructed using investment rates) based on *Penn World Table version 6.1*. In international comparisons, measuring the capital stock at domestic prices may give a biased view of capital accumulation, since the price of capital goods is systematically higher in poor relative to rich countries (Restuccia and Urrutia, 2001). Therefore, in comparative studies, measuring of the capital stock at common international prices using investment rates from the Penn World Tables have become a practice in growth literature. Data from Hsieh and Klenow (2010) show that the capital-to-output ratio in Turkey increased from 0.63 in 1960 to 1.56 in 2000. In 2000, this ratio in Brazil was 90% of the U.S. ratio. Similarly, the same ratio was 87% of the U.S. capital-output ratio in Turkey in 2000. Especially, low saving and investment rates have been bottlenecks for capital accumulation. In this regard, it is informative to report data for such variables.

Panel (c) in Figure 4 shows the time series for gross domestic savings (% of GDP) in each country during 1960-2013. This ratio for Korea increased from around 2% in 1960 to 34.1% in 2013. Initially, both Brazil and Turkey had higher ratios than that of Korea. Brazil and Turkey have shown very similar patterns (as well as magnitudes) between 1990 and 2013. The average gross domestic savings (% of GDP) is 18.5% in Brazil and 18.0% in Turkey during 1990-2013; it is more than 30% in Korea between 1990 and 2013. In Turkey, saving and investment rates both have been following downward trends for more than a decade. The ratio of gross fixed investments to GDP averaged less than 20% and the ratio of total domestic savings to GDP averaged around 17% during 1998-2010.⁹

Panel (d) shows TFP levels in each country relative to the U.S. during 1960-2000. Data are from Hsieh and Klenow (2010). TFP is the residual after controlling for physical

capital, human capital, and labor input. In other words, TFP captures all the influences on measured output that not included as explicitly measured inputs, such as the state of technology and unmeasured input quality. This approach is similar to our formulation in Section 3.1 and 3.2. Brazil and Turkey display very similar patterns. In 1970, relative TFP level was 61% in Brazil and 62% in Turkey. The deterioration of TFP in Brazil is clear in the post-1980 period.

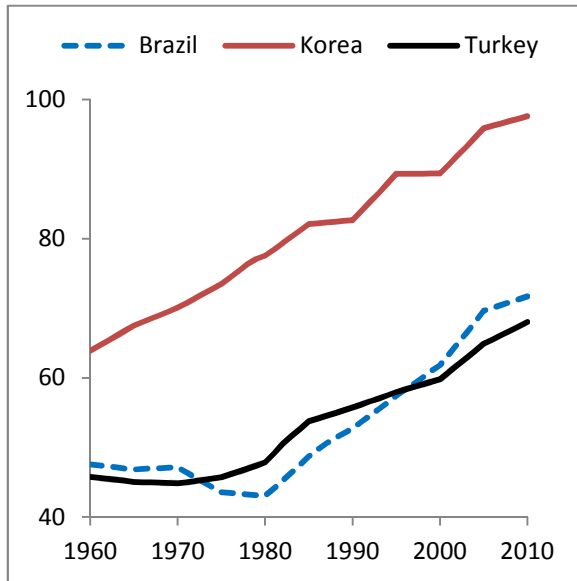
Similar to the deterioration of TFP in Turkey, Cole et al. (2005) and Restuccia (2012) establish the importance of the TFP factor in divergence experience of Latin America. Similarly, Daude and Fernández-Arias (2010) calculate measures of TFP for a cross section of countries and argue that TFP is the principal driver of the slow development of Latin America. Levy and Schady (2013), based on the Daude and Fernández-Arias (2010) dataset, compare TFP growth in East Asia, Latin America, and the U.S. during 1980-2007. They note that in East Asia, productivity growth has been faster than in the U.S., while in Latin America it was negative up to 2000. Since then, the region has continued to lose ground relative to East Asia.

Turkey's lost decades coincide with those of Latin America. Many observers call the 1980s the lost decade of development for Latin America [see, e.g., Krueger (1993, p. 1) and Rodrik (1995, p. 2927; 2005, p. 971)]. Kehoe and Prescott (2007) argue that Argentina, Brazil, Chile, and Mexico had depressions in the 1980s that were comparable in magnitude to those in the U.S. in the interwar period. The debt crisis was one of the key reasons for poor economic performance in Latin America. In August of 1982, Mexico announced that it was unable to meet its scheduled repayments, marking the beginning of the debt crisis. In addition, many Latin American countries have suffered from high and variable inflation rates. For example, Brazil's inflation rate exceeded 1000% per year in some years during the early 1990s. Since the mid-1990s, however, inflation rates in Latin America have come down

dramatically to the single digits in most cases. For example, in 2011, inflation was around 7% in Brazil and below 4% in Chile, Colombia, and Mexico (see, e.g., Bernanke, 2005; Levy and Schady, 2013).

