Measurement of NAIRU: What is new and what is next for the Turkish economy?

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Abstract

The Turkish economy has been exposed to several risks after the global crisis. These emanated mostly from external factors such as the adoption of unconventional monetary policies by advanced economies, the sovereign debt crisis in the Euro area and the exit from the prolonged use of extraordinary anti–crisis measures. However, policy measures adopted against these risks led to a notable slowdown in the Turkish economy, raising questions about a middle income trap. In the meantime, starting from 2012, Turkey was exposed to a massive influx of Syrian refugees due to the civil war in Syria and this forced immigration had various outcomes on labor markets and the general price level. This study takes the above discussion as its starting point and attempts to estimate NAIRU (Non-Accelerating Inflation Rate of Unemployment) for the Turkish economy, which is assessed to have changed in the meantime. NAIRU is an important metric for the monetary policy stance as it denotes the level of the unemployment rate that is compatible with a stable level of inflation. In particular, the analysis shows that NAIRU has increased against these developments, but more proportionately than the actual unemployment; while inflation stayed relatively stable. Also, the sensitivity of inflation to unemployment gap remained steady recently, which implies that the overall contribution of unemployment gap to inflation has certainly decreased. Obviously, this has important implications regarding the labor market structure and the monetary policy conduct. Also, the influx of refugees, which feeds into higher NAIRU, may have a dampening effect on inflation and this should also be taken into account in the implementation of the monetary policy. Yet, policy design should be based on the fact that these results are constituted with a short-term outlook, while long-term effects will be more wide-ranging, especially pertaining to the refugee inflow.

Key words: Global crisis, Sovereign debt crisis, Syrian refugees, Immigration, NAIRU, Monetary policy.

JEL classification codes: C32, C63, E24, E31.

1. Introduction

NAIRU is the non-accelerating inflation rate of unemployment that captures the presence of upward or downward pressures on inflation rate.[1] Hence, estimating NAIRU is crucial in order to identify whether there is a risk of inflationary build-up in the economy (Ball and Mankiw, 2002). In this regard, NAIRU provides an essential feedback for the conduct of monetary policy as it is an important benchmark for gauging the state of the business cycle, the outlook for future inflation and the appropriate stance of the monetary policy (Walsh, 1998).

NAIRU may vary over time or inflation may accelerate even if unemployment declines to rates that are compatible with stable inflation (Estrella and Mishkin, 2000). Moreover, NAIRU may fluctuate when there are large supply shocks due to oil price surge or escalating raw material prices (Boone et al., 2001). Obviously, NAIRU may change also due to structural factors as well as demographical or technological effects (Ball and Mankiw, 2002; Gordon, 1997). In fact, there is a lively debate that the global crisis caused an elevation in unemployment, while also leading to an increase in NAIRU (Guichard and Rusticelli, 2010; OECD, 2012; Valletta and Kuang, 2010; Daly et al., 2011; Daly et al. 2011, 2012; Daly et al., 2015; Weidner and Williams, 2011; Dickens, 2011).

Turkey represents such a case where the global crisis had notable effects on unemployment. In particular, the unemployment rate increased swiftly after the crisis. However, as of 2010, the unemployment rate has started to decline rapidly, falling even below the pre–crisis levels (Ceritoğlu et al., 2012).[2] On the other hand, from end-2012 till end-2014, the unemployment rate assumed an upward course, while recently, it remained relatively stable, albeit slightly above the pre–crisis levels (CBRT, 2016).

Even though the global crisis had a relatively short-lived effect on unemployment as manifested by the ensuing significant improvement, the subsequent surge in unemployment rate experienced during 2012–2014 necessitates a thorough analysis of this escalation. Accordingly, a breakdown shows that the increase in labor force participation and the decline in employment were major

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[1] NAIRU is used synonymously with natural rate of unemployment — a term that was put forward by Phelps (1967) and Friedman (1968). Hall (1979), Johnson and Layard (1986), Juhn et al. (1991), Gordon (1981), Weiner (1993), Blanchard and Katz (1997), Staiger et al. (1997a), Stiglitz (1997) and Cross et al. (1998) are pioneering works that analyze the natural rate of unemployment concept. Yet, natural rate of unemployment is identified with the structural features of the economy and considered to have a more long-term outlook, while NAIRU is rather a short-term concept exploiting the trade-off between unemployment and inflation.

[2] Ercan et al. (2010) report that global crisis caused a significant loss in wages and extended informalization at the work place. The crisis had a severe impact on especially non-farm employment. Also, the crisis caused a surge in unemployment across workers who had been unemployed for 6 months and more. Moreover, the crisis had a more pronounced adverse effect over the university graduates.

factors driving the unemployment rate dynamics, while rising population had a relatively minor effect (CBRT, 2016).

One important development during this episode is the evident slowdown in the economy, which clearly led to a surge in unemployment. In particular, the Turkish economy grew rather modestly by 2.1, 4.2 and 3.0 percent in 2012, 2013 and 2014, respectively, after the robust growth by 9.2 and 8.8 percent in 2010 and 2011, correspondingly.[3,4]

Another important development that may have influenced the unemployment rate during this period is the massive influx of Syrian refugees to Turkey. Specifically, the civil war in Syria, which started in March 2011, has led to a substantial wave of forced immigration from Northern Syria to Southeastern Turkey, especially as of 2012.[5] This had serious outcomes on labor market, prices and rents (Ceritoğlu et al., 2015; Balkan and Tümen, 2016; Tümen, 2016; Akgündüz et al., 2015; Del Carpio and Wagner, 2015; Fakih and Ibrahim, 2016; Özpınar et al., 2016; Hoffmann and Samuk, 2016; Aiyar et al., 2016).

The prolonged periods of slow growth in the economy raise the question of whether this deceleration is likely to be persistent, and if so, how this may change NAIRU. Also, the wave of Syrian refugees is likely to affect NAIRU as previous studies state that immigration has permanent effects on the natural rate.[6] Besides,

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[3] http://www.tuik.gov.tr.

[4] There is an extensive literature linking prolonged periods of slowdown in emerging economies to existence of a middle income trap, which is the situation when middle income countries are stuck in a certain level of per capita income. Eichengreen et al. (2013), Aiyar et al. (2013), Felipe et al. (2012), Ye and Robertson (2016), Lin and Rosenblatt (2012), Kharas and Kohli (2011), Woo (2012), Felipe (2012), Jimenez et al. (2012), Bulman et al. (2014) and Agénor et al. (2012) are important works along this line. In particular, middle income trap is defined to be occurring when middle income countries experience a slowdown in growth, which is sustained over the medium term (seven years). On the other hand, Pritchett and Summers (2014) note that some slowdowns may simply reflect a reversion of growth to the long-run trend as there is a substantial risk of slowdown for countries after periods of accelerated growth. Yeldan et al. (2013) and Yılmaz (2014) are pioneering works that analyze the Turkish middle income trap. In particular, Yeldan et al. (2013) confirm the middle income trap, while Yılmaz (2014) asserts that accumulation of high-skilled labor force and ability to produce technologically sophisticated goods are quite important to abstain from the trap.

[5] The Syrian crisis led to the biggest migration flow of history. As a gateway to Europe, Turkey has been the first country to welcome Syrian refugees. According to United Nations, 5.14 million Syrians fled their countries as of July 2017. This figure includes 2.97 million Syrians registered by the Turkish government and 2 million registered by United Nations High Commissioner for Refugees in Lebanon, Jordan, Iraq and Egypt as well as more than 30,000 Syrian refugees registered in North Africa (http://data.unhcr.org/syrianrefugees/regional.php).

[6] Gordon (1997), Bentolila et al. (2007), Friedman and Suchoy (2004), Saleheen and Shadforth (2006), Hatzinikolaou and Kammas (2010), Blanchflower et al. (2007) and D'Auria et al. (2008), among many others, discuss the effects of immigration on NAIRU.

the influx is already reported to have an impact on unemployment[7,8] and this effect may well be reflected on NAIRU. Hence, addressing this issue is crucial as NAIRU is an important metric for the stance of the monetary policy.

Against this background, this study estimates NAIRU as a latent variable in the spirit of earlier works.[9] In doing so, an unobserved components model is developed that is estimated by the Kalman filter.[10] However, due to the volatile nature of the Turkish economy[11], the parameters are assumed to be varying over time. This requires the adoption of a nonlinear state-space form where state variables and the time-varying parameters should be estimated simultaneously, and the nonlinearity can be handled via the Extended Kalman Filter (EKF) algorithm, which is an extension to the standard Kalman filter.[12]

It should be underlined that this paper does not intend to analyze the underlying structural forces driving the unemployment dynamics, but it solely tries to extract the unobservable NAIRU given the latest outlook by focusing on its

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[7] Ceritoğlu et al. (2015) find that the influx caused higher unemployment rate and lower labor force participation, informal employment and job finding rates among natives in the Turkish economy.

