

Abbasoğlu, Osman Furkan; İmrohoroğlu, Ayşe; Kabukçuoğlu, Ayşe

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**IS THE TURKISH CURRENT ACCOUNT DEFICIT
SUSTAINABLE?**

Osman Furkan Abbasođlu
Ayşe İmrohorođlu
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Is the Turkish Current Account Deficit Sustainable?*

Osman Furkan Abbasođlu[†] Ayşe İmrohorođlu[‡] Ayşe Kabukcuođlu[§]

January 26, 2017

Abstract

During the 2011-2015 period, Turkey's current account deficit as a percentage of GDP was one of the largest among the OECD countries. In this paper, we examine if this deficit can be considered sustainable using the Engel and Rogers (2006) approach. In this framework, the current account of a country is determined by the expected discounted present value of its future share of world GDP relative to its current share. A country, whose income is anticipated to rise relative to the rest of the world is expected to borrow now and run a current account deficit. Our findings suggest that Turkey's current account deficit in 2015 may be considered sustainable if the Turkish economy's share in the world economy could continue to grow at rates similar to the past. The same approach, however, indicates that the current account deficit in 2011, at its peak, was unlikely to be sustainable.

Keywords: Current account; open economy macroeconomics; growth

JEL Classification: F32; F41; F43

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[†]Istanbul School of Central Banking, Central Bank of the Republic of Turkey. E-mail: furkan.abbasoglu@tcmb.gov.tr

[‡]Department of Finance and Business Economics, Marshall School of Business, University of Southern California, Los Angeles, CA 90089-1427. E-mail: ayse@marshall.usc.edu

[§]College of Administrative Sciences and Economics, Koç University, Rumelifeneri Yolu, Sariyer, İstanbul. E-mail: akabukcuoglu@ku.edu.tr

1 Introduction

Turkey's current account deficits, reflecting the country's growing liabilities to the rest of the world, have been a focus of concern among academicians, politicians, and practitioners.¹ From 2011-2015, Turkey's current account deficit as a percentage of GDP was one of the largest among the OECD countries.² After 2011, where the current account deficit reached its peak of 9.6%, the Central Bank of the Republic of Turkey (CBRT) started instituting unconventional monetary policies that included measures to limit the credit growth and achieve financial stability. The Banking Regulation and Supervision Agency (BRSA) also imposed measures aimed at curbing consumer credit.³ In 2015, the current account deficit was reduced to 4.47% of GDP.

According to Milesi-Ferretti and Razin (1996a), current account deficits that exceed 5% of GDP are a cause for concern, especially if they are financed with short-term debt or foreign exchange reserves. From 1990-2001, the Turkish current account had a mix of surpluses and modest deficits that were lower than this threshold while Turkey had some of its major economic crises in its history. After 2001, the Turkish current account deficits exceeded the 5% threshold multiple times together with an increased reliance on short-term debt and declining national savings.⁴ Akkaya and Gürkaynak (2012) address a series of concerns about these deficits with an extensive documentation of the recent economic developments, some of which cast doubt on current account sustainability.

Under a commonly used definition, Milesi-Ferretti and Razin (1996a, 1996b, 1996c) include the creditors' willingness to lend in the definition of sustainability in addition to a country's ability to service its debt. In this paper, we take a different approach and focus on a country's ability to pay by asking whether the observed current account deficits can be a consequence of agents' optimizing behavior as in Engel and Rogers (2006). In this framework, the current account of a country is determined by the expected discounted present value of its future share of world GDP relative to its current share.⁵ The framework is a two-country general equilibrium model with a single, composite consumption good that is traded internationally. In each country, households choose consumption optimally over an infinite horizon. The country,

¹See, for example, Sekmen (2008); Oğuş and Sohrabji (2008); Akat and Yazgan (2013); İnsel and Kayıkcı (2012); Röhn (2012); Edgerly (2013); Kara (2013); Harvey and Gökölük (2014); and Özata (2014), among others.

²In 2013 and 2014, Turkey's current account deficit relative to GDP was the largest among OECD countries. During 2011-2015, it was also larger than those of the Latin American countries such as Argentina and Brazil. (Source: World Development Indicators)

³Increasing concerns about financial stability led to the foundation of the Financial Stability Committee (FSC) in 2011, with the aim of improving the coordination and cooperation among institutions that play a role in maintaining financial stability such as BRSA, Treasury, and the Capital Markets Board. FSC made policy recommendations to these institutions to bring down household indebtedness that appeared to be strongly connected to the current account deficit (Kara (2016)). See also Barçın (2012); Başçı and Kara (2011); and the International Monetary Fund (2012).

⁴Clark et al. (2012) note that some of the national savings are presumably "under the mattress" due to the underdevelopment of financial markets, and hence not reported.

⁵Following Engel and Rogers (2006), the series we focus on is the net GDP (i.e., GDP net of government spending and investment) since this is a more accurate measure of household income available for consumption. The rest of the world consists of Turkey's top 50 trade partners.