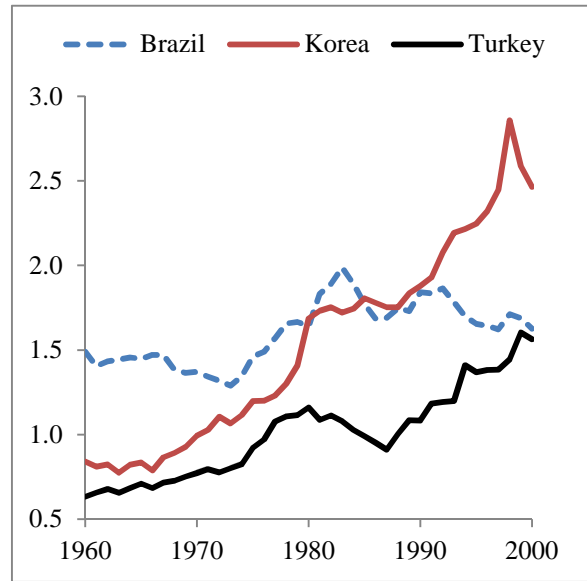
Figure 4. Some more comparisons for Brazil, Korea, and Turkey

(a): Human capital relative to the U.S. (%), 1960-2010



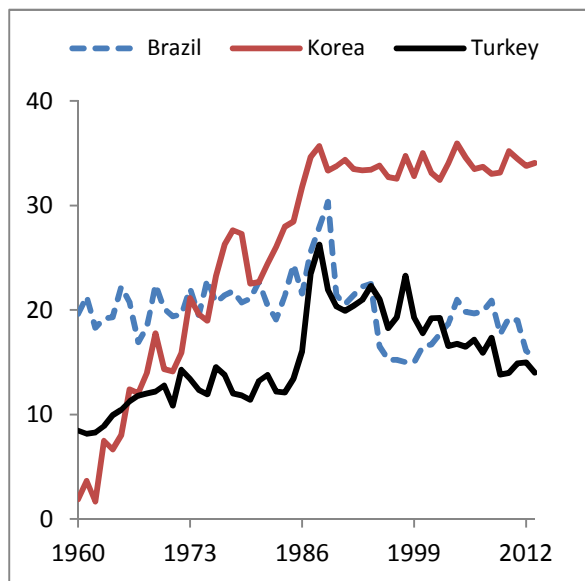
Source: Caselli (2005), The Barro-Lee dataset.

(b): PPP capital-output ratio, 1960-2000



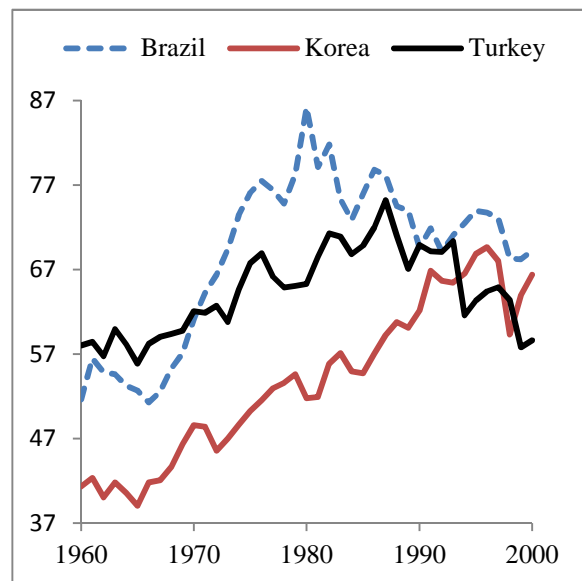
Source: Hsieh and Klenow (2010).

(c): Gross domestic savings (% of GDP), 1960-2013



Source: World Bank, World Development Indicators.

(d): TFP levels relative to the U.S. (%), 1960-2000



Source: Hsieh and Klenow (2010).

4. Concluding Remarks

This paper has explored some aspects of the convergence process of Turkey providing some international comparisons. In addition, we have presented a growth accounting exercise and argued that the rate of productivity growth will be an important determinant of the ability of the Turkish economy to converge to per capita income levels in developed countries (see, also, Altuğ and Filiztekin, 2006). In other words, productivity growth is not only crucial for the sustainability of economic reform programs in the short term but also be a major factor for Turkey to converge to per capita income levels in developed countries in the long-term.