[8] Turkey issued a decree in January 2016 allowing for work permits for Syrians. Yet, Syrian doctors and medical personnel were already allowed to work in health centers serving refugees. Also, over 4000 Syrian teachers received stipends from the Ministry of Education via a UNICEF-funded program, while agricultural workers are entitled to work legally as approved by provincial governors. Yet, as of May 2016, over 400,000 Syrians are working unregistered in Turkey, while only 10,000 had registered for work permits (Karasapan, 2016).

[9] A common approach to model NAIRU is to treat it as an unobserved stochastic process (King et al., 1995; Staiger et al., 1997a; Gordon, 1997). NAIRU can also be modeled using a production function (Layard et al., 1991; Nickell, 1997), and alternatively, it can be estimated assuming that it is a deterministic function of time (Staiger et al., 1997a, 1997b; Cross et al., 1998) or a function of demographics and labor market dynamics (Weiner, 1993; Staiger et al., 1997b). Additionally, NAIRU can be calculated via statistical approaches, which decompose unemployment series to its cyclical and trend components. Also, NAIRU can be measured bivariately on the basis of a Phillips curve equation with the presumption that shifts of the Phillips curve share a common trend with the unemployment rate (Laubach, 2001). Finally, NAIRU can be estimated via a multivariate filter by using a model that specifies the relationship between inflation, output and unemployment through the Phillips curve equation and the Okun law (Laxton and Tetlow, 1992; Richardson et al., 2000; Benes and N'Diaye, 2004).

[10] Kalman filter has been used extensively in the recent economics literature as a recursive estimation technique. Kuttner (1994) is a seminal paper that utilizes this approach for analyzing the U.S. economy, while Gerlach and Smets (1999) adopt this approach for the European economies. Kalman filter is discussed extensively in Kalman and Bucy (1961), Kalman (1960), Hamilton (1994a, 1994b) and Harvey (1990).

[11] Ertuğrul and Selçuk (2001), Kibritçioğlu et al. (2002) and Metin (1998) give a detailed account of the Turkish economy, while Alp and Elekdağ (2011), Başçı and Kara (2011), Kara (2008, 2013) and Us (2015) analyze the recent monetary policy practices.

[12] Despite its power, EKF was used in a limited number of works such as Grillenzoni (1993), McKiernan (1996) and Bacchetta and Gerlach (1997), and only in a few studies for the Turkish economy by Özbek et al. (2003), Özbek and Özlale (2005), Kara et al. (2007), Kara et al. (2007) and Us (2014a, 2014b, 2015).

relation with inflation. Accordingly, the paper also examines how inflation is linked to the unemployment gap.[13]

The paper proceeds as follows: The next section introduces the system specification. This is followed by data description and the estimation results. The subsequent section discusses the time-varying parameters of the Phillips curve, while the last section concludes this paper. The state-space representation of the EKF is provided in the Appendix.

2. System specification

Models that have been used to estimate NAIRU are based on a system of equations, which is a parsimonious version of a standard New Keynesian framework.[14] In the spirit of Us (2014a, 2014b) and Fabiani and Mestre (2000), the system consists of a Phillips curve, an Okun-type relationship between output gap and unemployment gap, some identities and a set of equations defining the law of motion for potential output and NAIRU, also including equations defining their respective trend components.

2.1. Baseline model specification

The baseline model is composed of the following equations:

$$\pi_t = \alpha_{1,t}\pi_{t-1} + \alpha_{2,t}\pi_{t-2} + \alpha_{3,t}ugap_{t-1} + \alpha_{4,t}z_t + \varepsilon_t^{\pi} \tag{1}$$

$$ygap_t = \beta_{1,t}ugap_{t-1} + \varepsilon_t^{ygap} \tag{2}$$

$$ugap_t = \delta_{1,t}ugap_{t-1} + \varepsilon_t^{ugap} \tag{3}$$

$$y_t = y_t^* + ygap_t \tag{4}$$

$$u_t = u_t^* + ugap_t \tag{5}$$

$$y_t^* = y_{t-1}^* + \gamma_{t-1} + \varepsilon_t^{y^*} \tag{6}$$

$$u_t^* = u_{t-1}^* + \eta_{t-1} + \varepsilon_t^{u^*} \tag{7}$$

[13] Şıklar et al. (1999), Yavan (1997), Kaya and Yavan (2007), Bildirici (1999), Yiğit and Gökçe (2012), Temurlenk and Başar (2012), Gianella et al. (2008), Us (2014a, 2014b) and Şengül and Taşçı (2014) are previous works that estimate NAIRU for the Turkish economy.
[14] Rudebusch and Svensson (1998), Peersman and Smets (1999) and Ball (1998, 1999, 2000) present insightful examples of New Keynesian small-scale macroeconomic models.

$$\gamma_t = \gamma_{t-1} + \varepsilon_t^{\gamma} \tag{8}$$

$$\eta_t = \eta_{t-1} + \varepsilon_t^{\eta} \tag{9}$$

The variables can be defined as follows: π_t is the inflation rate; u_t is the unemployment rate; y_t is the (log of) output level; z_t is the change in exchange rate, which captures supply-side pressures on inflation; y_t^* and u_t^* represent (the log of) potential output and NAIRU, respectively, while γ_t and η_t signify their stochastic trends. Correspondingly, $ygap_t$ and $ugap_t$ are the output gap and the unemployment gap.

Accordingly, equation (1) denotes the accelerationist-type Phillips curve equation. The coefficients $\alpha_{1,t}$ and $\alpha_{2,t}$ capture inflation persistence and are expected to be positive, while $\alpha_{3,t}$ and $\alpha_{4,t}$ seize the degree of demand-pull and cost-push inflation, respectively. The former is negative, whereas the latter is positive, and ε_t^{π} is the disturbance term.

Equation (2) states the Okun law, where $\beta_{1,t}$ is expected to be negative and ε_t^{ygap} is the error term. Equation (3) defines the autoregressive process for unemployment gap, while $\delta_{1,t}$ is predicted to be positive, and ε_t^{ugap} is the error term. Equations (4) are (5) denote the Beveridge and Nelson (1981) decomposition of output and unemployment, respectively. Equations (6) and (7) describe the linear trend model for potential output and NAIRU, where stochastic trends γ_t and η_t are modelled as an autoregressive process in equations (8) and (9), correspondingly. Obviously, $\varepsilon_t^{y^*}$, $\varepsilon_t^{u^*}$, ε_t^{γ} and ε_t^{η} are the disturbance terms.

The model can be represented in state-space form as follows:

$$x(t) = Fx(t-1) + Gu(t) + e_1(t) \tag{10}$$

$$y(t) = Hx(t) + e_2(t) \tag{11}$$

where $x(t)$ is the state vector, $y(t)$ is the observation vector, F is the transition matrix, H is the observation matrix and G is a known matrix. $e_1(t)$ and $e_2(t)$ denote vectors of normally distributed i.i.d. shocks, which are assumed to be

uncorrelated with each other and have covariance matrices R_1 and R_2, respectively. Furthermore, $u(t)$ is the vector of exogenous variables.

The measurement equation can be described as follows:

$$
\begin{bmatrix} \pi_t \\ y_t \\ u_t \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} \pi_t \\ \pi_{t-1} \\ ygap_t \\ ugap_t \\ y_t^* \\ u_t^* \\ \gamma_t \\ \eta_t \end{bmatrix}
$$

$$(12)$$

The transition equation can be expressed as:

$$
\begin{bmatrix} \pi_t \\ \pi_{t-1} \\ ygap_t \\ ugap_t \\ y_t^* \\ u_t^* \\ \gamma_t \\ \eta_t \end{bmatrix} = \begin{bmatrix} \alpha_{1,t} & \alpha_{2,t} & 0 & \alpha_{3,t} & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \beta_{1,t} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \delta_{1,t} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \pi_{t-1} \\ \pi_{t-2} \\ ygap_{t-1} \\ ugap_{t-1} \\ y_{t-1}^* \\ u_{t-1}^* \\ \gamma_{t-1} \\ \eta_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha_{4,t} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} z_t \end{bmatrix} + \begin{bmatrix} \varepsilon_t^\pi \\ 0 \\ \varepsilon_t^{ygap} \\ \varepsilon_t^{ugap} \\ \varepsilon_t^{y^*} \\ \varepsilon_t^{u^*} \\ \varepsilon_t^\gamma \\ \varepsilon_t^\eta \end{bmatrix}
$$

$$(13)$$

2.2. Alternative model specification

As an alternative to the baseline model specification, output gap[15] is used as a substitute for unemployment gap in order to measure the stance of aggregate demand in the Phillips curve. Accordingly, Okun law is reversed from unemployment gap to output gap. Therefore, equations (1) and (2) in the baseline model are replaced with the following equations such that:

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[15] The output gap is a measure of how far away an economy is from a desirable level of output. It presents a gauge of when the economy might be overheating or underperforming, which prompts the central bank to cool or to stimulate the economy, respectively, via appropriate policy tools (Lubik and Slivinski, 2010).