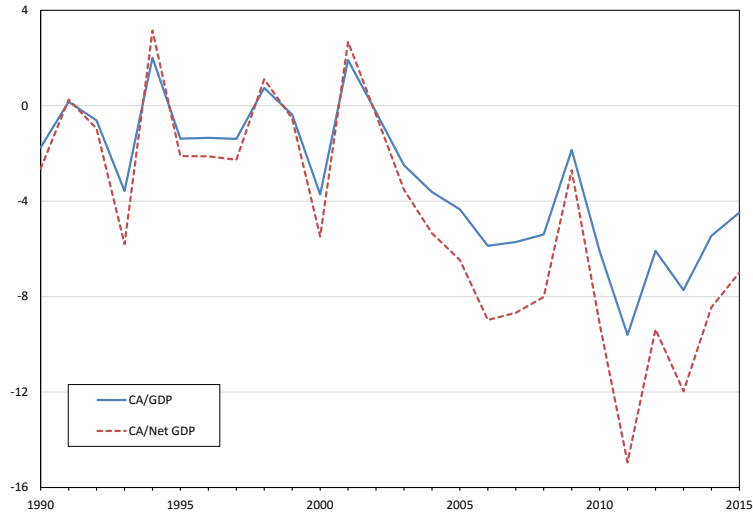
whose income is expected to rise relative to the rest of the world, may borrow to consume during that period and run a current account deficit. Using this key theoretical implication of the model, we calculate the future growth path for Turkey relative to the rest of the world that would justify the consumption decisions and, hence, the current account deficit observed in the data at a given point in time. With that growth rate, Turkey's current account deficit at the steady state is eliminated. We then ask if such a growth rate seems "reasonable" based on Turkey's past performance.

The framework employed here is reminiscent of the theoretical literature that centers around present value models of the current account (see for example, Sachs (1982) and Obstfeld and Rogoff (1995)). In these models, the current account emerges as an outcome of optimal savings and investment decisions of forward-looking households and is defined in relation to the expected future net GDP. This theoretical expression of the current account is then used as a testable implication of an open-economy growth model, which has been the approach followed by the empirical literature.⁶

In our quantitative analyses, we use an equilibrium relationship between the GDP share growth of a country given its external imbalances, implied by the open-economy growth model in Engel and Rogers (2006). We then calculate the net GDP share that Turkey needs to reach in the long run, given the current account-to-net GDP ratio of -6.99% in 2015 (See Figure 1). Next, we calculate the model's equilibrium-implied share growth and compare it with the observed growth performance in the past to assess the extent to which such a growth rate may be deemed "reasonable."

⁶Obstfeld and Rogoff (1995); Calderon, Chong, and Loayza (2002); and Edwards (2002, 2004), among others, provide an extensive review of the theoretical and empirical work on the current account that considers an intertemporal approach. In particular, the empirical literature uses the present value tests of Campbell (1987) and Campbell and Shiller (1987) to test these models. Some examples include Sheffrin and Woo (1990); Otto (1992); Ghosh (1995); Bergin and Sheffrin (2000); and Nason and Rogers (2006). The literature, in general, tests the hypothesis that the current account is equal to the forecast of its present value, where the forecast is obtained by the vector autoregression of the current account and the net GDP. Based on a similar methodology, Oğuş and Sohrabji (2008) find that Turkey violates intertemporal solvency in the 1992-2004 period.

Figure 1: Current account to GDP (%)



Our main findings can be summarized as follows. Under a plausible calibration of the model, the 2015 level of the current account at -6.99% of net GDP can be justified if Turkey’s income share could rise to 1.96% or 1.97% in the long-run. In 2015, this share was 1.83% . If the Turkish economy’s share were to grow at annual growth rates of 0.52% to 0.32% , reaching its new steady state in 14 to 23 years, then the current account deficit observed in 2015 could be reconciled with the optimizing behavior of the agents.

Is it realistic to assume Turkey’s income share will grow at such rates in the next 14 to 23 years? While it is impossible to answer this question with confidence, such growth rates are not unprecedented. The average annual share growth rate observed in Turkey in the 1990-2015 period was 0.42% . In the later higher growth period of 2001-2015, it was 0.73% . Thus, if the share growth rate could grow at similar rates to the past, then the current account deficit observed in 2015 could be considered sustainable. These results are similar to what Engel and Rogers (2006) conclude for the U.S. They report that if the U.S. income share is expected to rise gradually from 44% in 2004 to 47% by 2029, then their current account deficit of 7% of net GDP in 2004 can be considered optimal and sustainable.⁷ We also present evidence that not every trading partner of Turkey experienced an increase in their GDP shares in the world. For example, GDP shares of South Africa, Brazil, and Mexico in the world fell between 1990 and 2015. Thus, the same approach applied to these countries is likely to yield their current account deficits unsustainable.

Repeating the same exercise starting in 2011 for Turkey generates more negative results. In 2011, Turkey had the highest current account deficit in its history, with 15% of net GDP (9.6% of GDP). According to our findings, for this level of a deficit to be consistent with

⁷Engel and Rogers (2006) consider the rest of G7 countries as well as Sweden, Switzerland and Norway in constructing the world net GDP share of the U.S.

the optimizing behavior of the agents, the average annual share growth rate of the Turkish economy would have to be between 0.59% and 0.93% depending on the rate of speed of convergence. These growth rates are significantly higher than what has been observed in the past. While future performance of the Turkish economy may be hard to predict, based on the past performance of the economy, sustainability of such a high deficit seems particularly challenging.

In section 2, we describe the model and the key relationship for our analysis. In section 3, we describe the data. In section 4, we present our findings. In Section 5, we present sensitivity analysis and in section 6, we conclude.

2 Model

In this section, we summarize the key features of the model used in Engel and Rogers (2006). Consider a perfect foresight, two-country growth economy. In each country $i \in \{1, 2\}$, there are households with N_t^i working-age members at date t who maximize

$$\sum_{t=0}^{\infty} \beta^t N_t^i \log c_t^i$$

subject to

$$B_{t+1}^i + C_t^i \leq B_t^i(1 + r_t^B) + Y_t^i, \quad (1)$$

given the B_0^i , where $\beta \in (0, 1)$ is the discount factor, $c_t^i = C_t^i/N_t^i$ is per-member household consumption, and B_t^i is the beginning of period bond holdings by residents in country i at date t . The real world interest rate on bonds is given by r_t^B . Neither investment in physical capital, nor government spending is modeled explicitly; thus, Y_t^i is defined as the value of output net of investment and government spending.