Fluctuations in TFP may arise from many possible sources. Improvements in TFP can arise from new inventions or innovations in existing production processes by the nature of research and development. An example is Japan and Aoki et al. (2009) find evidence that the Japanese government played a part in TFP growth in the rapid growth era, following World War II, by directing the adoption of foreign technologies, promoting coordination of research and development (R&D) activities, and setting up ways in which available technology could be diffused across the country. On the other hand, reductions in TFP can arise from increased regulation on producers that may alter the efficiency or production. Barriers to formal market entry, regulation and barriers to competition, trade barriers and employment protection may reduce TFP growth. An example is Latin America and Restuccia (2012) argues that removing such barriers can lead to an increase in long-run labor productivity in Latin America relative to the United States of a factor of 4.

We should also note that this study mainly focuses on the differences in per capita GDP across countries. Per capita (real) GDP, although it is somehow the first measure in measuring the success of nations, is only a partial indicator of economic welfare because an evaluation regarding economic welfare also includes many other dimensions. One approach

is to enhance GDP with other objective factors such as consumption; income inequality; improvements in the health and education of the population, leisure, life expectancy, etc. (see, for example, Jones and Klenow, 2011).

There are many aspects of the growth process and international comparison that are not touched upon. For example, we do not deal with the issues of openness in great detail. We compare the growth experience of Turkey with Korea. However, we do not discuss much of export-oriented policies implemented by these two countries. The merchandise trade as a share of GDP was 5.6% in Turkey and 9.7% in Korea in 1960. The ratio was 49.3% in Turkey and 87.3% in Korea in 2012 (World Bank, 2014). This reflects significant differences in export policies in these two countries.

Krueger (1987) states that whereas Turkish economic policy with regard to the relative incentives for exportable and import-competing production was driven largely by foreign exchange availability, Korean economic policy in the 1960s and early 1970s was determined largely by the desire to maintain the momentum of the export drive (see also Onaran and Stockhammer, 2005). From one of the world's poorest nations in the 1960s, Korea has transformed itself into an innovative high-tech country with well-established global brands such as Hyundai and Samsung; and Korea is one of the leading suppliers of LCD screens, memory chips, and mobile phones (McKinsey, 2013). On the other hand, Turkey has not been able to create such global brands in production and distribution.

Will Turkey catch up with the industrial leader(s)? To be able to answer such a question, we need to develop a comprehensive understanding of TFP growth in Turkey. In addition, policies that affect productivity growth are important to design growth strategies. Here, we use the expression of growth strategies following Rodrik (2005), that is, that economic policies and institutional arrangements aimed at achieving economic convergence with the living standard prevailing in developed countries. Policymakers should aim to

develop a broad understanding of growth strategies in the light of the experiences of countries such as Korea. An example is the Knowledge Sharing Program (KSP) with Korea Development Institute, which is representative knowledge-sharing initiative seeking to support the development of partner countries by sharing Korea's experience. The title for the KSP in 2005 is "A Way Forward for the Turkish Economy: Lessons from Korean Experiences" and the title for 2008 is "Models and Strategies for National Technology and Innovation Capacity Development."¹⁰

Let us leave the last words to Edward F. Denison, known as one of the pioneers in the development of the U.S. National Income and Product Accounts, and as one of the originators of the growth accounting. Denison (1967, p. 4) states that "Governments in all countries make decisions directly affecting growth. They also adopt policies that influence individual decisions that affect growth. They must somehow compare the total advantages and disadvantages of their policies, including both effects on growth and all other effects, good and bad."¹¹

Appendix A

A.1 Countries in Figure 1(a)

Albania, Algeria, Angola, Argentina, Australia, Austria, Bahrain, Bangladesh, Barbados, Belgium, Bolivia, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Cyprus, Denmark, Dominican Republic, DR Congo, Ecuador, Egypt, Ethiopia, Finland, France, Germany, Ghana, Greece, Guatemala, Hong Kong, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mexico, Morocco, Mozambique, the Netherlands, New Zealand, Niger, Nigeria, Norway, Oman, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Saudi Arabia, Senegal, Singapore, South Africa, South Korea, Spain, Sri Lanka, St. Lucia, Sudan, Sweden, Switzerland, Syria, Taiwan, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, the United Kingdom, the

United States, Uruguay, Venezuela, Vietnam, Yemen, Zambia, and Zimbabwe. Countries in Figure 1(a) are selected such that there is no missing observation in the sample. Some countries such as former Soviet Union countries and some oil-rich Arab countries (Kuwait, Qatar, and the United Arab Emirates) are excluded.