$$\pi_t = \alpha_{1,t}\pi_{t-1} + \alpha_{2,t}\pi_{t-2} + \alpha'_{3,t}ygap_{t-1} + \alpha_{4,t}z_t + \varepsilon_t^{\pi} \tag{1'}$$

$$ugap_t = \beta'_{1,t}ygap_{t-1} + \varepsilon_t^{ugap} \tag{2'}$$

where $\alpha'_{3,t} > 0$ and $\beta'_{1,t} > 0$. Furthermore, output gap is modeled as an autoregressive process and hence equation (3) is modified as:

$$ygap_t = \delta'_{1,t}ygap_{t-1} + \varepsilon_t^{ygap} \tag{3'}$$

where $\delta'_{1,t}$ is expected to be greater than zero. These modifications imply a re-definition of the transition equation as below:

$$
\begin{bmatrix} \pi_t \\ \pi_{t-1} \\ ygap_t \\ ugap_t \\ y_t^* \\ u_t^* \\ \gamma_t \\ \eta_t \end{bmatrix} =
\begin{bmatrix}
\alpha_{1,t} & \alpha_{2,t} & \alpha'_{3,t} & 0 & 0 & 0 & 0 & 0 \\
1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \delta'_{1,t} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & \beta'_{1,t} & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1
\end{bmatrix}
\begin{bmatrix} \pi_{t-1} \\ \pi_{t-2} \\ ygap_{t-1} \\ ugap_{t-1} \\ y_{t-1}^* \\ u_{t-1}^* \\ \gamma_{t-1} \\ \eta_{t-1} \end{bmatrix} +
\begin{bmatrix} \alpha_{4,t} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \begin{bmatrix} z_t \end{bmatrix} +
\begin{bmatrix} \varepsilon_t^{\pi} \\ 0 \\ \varepsilon_t^{ygap} \\ \varepsilon_t^{ugap} \\ \varepsilon_t^{y^*} \\ \varepsilon_t^{u^*} \\ \varepsilon_t^{\gamma^*} \\ \varepsilon_t^{\eta^*} \end{bmatrix} \tag{13'}
$$

Meanwhile, the observation equation remains unchanged.

3. Data and the estimation results

This section describes data and discusses the estimation results. The models utilize quarterly data on inflation, output, unemployment and nominal exchange rate for Turkey during 2000Q1–2015Q4.[16] Inflation is first-differenced seasonally adjusted CPI series in logs. Output is seasonally adjusted GDP in logs and unemployment is seasonally adjusted series in percentages. Exchange rate is the logarithmic difference of the USD/TRY spot rate. Seasonal adjustment is handled via TRAMO/SEATS (Gómez and Maravall, 1996). The initial values are set according to Chan and Hsiao (2011). Summary statistics are provided in Table 1.

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[16]   Data are publicly available at http://evds.tcmb.gov.tr.

Table 1
Summary Statistics

Variables	Average	Standard Deviation	Minimum	Maximum
Inflation Rate	0.025443	0.017389	0.003812	0.088502
Output	0.167495	0.022409	0.001814	0.173332
Unemployment Rate	0.09844	0.016637	0.011978	0.138658
Exchange Rate	0.005394	0.027765	-0.05079	0.10488

3.1. Baseline model results

Figure 1 presents the estimation results of the baseline model. Accordingly, model-consistent estimates for NAIRU, unemployment gap, potential output, output gap and inflation are illustrated. Also, the actual values for the unemployment, output and inflation are depicted to assess the plausibility of the estimation results.

The analysis also shows the regime switches of the Central Bank of the Republic of Turkey (CBRT).[17] In particular, the monetary policy conduct is categorized as ERBS Program, 2001 Crisis, Implicit Inflation Targeting, Strict Inflation Targeting, Global Crisis and New Monetary Policy Mix for the periods covering 2000Q1–2000Q4, 2001Q1–2001Q4, 2002Q1–2005Q4, 2006Q1–2008Q4, 2009Q1–2010Q4 and 2011Q1–2015Q4, respectively.

Against this background, Figure 1 indicates that the model-consistent estimate for NAIRU is reasonable. Moreover, the estimates for unemployment gap, potential output and the output gap seem plausible. Also, the inflation estimate is realistic given the actual inflation. In particular, NAIRU moves in tandem with the actual unemployment by exhibiting higher volatility. However, this is anticipated as NAIRU is observed to be more sensitive to economic fluctuations than the actual unemployment (Clark and Laxton, 1997). In fact, NAIRU displays a sharper increase than the actual unemployment during the crisis episodes in 2001 and 2008.

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[17] The time period covered in the analysis is crucial for the Turkish economy. In particular, between 2000Q1 and 2001Q1, the CBRT conducted an IMF-backed exchange–rate–based stabilization (ERBS) program, which eventually collapsed with the outbreak of the financial crisis in February 2001. Starting from May 2001, the CBRT has implemented the transition program for strengthening the Turkish economy (CBRT, 2001). In 2002, the implicit inflation targeting regime was adopted. This was followed by the implementation of the strict inflation targeting regime starting from 2006. In the last quarter of 2008, the CBRT faced challenges originating from the global crisis that occurred in September 2008. Consequently, the CBRT adopted anti–crisis measures, which were later withdrawn starting from April 2010. Finally, as of end-2010, the CBRT has conducted a new monetary policy framework, which departed from strict inflation targeting by the inclusion of financial stability as a supplementary objective to its primary goal of maintaining price stability (Erçel, 1999; Başçı and Kara, 2011; Başçı et al., 2007; Kara, 2008, 2013).

Between the two crisis episodes, on the other hand, NAIRU seems to be fluctuating around a steady trend in line with the actual unemployment.

One specific point that should be mentioned is the fact that the actual unemployment rate and the NAIRU settle on a higher plateau after the domestic financial crisis in 2001, whereas both series decline back to their pre–crisis levels notwithstanding the sharp increase registered with the onset of the global crisis.[18,19,20, 21,22] Consequently, the new monetary policy mix is implemented after the global crisis episode, which leads to a further decline in both the actual unemployment and the NAIRU.[23]

However, as of the first quarter of 2012, NAIRU starts to surge parallel to the slight increase in actual unemployment. This upward trend becomes more evident starting from the second quarter of 2014. Despite a temporary drop at end-2013, NAIRU and the actual unemployment continue to increase until the end of the analyzed period. It should be underlined that this episode is marked by the outbreak of the Syrian conflict, which led to a massive influx of refugees to Turkey. Apparently, this caused an increase in NAIRU.[24]

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[18] A series of packages was enacted in Turkey to combat aggravating unemployment and output losses via fiscal stimulus measures. The first package was announced in October 2008, which was complemented in February 2009 with the initiation of the work sharing program. The third package was announced in May 2009 with further stimulus measures (Ercan et al., 2010).

[19] The work sharing program was the most widely implemented program in Turkey, comprising of extensive measures for enhancing employment. These measures were initiated to compensate workers employed in enterprises, where production and employment hours were reduced or stopped due to crisis or other adverse conditions. In February 2011, the program was extended to include sectoral or regional crisis conditions (Ercan et al., 2010; Kölmek, 2014).

[20] Another important program within the employment package was the Public Infrastructure Employment Program (PIEP) that was initiated in July 2009. PIEP was designed for employees that were threatened by economic crises or displacement due to privatization, economic restructuring or natural disasters. The program aimed at providing short-term employment along with training and apprenticeship services in exchange for a public-related work or service (Ercan et al., 2010; Kölmek, 2014).

[21] The anti–crisis measures also included Wage Guarantee Fund, which aimed at protecting employees who had been adversely affected from their employers' declaration of bankruptcy and/or revelation of inability to pay (Ercan et al., 2010; Kölmek, 2014).

[22] The CBRT took extensive measures to eliminate the adverse effects of the global crisis, which were abated gradually in accordance with the exit strategy (CBRT, 2010).

[23] Advanced economies opted for unconventional policy tools to contain the adverse effects of the global crisis. This caused rapid credit growth and overvalued exchange rates in emerging economies, including Turkey, which posed risks to financial stability. Hence, the new monetary policy mix was adopted by the CBRT to jointly fulfill the price stability and the financial stability objective (IMF, 2012; Akçelik et al., 2013).

[24] The effect of Syrian conflict on unemployment rate was analyzed also for other affected countries. In particular, Stave and Hillesund (2015) report that the unemployment rate in Jordan has increased from 14.5 percent before the Syrian crisis to 22.1 percent after the inflow of refugees. The increased unemployment rate was mostly manifested among young workers as well as the lowest educated and the poorest segments of the population. Cherri et al. (2016) discuss that the Syrian refugee influx caused

Meanwhile, the recent heightening in unemployment and the surge in NAIRU also coincide with the implementation of monetary tightening amid elevated risk. In particular, starting from the last quarter of 2011, the CBRT opted for additional monetary tightening against worsening risk appetite driven by the sovereign debt crisis.[25] Moreover, Fed's taper signal in May 2013[26] also deteriorated the global risk appetite, resulting in sudden outflows of capital from emerging economies, including Turkey. This required the adoption of a tight monetary policy as well as a front-loaded monetary tightening in August 2013 (CBRT, 2014, 2015). Accordingly, employment seems to have been adversely affected by these tightening measures, which obviously had an unfavorable impact on NAIRU as well.