The consolidated budget constraint of the household in country i in period t can be written as:

$$\begin{aligned} C_t^i + \frac{C_{t+1}^i}{1 + r_{t+1}^B} + \frac{C_{t+2}^i}{(1 + r_{t+1}^B)(1 + r_{t+2}^B)} + \dots \\ \leq B_t^i(1 + r_t^B) + Y_t^i + \frac{Y_{t+1}^i}{1 + r_{t+1}^B} + \frac{Y_{t+2}^i}{(1 + r_{t+1}^B)(1 + r_{t+2}^B)} + \dots \end{aligned} \quad (2)$$

This maximization problem results in the following Euler equation:

$$\frac{c_{t+1}^i}{c_t^i} (1 + g_{t+1}^i) = \beta(1 + r_{t+1}^B) \quad (3)$$

where the population growth rate is given by $1 + g_{t+1}^i = N_{t+1}^i/N_t^i$.

Goods market clearing condition is given by:

$$C_t^1 + C_t^2 = Y_t^1 + Y_t^2 = Y_t^w \quad (4)$$

where Y_t^w is the world net GDP. Engel and Rogers (2006) define $\gamma_t^i = Y_t^i/Y_t^w$ as country i 's share of world net GDP at time t , and $\bar{\gamma}^i$ as the same share at the steady-state. Home country's net GDP share is assumed to follow:

$$\gamma_{t+h}^i = \alpha^h \gamma_t^i + (1 - \alpha^h) \bar{\gamma}^i. \quad (5)$$

where γ_{t+h}^i is the h -period-ahead net GDP share of country i . In equation 5, α represents the speed of convergence of country i 's share of the world GDP to its steady state share. Notice that taking the world interest rate as given, equations (1) and (3) for each country i and equation (4) characterize an equilibrium under financial integration. Using (2), (3), and (4), in addition to the law of motion for share growth (5), and the definition of the current account, Engel and Rogers (2006) derive the following equation for the current account of Home relative to its net output (here we drop country superscripts as we focus only on Home):

$$\frac{CA_t}{Y_t} = 1 - \left[\frac{1 - \beta}{1 - \alpha\beta} + \frac{\beta(1 - \alpha) \bar{\gamma}}{1 - \alpha\beta \gamma_t} \right] \quad (6)$$

Converting equation 6, it is possible to obtain:

$$\frac{\bar{\gamma}}{\gamma_t} = 1 - \frac{1 - \alpha\beta}{\beta(1 - \alpha)} \frac{CA_t}{Y_t}. \quad (7)$$

This is the equilibrium condition for our analysis that fleshes out the link between share growth and current account relative to net GDP for Home. Note that the expression does not depend on the absolute level of Home's net GDP share but only on its long-run share relative to the current share. Therefore, the expectation about how much the share will grow.⁸ Using easily calibrated values for α and β , one can calculate the expected increase in a country's share of world GDP, $\bar{\gamma}/\gamma_t$, that would make its current account-to-net GDP ratio, CA_t/Y_t , at a given year consistent with the optimizing behavior of the agents in the economy.

According to this model, the country that is expecting to grow faster than the rest of the world will borrow from the rest of the world and run a current account deficit. As this country reaches a higher GDP share in the world, it will service its debt, obtaining a steady decline in this deficit. At the steady state the current account will be balanced. The equilibrium condition in equation 7 calculates the future growth rate in the GDP share of a county that would make this kind of a transition feasible. Our approach is composed of calculating the

⁸The analysis also does not require to feed in any real world interest rate series to the model, which is known to be difficult to construct in the small open economy models of emerging countries (see Neumeyer and Perri (2005) for a detailed discussion). While the real interest rate appears in the budget constraint of the household's problem, the key equation of the analysis focuses on the relationship between the expected share growth and the current account relative to net GDP.

growth rates needed for the current account deficit to be eliminated under different assumptions for the length of the transition period. In our benchmark experiment, we consider three cases with $\alpha = 0.7$, $\alpha = 0.75$, and $\alpha = 0.8$ to evaluate transition paths of 14 to 23 years for a benchmark value of $\beta = 0.98$.⁹

Predicting future growth rates of the GDP share of a country is of course very challenging. Therefore, assessing the likelihood of the growth rates found from equation 7 is difficult. Our approach is to compare the model-generated future growth rates with the observed growth rates in the past. Turkey’s world GDP share, where the world is composed of Turkey’s top 50 trading partners displayed in Figure 2, increased from 1.64% in 1990 to 1.83% in 2015, an 11.6% increase in 25 years. We use this growth rate in our subsequent analysis to assess the likelihood of the sustainability of the current account deficit observed in 2015.

Figure 2: Turkey’s net GDP share in the world (%)



3 Data

We define the “rest of the world” for the Turkish economy as Turkey’s top 50 trade partners. Some interesting observations emerge from Figure 6 in Appendix A that displays Turkey’s top 20 trade partners in 1990 and 2015.

For example, between 1990 and 2015, there is a significant decline in the share of trade with Germany and a rise in the share of trade with the Russian Federation.¹⁰ China, which is not among the top 20 partners in 1990, appears as Turkey’s third most important trade

⁹In Section 5.1, we provide sensitivity analysis to the discount factor and the α that affects the transition paths.

¹⁰Share of trade is defined as the share of each country’s sum of imports from and exports to Turkey in each year. The data is from Foreign Trade Statistics of the Turkish Statistical Institute. To make data across years comparable, we define the Russian Federation in 2013 as the sum of Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan; we define Former Yugoslavia as the sum of Bosnia and Herzegovina, Croatia, Kosovo, Macedonia, Montenegro, Slovenia, and Serbia.

partner in 2015. In addition, Turkey's top 20 trading partners decline from accounting for 82% of the trade in 1990 to 73% in 2015.