A.2 Growth Accounting: Some Comparisons

A.2.1 Alternative Decompositions

We present two alternative frameworks following Hsieh and Klenow (2010). Dividing Equation (1) by working-age population (N), and rearranging yields the following expression:

$$\frac{Y}{N} = A \left(\frac{K}{N}\right)^\alpha \left(\frac{Lh}{N}\right)^{1-\alpha}. \quad (\text{A1})$$

An alternative accounting is based on the following rearrangement:

$$\frac{Y}{N} = A^{1/(1-\alpha)} \left(\frac{K}{Y}\right)^{\alpha/(1-\alpha)} \left(\frac{Lh}{N}\right). \quad (\text{A2})$$

Hsieh and Klenow (2010) provide a discussion for both equations. We describe the results of the accounting exercises using equations (A1) and (A2). We use the same data as in Section 3.2. In addition, data for working-age person (N), (population 15 years old and over) are from the Ministry of Development of Turkey, Economic and Social Indicators (1950-2010). Table A.1 presents the results for the 2002-2007 period. The bigger exponents on TFP [$1/(1-\alpha)$ instead of 1] and on effective labor [1 rather than $(1-\alpha)$] in Equation (A2) reflect the impact these two variables on output both directly and indirectly through capital per worker. In our case, $\alpha = 0.5$. Therefore, the last figure in Table A.1 is 5.18 ($=2*2.59$). The exercise based on Equation (A2) implies that over the period 2002-2007, GDP per economically active person has grown at 4.85% per year, which is completely accounted for by a 5.18% growth rate in TFP factor, $A^{1/(1-\alpha)}$.

Table A.1. Alternative decompositions (average annual changes, %)

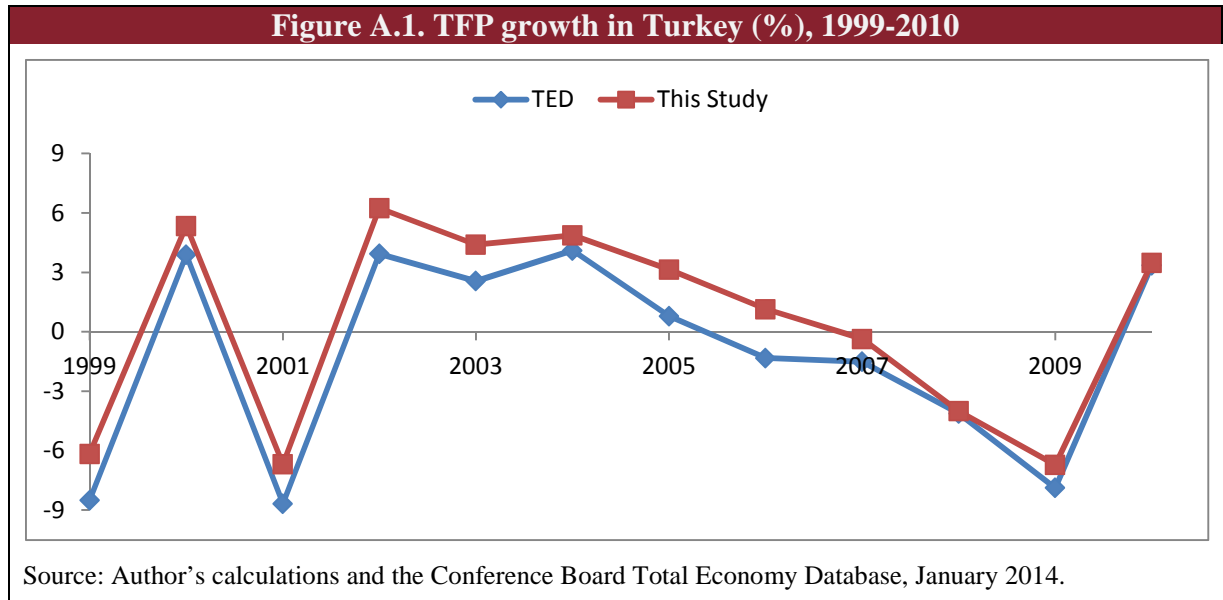
Decomposition with Equation (A1)				
Period	Y/N	Contribution of:		
		K/N	Lh/N	A
2002-2007	4.85	2.05	0.21	2.59

Decomposition with Equation (A2)				
Period	Y/N	Contribution of:		
		K/Y	Lh/N	A
2002-2007	4.85	-0.75	0.43	5.18

Source: The Barro-Lee dataset (<http://www.barrolee.com/>), Demiroğlu (2012), TurkStat, Ministry of Economy, Author's calculations.