Meanwhile, the baseline model produces an unemployment gap series, which is negative through most of the analyzed period. This implies that the deviation of unemployment from NAIRU is inflationary. In particular, the estimated unemployment gap series provides a higher contribution to inflation especially during crisis episodes in 2001 and 2008. Yet, inflationary pressures stemming from the unemployment gap are lessened starting from the first quarter of 2012.

As for the potential output, it is sensitive to crisis episodes by displaying a plunge in 2001 and 2008, whereas it continues to trend upwards otherwise. Also, the output gap is highly volatile above zero until the end of the global crisis period, while the series stabilizes with the adoption of the new monetary policy mix.

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the unemployment rate to double to 34 percent, while the labor force to increase by 50 percent since 2011 in Lebanon. Heinisch and Wohlrabe (2016) analyze the effects of influx in Germany, which was the most targeted country in Europe by refugees in 2015. The authors claim that migrants are directly increasing the level of population and will have noticeable positive effects on the potential GDP growth, whereas for evaluating their effects on the labor market, one has to consider the fact that the number of refugees that enter the labor market is limited due to several factors (e.g. the duration of the asylum process, the skill and education level of the refugees, the language barrier, the possibility that the refugees may go back to their home country in case of resolution of the conflict etc.). Obviously, these factors prevent refugees to have immediate access to the labor market.

[25] The sovereign debt problems in some Euro area countries heightened global risk aversion, thus resulting in sudden outflows of capital from emerging market economies, including Turkey. The sovereign debt crisis was felt severely from August 2011 to June 2012, causing unfavorable risk perception towards Turkey, which also led to elevated volatility and widened current account deficit (Akçelik et al., 2013).

[26] After the taper signal in May 2013, the Fed delivered the first rate hike in December 2015 by initiating the long-waited exit from the prolonged use of unconventional monetary policies (Fed, 2015). However, other major central banks diverged from the Fed by opting for further easing policies. In fact, the Bank of Japan and the ECB delivered a recent rate cut and adopted more aggressive quantitative easing programs. Also, Sveriges Riksbank, Danmarks Nationalbank and the Swiss National Bank reduced their policy rates below zero, while Reserve Bank of New Zealand and Norges Bank cut their policy rates and Czech National Bank stated the possibility of entering into negative zone. Despite these divergences, evidence shows larger international interest rate spillovers for U.S. policy announcements than those for other central banks, which marks the Fed's policy rate lift-off as a crucial step towards normalization of global monetary policies (Fischer, 2015; Rogers et al., 2014; Ehrmann and Fratzscher, 2005; Fed, 2014).
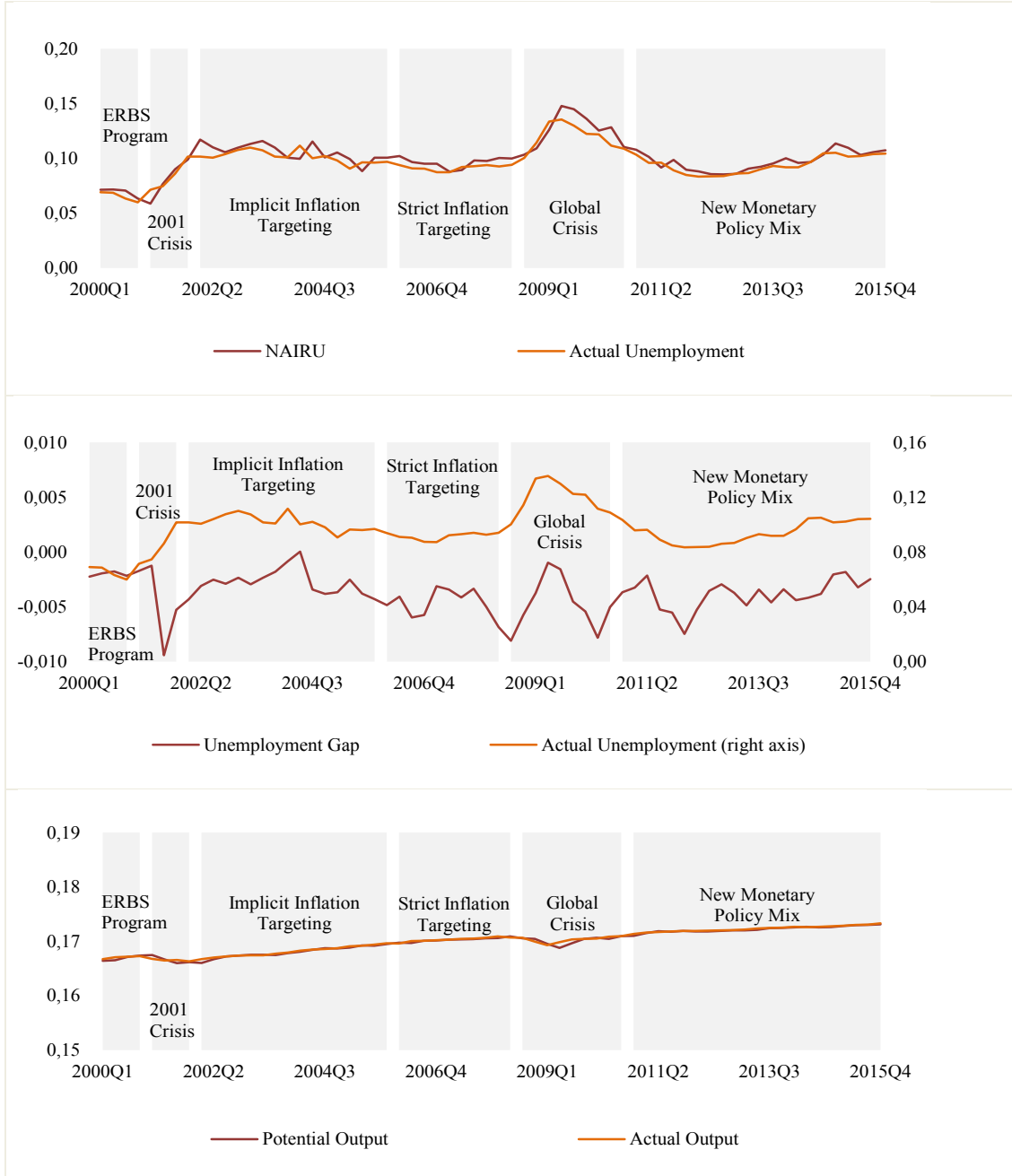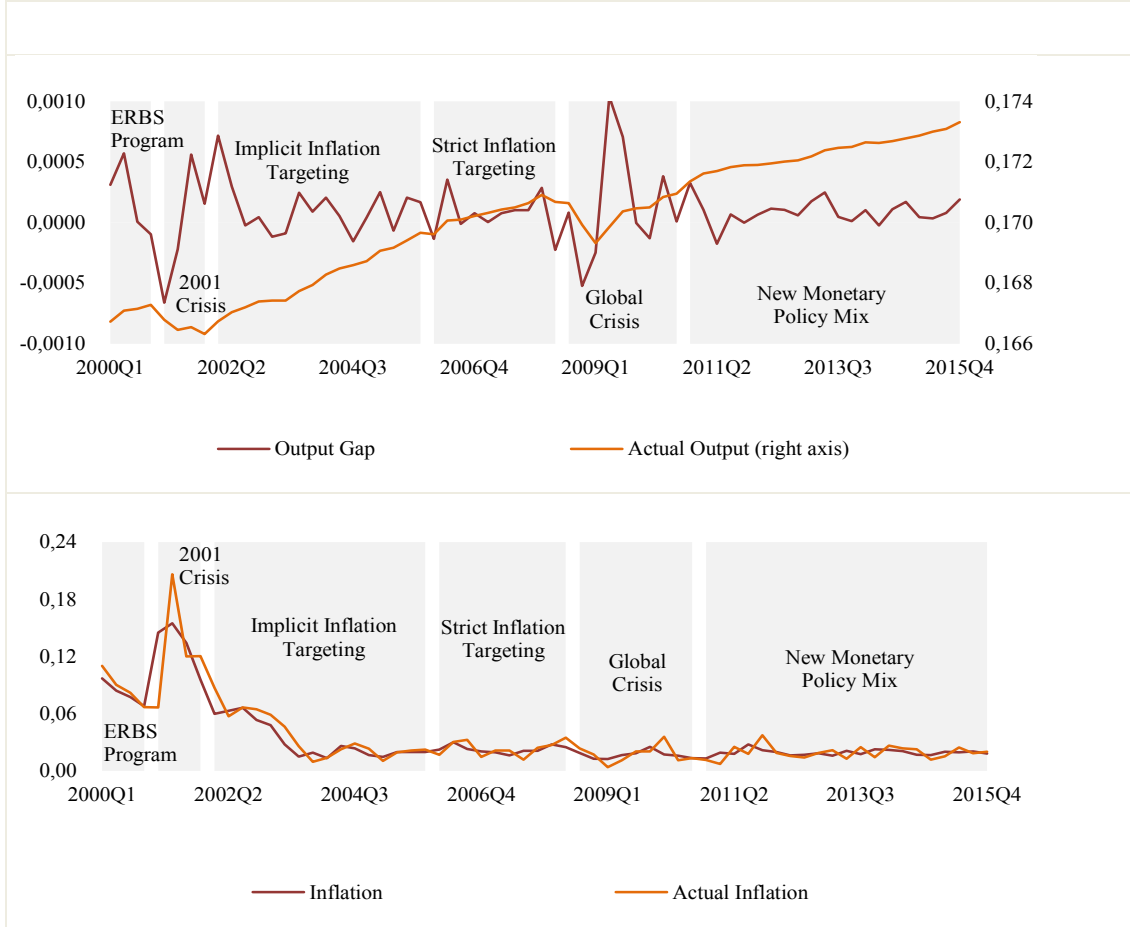
Figure 1
Baseline Model Results