We measure the world net GDP as GDP net of investment and government expenditures of Turkey's top 50 trade partners in 2015.¹¹ In calculating the world output, several issues have to be dealt with. First, Engel and Rogers (2006) use 1990 real exchange rates to measure GDP in each country for all years. We use gross domestic product in constant 2011 international dollars. Second, in defining the rest of the world for the US, Engel and Rogers (2006) only consider the sum of GDP for advanced economies. In particular, they do not include China and East Asian emerging economies that have experienced rapid growth. The shares model implies that these economies should be borrowing from the rest of the world and running current account deficits. Given the inability of the model to explain the behavior of these economies, Engel and Rogers (2006) drop them from the definition of the world GDP. We do not follow this approach and instead provide data on Turkey's world GDP share with China as China is likely to continue to be an important trade partner for Turkey.¹²

Finally, we use the current account-to-GDP and the current account series for Turkey for the 1990-2015 period to calculate the current account as a percentage of GDP and net GDP.¹³ In the next section, we present the results of our quantitative experiments.

4 Results

We start this section by examining if Turkey's current account deficit in 2015 can be considered sustainable using the Engel and Rogers (2006) approach. This requires us to calculate the future growth rate of Turkey's GDP share in the world economy that would eliminate the current account deficit at the steady state. We then compare these model-generated growth rates that would deem the observed current account deficits sustainable with Turkey's past growth rates to evaluate their likelihood. Next, we repeat the same exercise by looking at the data in 2011 when Turkey reached the largest current account deficit in her history, given by -9.6% of GDP.

4.1 The current account deficit in 2015

The first panel of Table 1 summarizes Turkey's net GDP share as well as the growth rates associated with its share between 1990 and 2015. Turkey's net GDP share in the world increased from 1.64% in 1990 to 1.83% in 2015. This implies a growth rate of 11.59% over the 1990-2015 period and an annual growth rate of 0.42%. Turkey's share in the world increased, indicating a somewhat faster net GDP growth relative to its top 50 trade partners, despite a turbulent period for Turkey with major recessions in 2000 and 2001. In the 2001-2015 post-

¹¹These countries constitute 91% of Turkey's trade volume with the rest of the world. Data on GDP, investment, and government expenditures are from World Bank's World Development Indicators database.

¹²Excluding China makes it easier to justify higher current account deficits since Turkey's GDP share in the world grows faster in the absence of China. This is similar to what Engel and Rogers (2006) find for the US.

¹³These series come from World Bank's World Development Indicators database.

crisis period, the share growth was 11.57% at an annual growth rate of 0.73%. In fact, Turkey's annual world GDP share growth has increased since 2001, the year the current account deficit started to increase dramatically.

The second panel of Table 1 provides Turkey's model-implied world net GDP share at the steady state and the growth rates needed to reach that level computed using equation (7). This exercise finds the future growth rates under which the current account deficit relative to net GDP equal to 6.99% in 2015 can be justified with the optimizing decision of the agents in equilibrium.¹⁴ We make our analysis under three cases: $\alpha = 0.7$, $\alpha = 0.75$, and $\alpha = 0.8$ that induce the economy to converge to the steady state in 14, 18, and 23 years, respectively. If convergence is fast ($\alpha = 0.7$), then the economy reaches a long-run share of 1.96% in 2029, with a 7.47% increase in its net GDP share ($\frac{\bar{\gamma}}{\gamma_t} - 1 = 0.0747$) over these 14 years. This implies an annual growth rate of 0.52% during the 2015-2024 period. With an adjustment speed at $\alpha = 0.75$, it takes the economy 18 years to converge to its steady-state share of 1.97%, with an expected 7.56% increase in its net GDP share during its transition from 2015 to 2033. This implies an annual growth rate of 0.41% during the period. Along a slower adjustment path, with $\alpha = 0.8$, the model-implied share increase is 7.7% over 23 years, with an annual share growth rate of 0.32%.

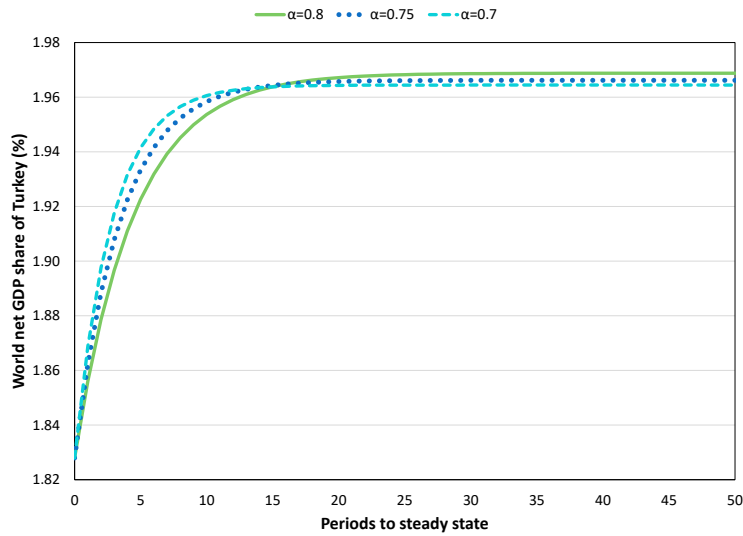
Table 1: Results for the economy in 2015 (Benchmark)

Data			
Net GDP share in 1990 (%)	1.64		
Net GDP share in 2015 (%)	1.83		
Share growth: 1990-2015 (%)	11.59		
Share growth: 2001-2015 (%)	11.57		
Annual share growth: 1990-2015 (%)	0.42		
Annual share growth: 2001-2015 (%)	0.73		
Model			
	$\alpha = 0.7$	$\alpha = 0.75$	$\alpha = 0.8$
Steady state share $\bar{\gamma}$ (%)	1.96	1.97	1.97
Share growth ($\frac{\bar{\gamma}}{\gamma_{2015}} - 1$) (%)	7.47	7.56	7.70
Years to convergence	14	18	23
Annual share growth (%)	0.52	0.41	0.32

The transition dynamics under these different speeds of adjustment are depicted in Figure 3. The country, expecting to grow faster than the rest of the world, borrows externally in 2015 to finance its consumption and stimulates its income growth and reaches a higher net GDP share in the world in the long-run, some of which is sacrificed to service the debt to the rest of the world. Depending on the value of the adjustment parameter, years to convergence as well as long-run shares vary.