A.2.2 A Comparison of TFP Growth Rates

Figure A.1 compares the annual growth rates of our calculated TFP series with the TFP growth reported by the Total Economy Database (TED) during 1999-2010 for Turkey.¹² We compute the annual growth rate in our calculated TFP series with the following formula: $g_t = 100 * [(TFP_t/TFP_{t-1}) - 1]$, where t denotes the year and g_t denotes the TFP growth rate for year t .



We observe that our calculations are comparable with the TED and the simple correlation between these two series is 0.99, indicating similarities. We calculate that TFP

growth in 2010 is 3.48% and the corresponding figure reported by the TED is 3.36% for 2010. On the other hand, there are some differences between 2002 and 2007. For example, the average growth rate in TFP, during 2002-2007, reported in the TED is 1.43%, whereas our calculations suggest that the average TFP growth rate in the same period is 3.24%.

A.2.3 A Comparison with China

What is the relative performance of Turkey, in the high-growth era of 2002-2007, compared to China, the leading emerging economy? We replicate the growth accounting exercise for China. All data for China (except human capital) are from Kehoe and Ruhl (2010). Human capital is constructed following the procedure explained in Section 3 and $\alpha = 0.5$. This value of capital income share is also consistent with China's average capital income share as reported in China's national accounts (see Zhu, 2012).

Table A.2 shows the sources of growth in output per worker for China during 2002-2007. The results presented in Table 3 and Table A.2 are based on the national currency estimates. Therefore, the results are not directly comparable. However, the figures are useful to see the growth performance of Turkey and China, since they provide information on average annual growth rates. TFP growth is the dominant factor behind the Chinese growth. This is not surprise, since the recent literature on China comes to the conclusion that aggregate productivity growth has been the most important source of China's growth since 1978 (see Zhu, 2012 and the references therein).

Table A.2. Sources of growth in China (average annual changes, %)

Period	Output per worker	Contribution of:		
		Physical capital per worker	Human capital per worker	Total factor productivity
2002-2007	9.6	4.9	0.3	4.4

Source: The Barro-Lee dataset (<http://www.barrolee.com/>), Kehoe and Ruhl (2010), Author's calculations.

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¹ The World Bank (2014), World Development Indicators Database (online access).

² <http://www.bloomberg.com/news/2011-06-30/turkish-economic-growth-accelerated-to-11-in-first-quarter-1-.html>

³ Many studies present similar pictures to Figure 1(a). See, e.g., Romer, 1987; Barro, 1991; Acemoglu, 2009.

⁴ Asian Dragons is a term used in reference to Hong Kong, Singapore, South Korea, and Taiwan. Hong Kong and Singapore are not included in Panel (a) in Figure 2, since they are rich city-states.

⁵ See Adamopoulos and Akyol (2009) and İmrohoroğlu et al. (2014) for detailed studies regarding a comparison of Turkey and the region of Southern Europe.

⁶ One point that should be noted is that in emerging markets possible biases in inflation would matter. Yörükoğlu (2010) argues that a challenge for monetary policy in emerging market economies is the measurement of inflation itself due to the issues such as quality measurement bias, new goods bias, etc. In that regard, Arslan and Ceritoğlu (2013) estimate that 2.28% of quality growth was measured as inflation during 2003-2009 in Turkey.

⁷ http://www.mod.gov.tr/en/SitePages/mod_easi.aspx

⁸ We also plot the relative per capita income in Turkey and in other Latin American countries. A simple eyeballing suggests that Brazil can be named as a peer country of Turkey in comparison with other Latin American countries. The figures are available upon request.

⁹ http://www.mod.gov.tr/en/SitePages/mod_easi.aspx.

¹⁰ The details are available at:

http://www.keia.org/sites/default/files/publications/kei_koreacompass_tcha_final.pdf

¹¹ Denison (1967) provides one of the earlier detailed empirical studies for the postwar experience of productivity and economic growth, measuring the sources of growth in Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, the United Kingdom, and the United States between 1950 and 1962.

¹² The methodological notes of the TED are at: <http://www.conference-board.org/data/economydatabase/>