Figure 1. (continued)

In the meantime, the baseline model produces an inflation series, which captures the actual inflation dynamics. In particular, similar to actual inflation, the estimated inflation series settles on a downward course with the adoption of the ERBS program, yet this is interrupted temporarily with the outbreak of the domestic financial crisis in 2001. Having declined considerably until the midst of the implicit inflation targeting regime, inflation remains relatively stable for the rest of the analyzed period, except for slight slumps observed during the global crisis and the implementation of the new monetary policy mix.

Overall, NAIRU is steady during periods when inflation is stable, i.e. non-accelerating, and surges when inflation tends to increase. However, NAIRU responds more severely to the global crisis than the actual inflation by displaying a

significant rise, which is then followed by a decline; while inflation, on the other hand, is relatively steady. Moreover, NAIRU is increasing even though inflation is stable during the new monetary policy mix, which indicates that the tight monetary policy implemented during this period was able to control inflation; yet had an unfavorable impact on unemployment. Alternatively, this may also imply that the refugee inflow, which had an adverse effect on NAIRU, had a favorable impact on inflation.[27]

3.2. Alternative model results

Figure 2 presents the estimation results of the alternative model. The estimates for NAIRU and inflation are similar to those of the baseline model, while the unemployment gap is smoother. However, potential output and output gap are more volatile as output gap enters the Phillips curve equation, which causes these series to be estimated more precisely.[28]

3.3. Sensitivity analysis

In order to analyze the robustness of the results, the dynamic homogeneity condition is imposed in both specifications. This implies neutrality, which indicates that permanent changes in inflation should not affect output in the long run. Nickell (1988) argues that "if the model does not possess this kind of neutrality, then unemployment can be shifted, even in the long run simply by changing the level of inflation". Accordingly, dynamic homogeneity condition guarantees that the existence of a trade-off between inflation and output is only limited to short run (Laubach and Williams, 2003; Greenslade et al., 2003; Batini and Greenslade, 2006). Also, the constraint infers that prices are determined by nominal factors such as wages and imported costs (Gómez and Julio, 2000).

Dynamic homogeneity condition can be imposed by restricting the sum of the coefficients of the explanatory inflation terms in the Phillips curve equation to be equal to unity or by using differenced inflation terms in the Phillips curve equation, which automatically satisfies the unity constraint (Fabiani and Mestre, 2000).

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[27] Balkan and Tümen (2016) find that the general level of consumer prices in Turkey has declined by approximately 2.5 percent due to the Syrian refugee influx. The decrease is attributed to the fact that refugees supply inexpensive informal labor. This leads to reduced prices in these sectors and causes overall prices to fall, even though prices in formal labor-intensive sectors remain unchanged.

[28] It should be noted that this paper focuses on estimating NAIRU. Hence, the measurement of potential output and the output gap may not be as sophisticated as those in other models such as Kara et al. (2007), Özbek and Özlale (2005), Erdoğan-Coşar et al. (2012) and Alp et al. (2012), which only compute these series. Also, the estimate for the output gap may not necessarily follow the official output gap forecasts, which are produced for the latest 12-month and the upcoming 3-year period.

Figure 2
Alternative Model Results

NAIRU (Baseline Model) — NAIRU (Alternative Model) — Actual Unemployment

Unemployment Gap (Baseline Model) — Unemployment Gap (Alternative Model, right axis)

Potential Output (Baseline Model) — Potential Output (Alternative Model) — Actual Output
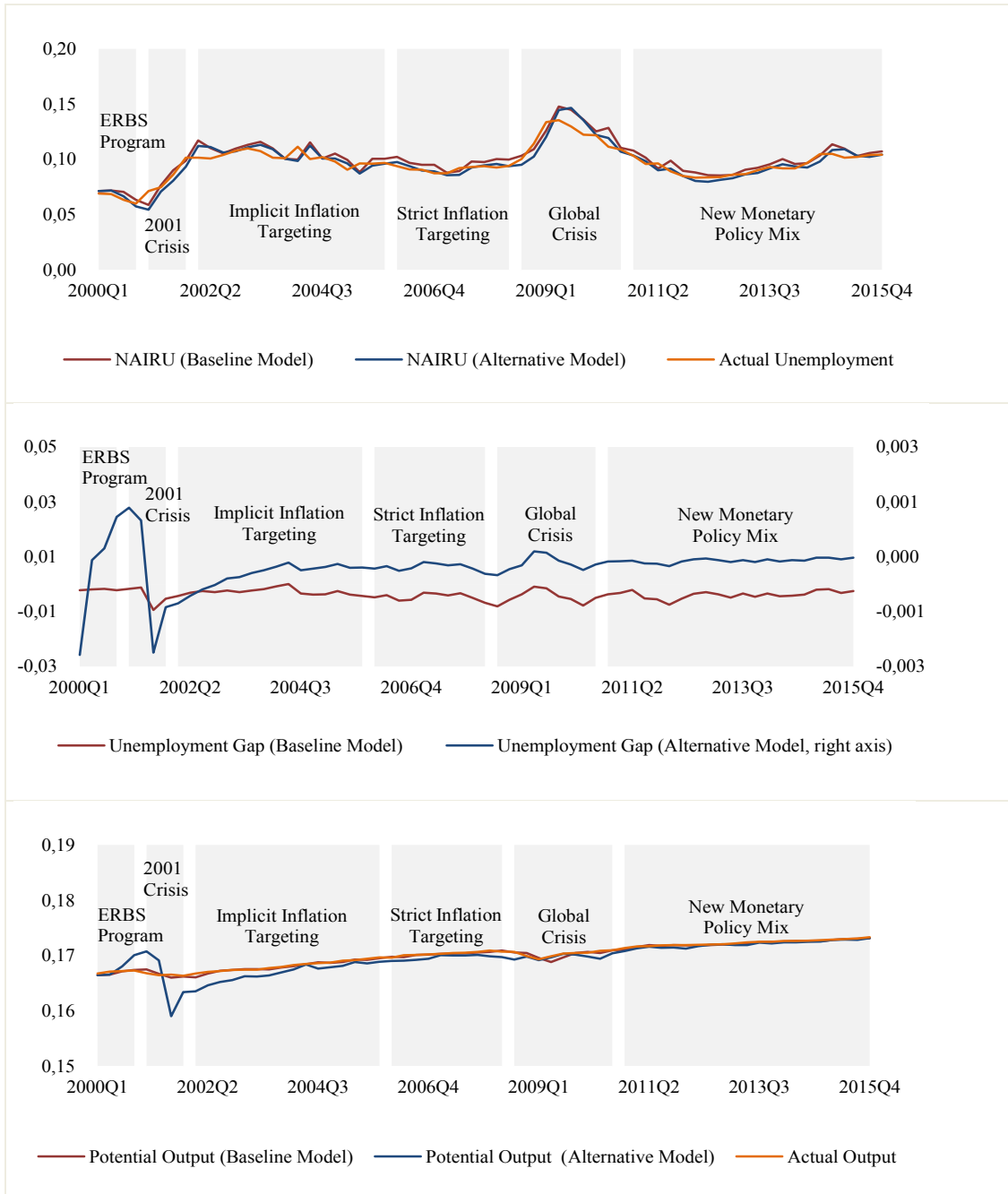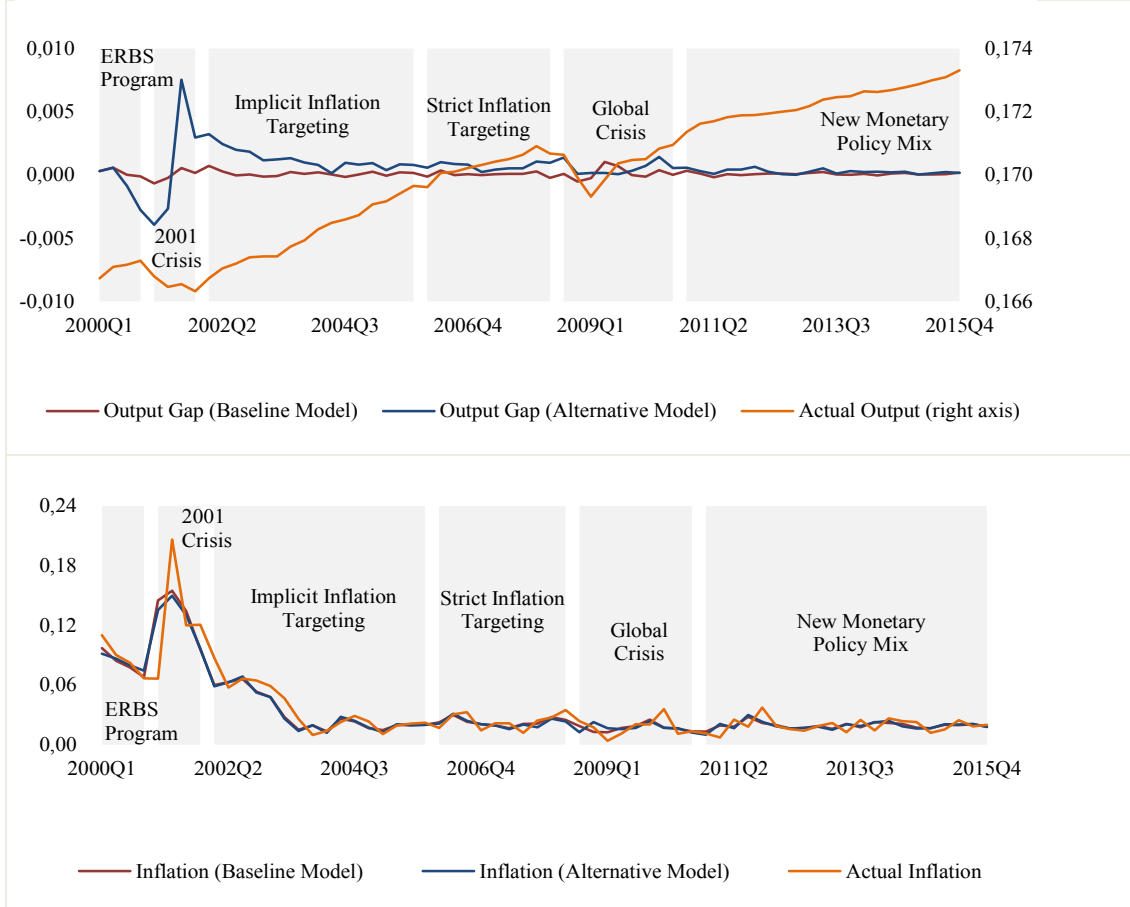
Figure 2 (continued)