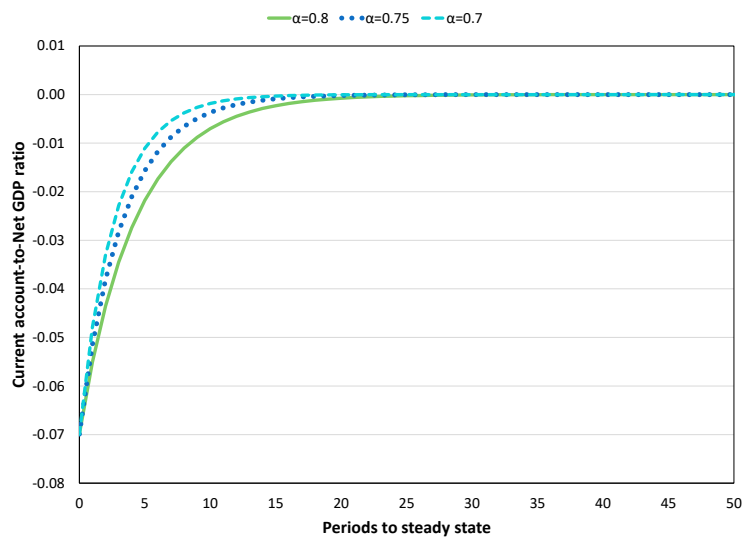
¹⁴We also provide results using gross GDP in Appendix B with a current account-to-GDP ratio of -4.47% in 2015.

Figure 3: World net GDP share of Turkey after 2015



In Figure 4, the path of the current account (relative to net GDP) after 2015 (with different adjustment speeds) is shown. The model predicts a steady decline of the deficit in the current account that must eventually satisfy a balance in the long run. This reflects the model's prescription for the economy on how to behave optimally in the long run. The model implies that if Turkey's net GDP share were to grow on average between 0.32%-0.52% for an extended time period, then Turkey's current account deficit would decline to zero in 14 to 23 years.

Figure 4: Turkish current account relative to net GDP after 2015



Is it realistic to expect Turkey's share to grow at the rates implied by the model under these three convergence speeds? Based on Turkey's recent growth experience, it is not impossible to

imagine future growth rates that would justify the current account deficits observed in 2015. The average annual share growth rate observed in Turkey in the 1990-2015 period was 0.42%. In the later higher growth period of 2001-2015, it was 0.73%. With $\alpha = 0.7$, the model implies that if Turkey's share grows at an annual rate of 0.52% for 14 years, the current account deficit in 2015 would be paid back successfully. With $\alpha = 0.75$ and $\alpha = 0.80$, lower growth rates (0.41% and 0.32%), that last longer are sufficient to generate transition paths to steady state where the current account deficit is eliminated.

These back-of-the-envelope calculations suggest that the most recent current account deficit observed in Turkey may be reconciled with optimal savings behavior if the future growth of the Turkish economy relative to its trading partners continues to resemble its performance in the past. Our next question is whether we could have made a similar conclusion if we conducted this exercise for 2011, the year when the current account deficit reached its peak level.

4.2 The current account deficit in 2011

In 2011, Turkey had the highest current account deficit in its history, where it reached 15% of net GDP (9.6% of GDP). In this section, we assess whether a deficit of this level could be considered sustainable under the Engel and Rogers (2006) approach. Table 2 shows the results of this exercise from the 2011 vantage point.

The model-implied annual share growth rates in this case are between 0.59%-0.93% for the three convergence speeds we consider. For instance, if Turkey could achieve a long-run share of 2.05%-2.06% in 16-20 years (with $\alpha = 0.70$ and $\alpha = 0.75$), then the current account deficit observed in 2011 could be considered optimal. This implies an annual share growth of 0.93% and 0.75%, respectively. Under a longer convergence path (with $\alpha = 0.80$), an annual growth rate of 0.59% that lasts for 26 years is needed for the current account deficit in 2011 to be deemed optimal. Given that these growth rates are significantly higher than what has been observed in Turkey previously, the level of the current account deficit in 2011 could be considered alarming. Perhaps the actions taken by the Central Bank and the Banking Regulation and Supervision Agency aimed at reducing the current account deficit in 2011 reflected concerns that are justifiable with these findings.¹⁵

¹⁵Faced with the dramatic deterioration in the current account, CBRT framed a mix of unorthodox policies in late 2010. While keeping price stability as the main target, the CBRT introduced supplementary financial stability objectives and used general macroprudential policies to improve the current account and avoid potential risks of sudden stops. Throughout 2011 as well as in 2013 and 2014, BRSA introduced specific policies to curb consumer credit with higher credit card limits and regulations on housing loans, vehicle loans, and collateralized consumer loans. (See Kara (2016)).

Table 2: Results for the economy in 2011

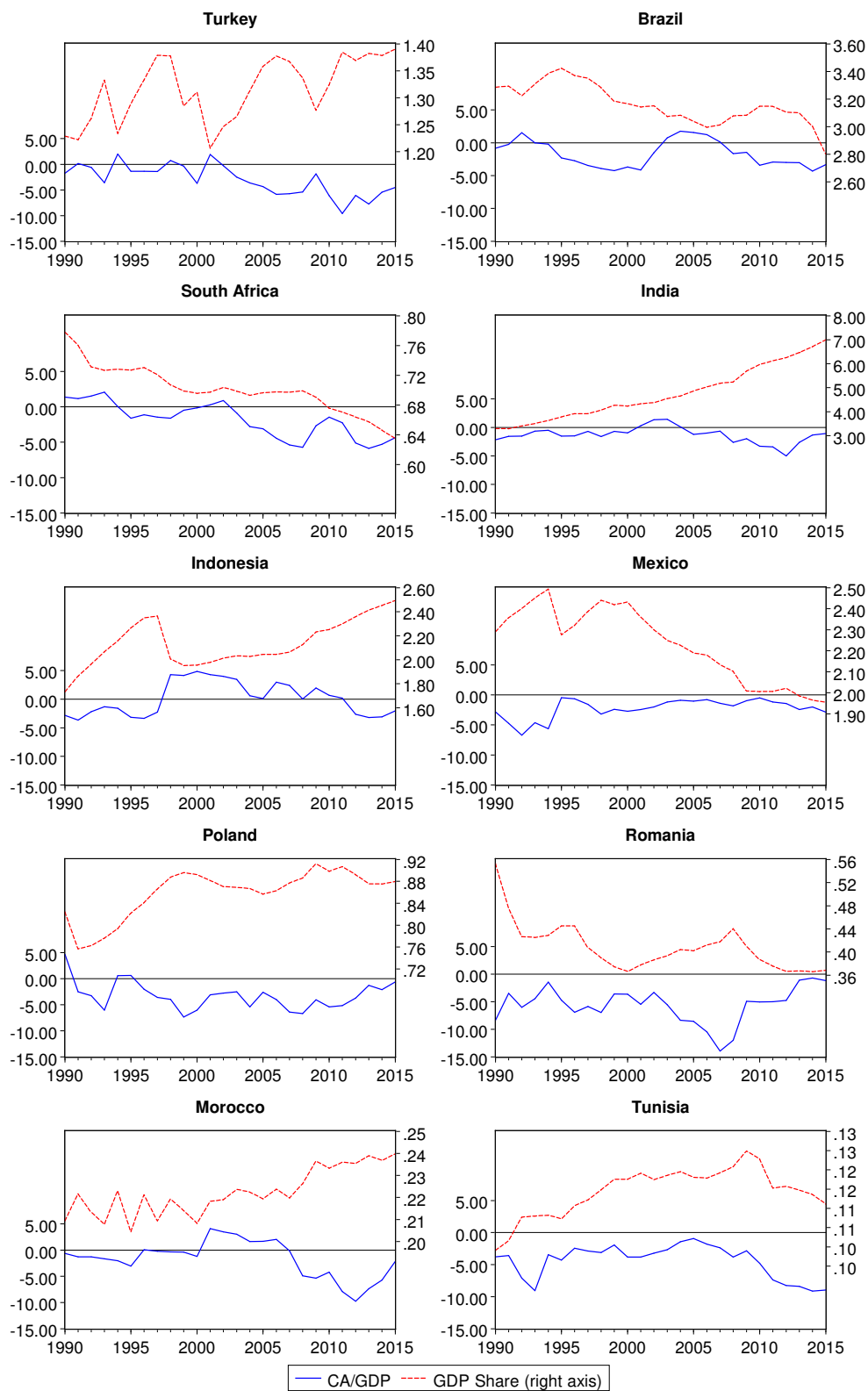
Data			
Net GDP share in 1990 (%)		1.64	
Net GDP share in 2011 (%)		1.77	
Share growth: 1990-2011 (%)		7.93	
Share growth: 2001-2011 (%)		7.91	
Annual share growth: 1990-2011 (%)		0.35	
Annual share growth: 2001-2011 (%)		0.69	
Model			
	$\alpha = 0.7$	$\alpha = 0.75$	$\alpha = 0.8$
Steady state share $\bar{\gamma}$ (%)	2.05	2.06	2.06
Share growth ($\bar{\gamma}/\gamma_{2011} - 1$) (%)	15.96	16.17	16.47
Years to convergence	16	20	26
Annual share growth (%)	0.93	0.75	0.59

4.3 Comparison across countries

In our analysis, we used the past growth rates of the Turkish economy's GDP share to assess if the model-implied future growth rates were reasonable. While this approach has its obvious limitations, it is interesting to examine the performance of countries from this perspective. In Figure 5, we compare Turkey with some of its trading partners since the 1990s. On the right scale of Figure 5, we provide data on the net GDP share of a country and on the left scale we display their current account balance.¹⁶ While Turkey's net GDP share increased in this time period, a number of its trading partners with current account deficits, such as Brazil, South Africa, and Mexico experienced a decline in their GDP shares. For their current account deficits to be considered sustainable based on the Engel and Rogers (2006) approach, the expectations of the agents about the future growth rates of these economies relative to the rest of the world would have to be significantly higher than what was observed in the past. In Turkey's case, we find that the current account deficit in 2015 could be reconciled with the optimizing behavior of the agents if they expected growth rates similar to the past.

¹⁶For better comparison purposes, we provide data on each country's share in total world GDP. This measure is highly correlated but not the same as the data provided in Figure 2 that displayed Turkey's share in GDP across its top 50 trading partners.