Since the Phillips curve equation does not contain any differenced inflation terms, dynamic homogeneity condition is forced by restricting the sum of lagged inflation terms in the Phillips curve equation to be equal to unity (Bjørnland et al., 2007). Meanwhile, the state-space representation of the model is unchanged in both the baseline model and the alternative model specifications.

The sensitivity analysis in Figure 3 shows that NAIRU follows a smoother path under the dynamic homogeneity constraint in the baseline model, while the restriction leads to virtually no change in the estimation of NAIRU in the alternative model. Also, the dynamic homogeneity constraint leaves the unemployment gap almost unchanged in both the baseline and the alternative model specifications.
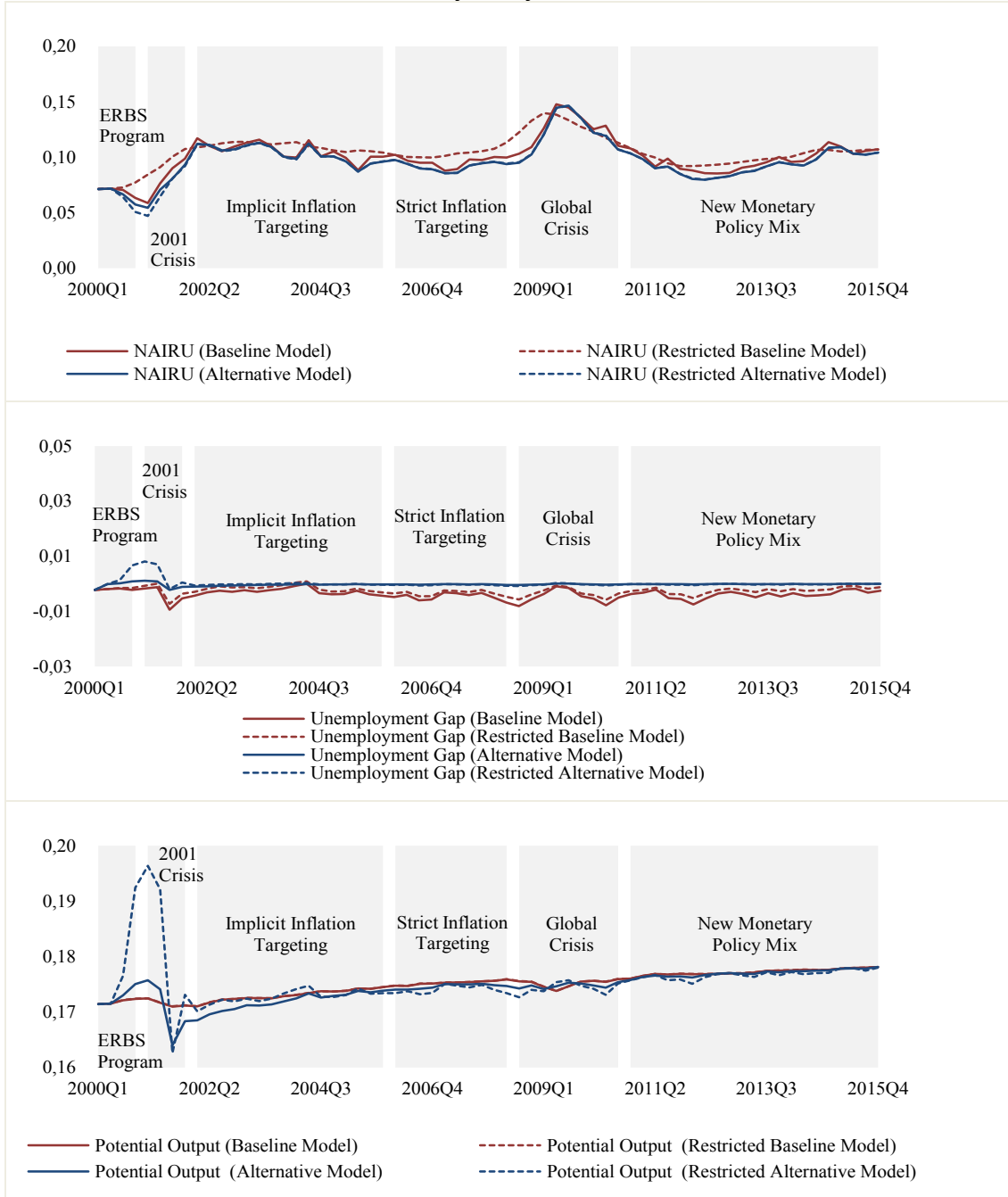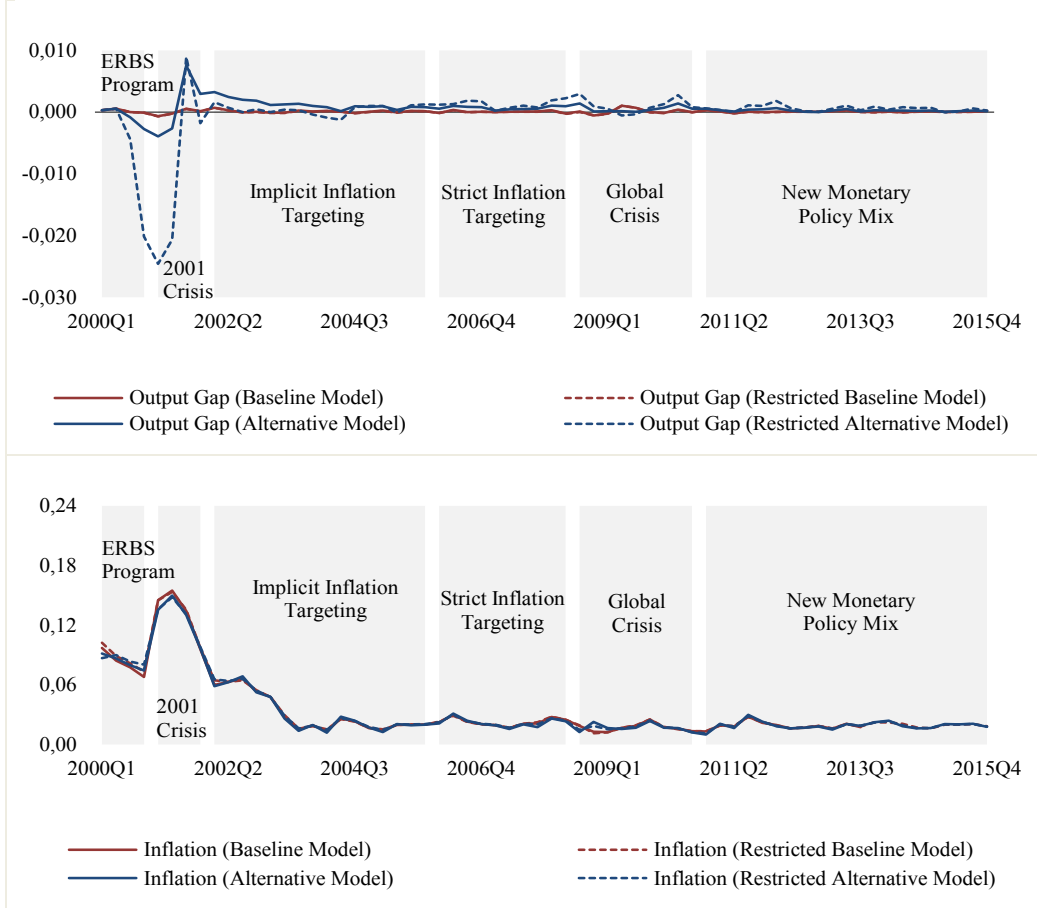
Figure 3
Sensitivity Analysis