Figure 5: Net GDP share in the world (%)



5 Sensitivity Analysis

5.1 Discount Factor

Findings about the optimality of the current account deficit in a given year are not very sensitive to the discount factor used for the country. In our benchmark economy, we used a discount factor of 0.98. In theory, a lower discount factor, β , implies more impatient consumers, which suggests a higher interest rate at the steady-state, implying a higher cost of financing the current account deficit. In turn, for the current account deficit to be optimal, the country will need to reach a higher net income share, $\bar{\gamma}$, in the long run. The length of the transition path (years to convergence) depends on the adjustment parameter, α . However, the quantitative impact of a change in the discount factor is not significant.

In our sensitivity analysis, we consider discount factors equal to 0.95 and 0.97 as summarized in Table 3. For $\beta = 0.97$, the model implied annual growth rates range between 0.34% and 0.53% with years to convergence between 14 and 23. Based on past experience, it is possible for Turkey's GDP share to grow at 0.53% for 14 years. Hence, this change in the discount factor implies similar growth rates to justify the current account deficit in 2015 since with $\beta = 0.98$, implied growth rates were between 0.32% and 0.52%. Even with a lower discount factor, $\beta = 0.95$, expected share growth rates in the model look robust and range between 0.37% to 0.53%

Table 3: Results for the economy in 2015: Sensitivity Analysis

Data			
Net GDP share in 1990 (%)		1.64	
Net GDP share in 2015 (%)		1.83	
Share growth: 1990-2015 (%)		11.59	
Share growth: 2001-2015 (%)		11.57	
Annual share growth: 1990-2015 (%)		0.42	
Annual share growth: 2001-2015 (%)		0.73	
Model ($\beta = 0.95$)			
	$\alpha = 0.7$	$\alpha = 0.75$	$\alpha = 0.8$
Steady state share $\bar{\gamma}$ (%)	1.98	1.98	1.99
Share growth ($\bar{\gamma}/\gamma_{2015} - 1$) (%)	8.22	8.46	8.83
Years to convergence	15	18	23
Annual share growth (%)	0.53	0.45	0.37
Model ($\beta = 0.97$)			
	$\alpha = 0.7$	$\alpha = 0.75$	$\alpha = 0.8$
Steady state share $\bar{\gamma}$ (%)	1.97	1.97	1.98
Share growth ($\bar{\gamma}/\gamma_{2015} - 1$) (%)	7.71	7.85	8.07
Years to convergence	14	18	23
Annual share growth (%)	0.53	0.42	0.34

5.2 Speed of Convergence

In our benchmark results, we assumed convergence speeds that led the economy to a steady state between 14 and 26 years at which time the current account deficit was eliminated. Assuming higher levels for α leads to longer time periods for convergence to the steady state and also a lower average share growth needed to eliminate the current account deficit. These results are provided in Table 4.

Table 4: Results for the economy in 2015: Sensitivity Analysis

Model ($\beta = 0.98$)	$\alpha = 0.9$	$\alpha = 0.95$	$\alpha = 0.98$
Steady state share $\bar{\gamma}$ (%)	1.74	1.76	1.83
Share growth ($\bar{\gamma}/\gamma_{2015} - 1$) (%)	8.42	9.84	14.12
Years to convergence	47	99	269
Annual share growth (%)	0.17	0.09	0.05

6 Conclusions

This paper uses the two country set-up of Engel and Rogers (2006) to examine to what extent the observed current account deficit in Turkey can be explained by agents' optimal savings behavior. In this framework, the current account of a country is determined by the expected discounted present value of its future share of world GDP relative to its current share. A country, whose income is anticipated to rise relative to the rest of the world, is expected to borrow now and run a current account deficit. The model calculates the needed growth rate in the future GDP share of a country that will lead to a steady decline of the current account deficit, eventually reaching zero at the steady state.

We find that the Turkish current account deficit in 2015 could be justified if Turkey's GDP share could grow at rates between 0.32% and 0.52% between 14 to 23 years. We do not mean to ignore the potential dangers of borrowing, especially for a country like Turkey that is situated in a very turbulent area, exposed to many political and economic risks. As the International Monetary Fund (2013) points out, concerns related to inflation continue to be high in Turkey; current account deficits being financed by short-term flows as opposed to foreign direct investment or lower global demand for emerging market assets in the future can all result in a sudden stop in capital flows that would seriously hamper Turkey's future economic growth. Nevertheless, this approach indicates that the current account deficit in 2015 could be sustainable if Turkey's GDP share could grow at rates observed in the past. The same approach, however, indicates that the current account deficit in 2011, at its peak, was unlikely to be sustainable. The expected growth rates for this case appear to be highly challenging. We conclude that the decline in the deficit that took place since 2011 appears to be a change in the right direction.

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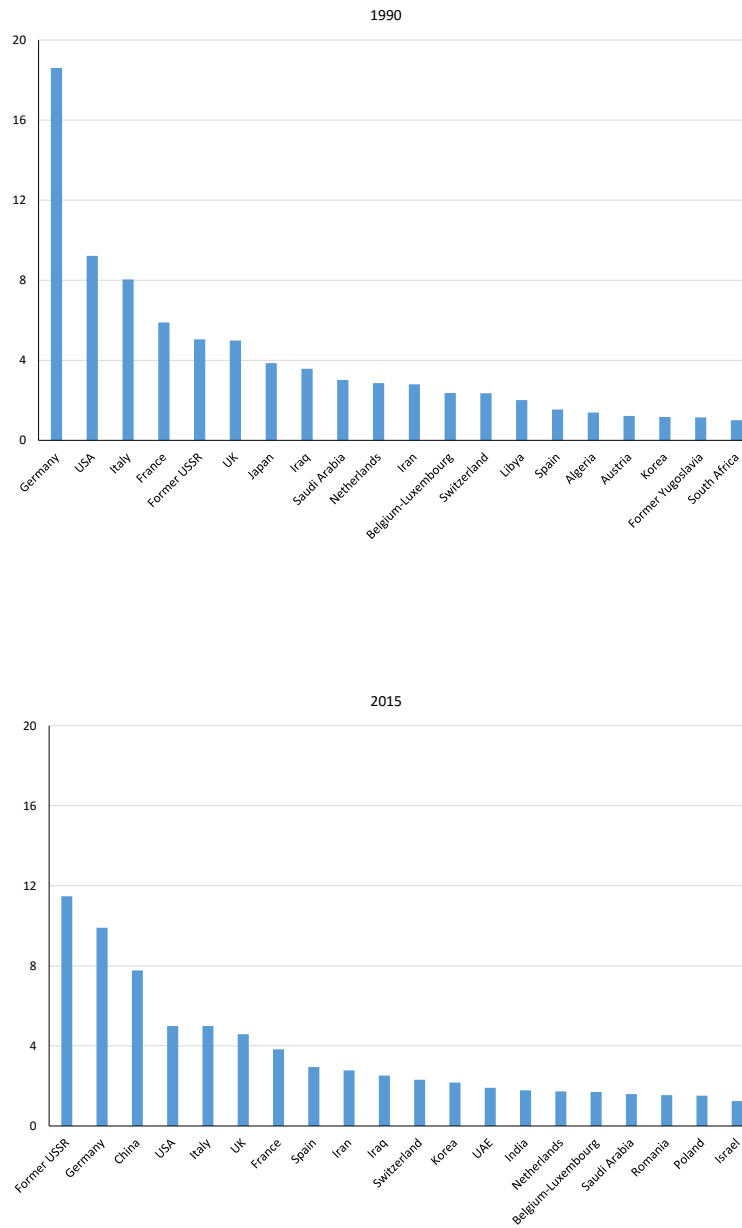
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Appendix A Turkey's Top Trade Partners

The rest of the world consists of Turkey's top 50 trade partners in each year. In 2015, these countries, ordered according to trade shares (in descending order), were: Former USSR, Germany, China, U.S., Italy, U.K., France, Spain, Iran, Iraq, Switzerland, Korea, United Arab Emirates, India, Netherlands, Belgium, Luxembourg, Saudi Arabia, Romania, Poland, Israel, Egypt, Bulgaria, Former Yugoslavia, Japan, Greece, Czech Republic, Sweden, Austria, Algeria, Brazil, Taiwan, Morocco, Hungary, Vietnam, Indonesia, Denmark, Malaysia, Libya, Canada, Syria, South African Republic, Slovakia, Thailand, Ireland, Finland, Mexico, Portugal, Bangladesh, Norway, Turkish Republic of Northern Cyprus.

Figure 6: Top 20 Trade Partners and Trade Shares in 1990 and 2015



Appendix B Engel and Rogers (2006) Analysis Using Gross GDP

In this section, we consider the Engel and Rogers (2006) exercise using gross GDP, rather than net, to determine whether a current account-to-GDP ratio of -4.47% in 2015 can be justified. We plot Turkey's GDP share growth in the world in Figure 7 below.

Figure 7: World GDP share of Turkey (with gross GDP, %)

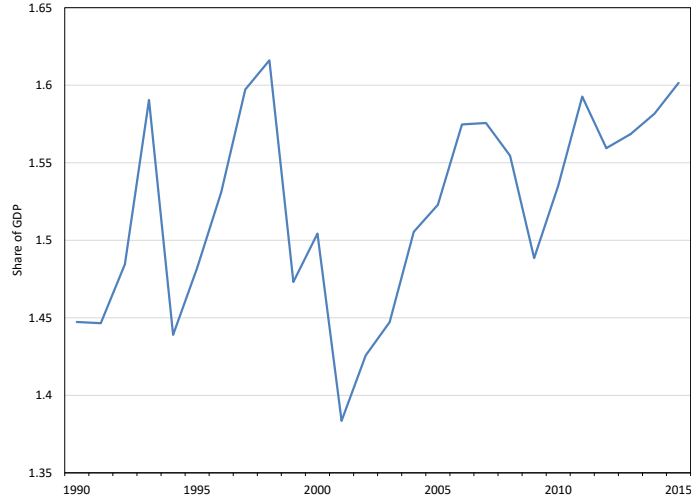


Table 5 summarizes the results from our analysis using Turkey’s world GDP share. According to this experiment, the current account deficit in 2015 might be considered an outcome of optimal decisions under certain assumptions. For instance, if we set $\alpha = 0.7$, the steady-state GDP share is calculated as 1.68%, implying a total growth rate of 4.78% and an annual growth rate of 0.36% in a period of 13 years. This appears plausible since Turkey’s GDP grew 8.37% in the 1990-2015 period with an annual growth rate of 0.57%. Hence, our conclusions from the benchmark experiment with net GDP shares remain robust when the analysis is conducted with a broader income measure.

Table 5: Results with gross GDP

Data			
GDP share in 1990 (%)			1.45
GDP share in 2015 (%)			1.60
Share growth: 1990-2015 (%)			8.37
Share growth: 2001-2015 (%)			15.75
Annual share growth: 1990-2015 (%)			0.57
Annual share growth: 2001-2015 (%)			0.45
Model			
	$\alpha = 0.7$	$\alpha = 0.75$	$\alpha = 0.8$
Steady state share $\bar{\gamma}$ (%)	1.68	1.68	1.68
Share growth ($\bar{\gamma}/\gamma_{2015} - 1$) (%)	4.78	4.84	4.93
Years to convergence	13	16	20
Annual share growth implied by the model (%)	0.36	0.30	0.24

Model-implied transition paths from a GDP share of 1.6% in 2015 under three different α 's are graphed in Figure 8. Under the scenario where adjustment occurs slowly ($\alpha = 0.8$),

convergence takes 20 years and the economy reaches a world GDP share of 1.68%.

Figure 8: Future world GDP share of Turkey