Figure 3 (continued)

Moreover, dynamic homogeneity constraint does not notably affect potential output and the output gap estimations in the baseline model. However, potential output and output gap series react more sharply to crisis episodes in the restricted alternative model. As for inflation, the constraint leads to virtually no change under both the baseline and the alternative model specifications. This sensitivity analysis is a robustness check, which justifies that the selected models are already featured to have long-run neutrality.

4. Time-varying parameters of the Phillips Curve

Figure 4 presents the evolution of the time-varying parameters of the Phillips curve measured by EKF under all specifications, including the dynamic homogeneity constraint. This helps to infer the contribution of inflation persistence

as well as demand and supply-side factors to current inflation. Accordingly, the results point to the presence of a considerable inertia in inflation, which confirms previous findings by Özçiçek (2011) and Tunay (2009) hinting at significant inflation persistence even after the disinflation period in Turkey. Moreover, the dynamic homogeneity constraint causes remarkably higher persistence in inflation in both the baseline and the alternative model specifications. This can be justified by the larger α_1 produced in the restricted versions of both models, while the feedback coefficient from past inflation produced by the alternative model is similar to that estimated by the baseline model.

In the meantime, π_{t-2} has a lower yet gradually increasing contribution to current inflation, and the baseline model produces a higher α_2 coefficient than other specifications. The persistence implied by the baseline model is even more apparent starting with the implementation of the strict inflation targeting regime. Meanwhile, the dynamic homogeneity constraint yields a lower α_2 coefficient in both models, while the lowest coefficient is produced in the restricted alternative model.

Estimation results indicate a weak demand-pull inflation as evident by the considerably low α_3 parameter for the unemployment gap. This is compatible with previous studies in the literature citing a poor link between unemployment and inflation in the Turkish economy.[29] Yet, the coefficient increases starting with the implementation of the strict inflation targeting regime, and remains relatively stable at a higher plateau as of the global crisis episode. In the meantime, the alternative model also points to a weak and steady demand-pull inflation throughout the analyzed period. Also, the dynamic homogeneity constraint yields a higher coefficient in the alternative model than that produced in the baseline model.

Finally, the estimation results indicate that cost-push inflation as measured by the degree of pass-through from exchange rate to inflation, which can be captured by α_4, declines considerably over time. This confirms previous findings that indicate lower pass-through from exchange rate to inflation in the post–2001 period.[30]

The alternative model produces a slightly higher coefficient than the baseline model, while the dynamic homogeneity constraint lowers the pass-through in both specifications, but more notably in the alternative model. Yet, α_4 coefficient is still sizeable under the dynamic homogeneity constraint, pointing to the presence of a considerable supply-side pressure on inflation.[31]

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[29] Karahan et al. (2012) show that inflation is weakly related to unemployment, while Kuştepeli (2005) finds no meaningful relationship between inflation and unemployment for the Turkish economy. Also, Uysal and Erdoğan (2003) present quite a weak link between unemployment and inflation in Turkey.

[30] Kara and Öğünç (2005, 2008), Kara et al. (2007) and Karasoy et al. (2005) report lower pass-through from exchange rates to inflation.

[31] Kara (2013) asserts that exchange rate has a major contribution to inflation and it acts as the main determinant of the cost channel in Turkey.
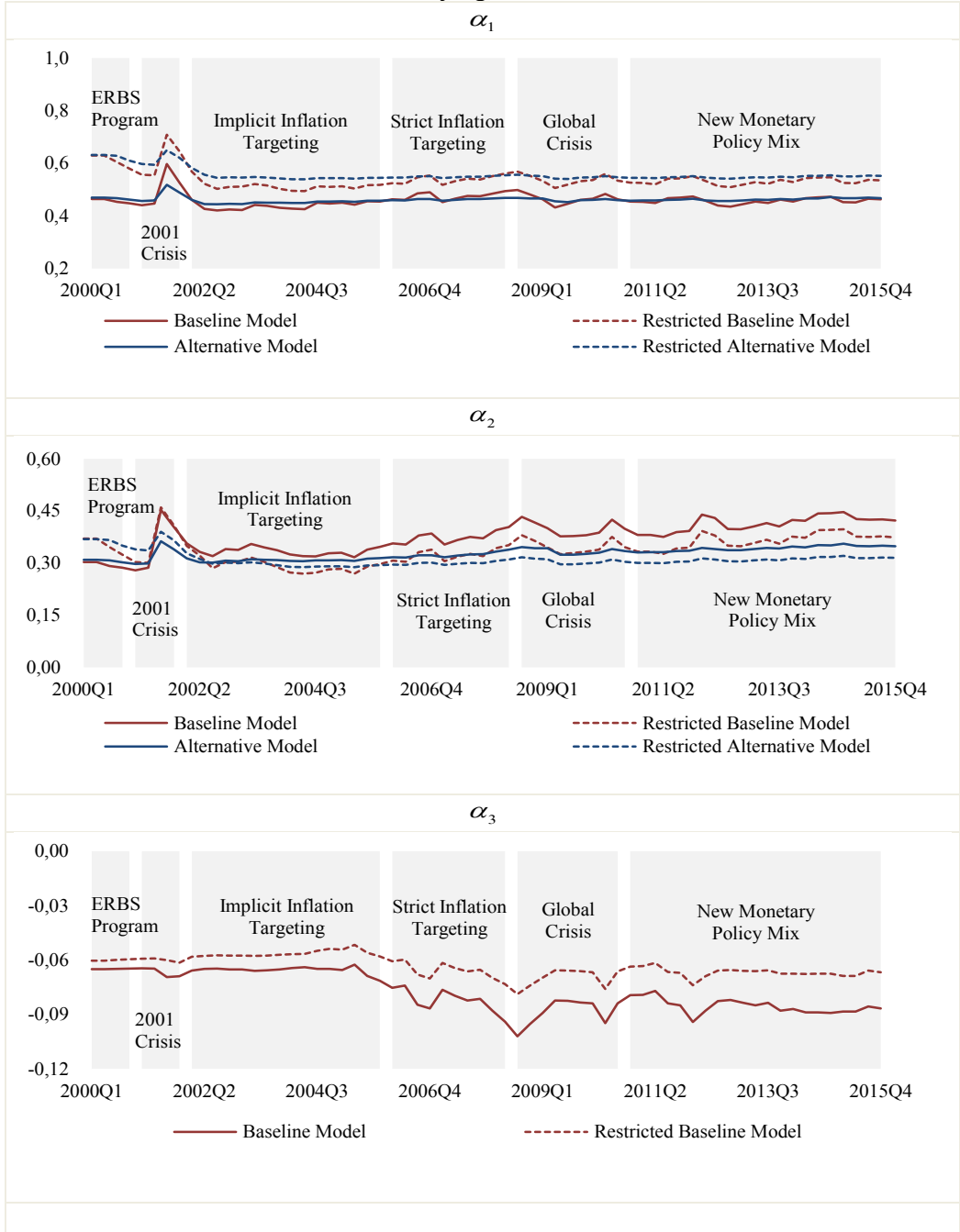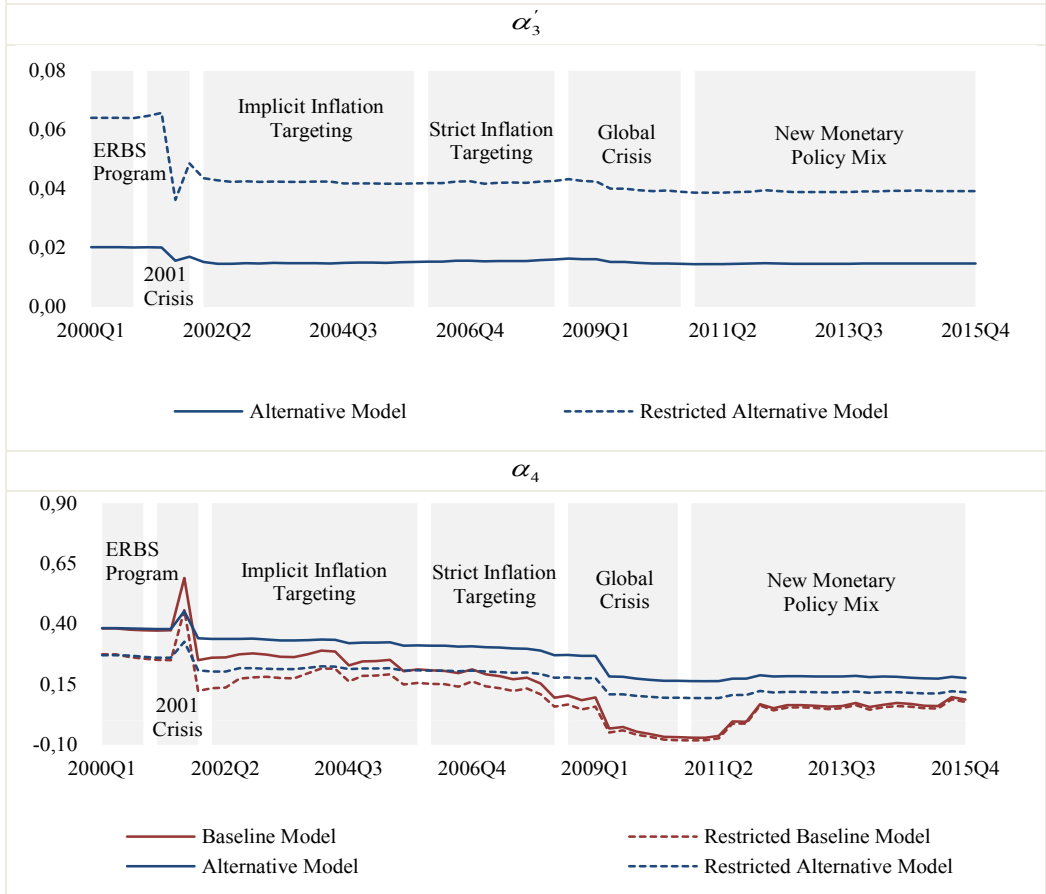
Figure 4
Time-Varying Parameters

α_1

α_2

α_3

Figure 4 (continued)

$$\alpha_3'$$

Alternative Model — — Restricted Alternative Model

$$\alpha_4$$

Baseline Model — — — Restricted Baseline Model
Alternative Model — — — Restricted Alternative Model

5. Conclusion

NAIRU is the unemployment rate that corresponds to a stable inflation. Yet, attempting to model NAIRU in the Turkish economy during an episode marked by important shocks is obviously a challenge. In particular, global crisis is a major event that had serious implications on labor markets across a wide range of countries, including Turkey.

Furthermore, the developments after the global crisis, including the adoption of unconventional tools by major central banks, the sovereign debt crisis in the Euro area as well as the normalization of global monetary policies had significant effects on the Turkish economy, where the buffering devices utilized in this context caused notable slowdown, while also increasing the unemployment rate. Moreover, Turkey

had to welcome a massive influx of Syrian refugees that caused diverse labor market outcomes. This raised the issue of whether these developments were translated into permanent structural changes in the Turkish labor market, which also led to fluctuations in the level of the NAIRU.

Against this background, this paper attempts to estimate NAIRU for the Turkish economy. The results show that the estimated series are plausible. In particular, NAIRU moves in tandem with actual unemployment and the estimations are able to capture the recent heightening in unemployment, which is reflected as an increase in NAIRU.

However, NAIRU follows a more volatile path than actual unemployment. This indicates that the estimated NAIRU series reacts more sharply to the crisis episodes than the actual unemployment, which is inherently more persistent. Also, the estimations point to a rather higher NAIRU than the actual unemployment through most of the analyzed period. This implies a negative unemployment gap, which contributes positively to inflation.

Yet, despite the latest elevation in unemployment that is also reflected on NAIRU, the unemployment gap is less inflationary in the recent period. Also, the sensitivity of inflation to unemployment gap as measured by the time-varying parameter remained stable during this period, which implies that the overall contribution of unemployment gap to inflation has certainly decreased. Obviously, this has important implications regarding the labor market structure and the monetary policy conduct.

In this regard, despite the unchanged sensitivity of inflation to the unemployment gap, the fact that NAIRU increased more proportionately than the actual unemployment implies disinflationary pressure, and this is a useful feedback for the monetary policy design. Also, the influx of refugees, which led to higher NAIRU, may have a dampening effect on inflation, and this should also be taken into account in the monetary policy conduct.

Obviously, the developments in the recent episode may have diverse impacts on different segments of the labor force.[32] Similarly, inflation persistence, pass-through from exchange rates and the sensitivity to unemployment gap and output gap may vary across subcategories of consumer prices.[33]

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[32] Ceritoğlu et al. (2015) report higher adverse effects of the refugee influx on females, younger workers and less-educated workers as well as informally employed workers.

[33] Altissimo et al. (2009), Tillmann (2012), Ceritoğlu et al. (2012), Öğünç and Sarıkaya (2011), Alp et al. (2012), Başer et al. (2012), Atuk et al. (2013), Özmen and Sevinç (2011), Erdoğan-Coşar et al. (2012) and Özçiçek (2011) discuss that estimation results are sensitive to using aggregate data versus micro data.

Hence, future research may seek to derive NAIRU based on micro data.[34] In this regard, a breakdown of employment by industry, formality, education, gender and age may provide a more precise measurement of NAIRU, which therefore helps to pinpoint the effects of the recent developments on each of these segments. Moreover, inflation may also be estimated using micro data.[35] This also enables to identify the impact of the latest developments on inflation more accurately, while also yielding a better understanding about the effectiveness of the monetary policy.

The global crisis posed significant challenges to the Turkish economy. Yet, the post–crisis period was also marked by the Syrian conflict, which constituted a major risk on the Turkish economy given the associated influx of refugees. The analysis shows that the NAIRU has increased against these developments. This has serious implications concerning the link between inflation and unemployment gap, which should be taken into account with respect to the transmission of the monetary policy. However, it should be noted that these results are based on a short-term outlook, while long-term effects of the refugee inflow will be more wide-ranging.[36] Hence, the consequences of the refugee problem regarding particularly the labor market and inflation will be better understood as new data sets with micro-level details become available, which, however, is beyond the scope of this paper.

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[34] Micro-level data on employment can be obtained from the Turkish Household Labor Force Survey, which is compiled and published by the Turkish Statistical Institute (TURKSTAT). The industry classification is provided by two-digit level based on NACE-Rev2. The survey is conducted monthly and has very large sample size even at regional level. However, the dataset is available publicly only in annual frequency.

[35] TURKSTAT provides data on consumer prices for 437 items using NUTS2-level regional categorization. The dataset is available publicly in monthly frequency. The items can be grouped under 12 broad categories and 44 subcategories using COICOP standards.

[36] Aiyar et al. (2016) discuss that refugees may cause lower wages and higher unemployment among native workers, but past experience indicates that these adverse effects are limited and temporary.

Appendix

Nonlinear State-Space Models and the EKF

A nonlinear state-space model can be represented as:

$$x_{k+1} = f_k(x_k) + H_k(x_k)\xi_k \tag{1}$$

$$y_k = g_k(x_k) + \eta_k \tag{2}$$

The f_k and g_k are vector-valued functions, while ξ_k and η_k represent white noise processes with the covariance matrices, Q_k and R_k, respectively. The starting values for the EKF algorithm are:

$$P_0 = \text{cov}(x_0) \tag{3}$$

$$\hat{x}_0 = E(x_0) \tag{4}$$

As mentioned in Chui and Chen (1991), the updating equations can be written as:

$$P_{k|k-1} = \left[\frac{\partial f_{k-1}}{\partial x_{k-1}}(\hat{x}_{k-1}) \right] P_{k-1} \left[\frac{\partial f_{k-1}}{\partial x_{k-1}}(\hat{x}_{k-1}) \right]' + H_{k-1}(\hat{x}_{k-1})Q_{k-1}H'_{k-1}(\hat{x}_{k-1}) \tag{5}$$

$$\hat{x}_{k|k-1} = f_{k-1}(\hat{x}_{k-1}) \tag{6}$$

$$K_k = P_{k|k-1}\left[\frac{\partial g_k}{\partial x_k}(\hat{x}_{k|k-1}) \right] P_{k|k-1} \left[\left[\frac{\partial g_k}{\partial x_k}(\hat{x}_{k|k-1}) \right] P_{k|k-1} \left[\frac{\partial g_k}{\partial x_k}(\hat{x}_{k|k-1}) \right]' + R_k \right]^{-1} \tag{7}$$

$$P_k = \left[I - K_k \left[\frac{\partial g_k}{\partial x_k}(\hat{x}_{k|k-1}) \right] \right] P_{k|k-1} \tag{8}$$

$$\hat{x}_{k|k-1} = \hat{x}_{k|k-1} + K_k \left[y_k - g_k(\hat{x}_{k|k-1}) \right] \tag{9}$$

where equations 5–9 denote the optimal Kalman gain, the updated estimate covariance, the updated state estimate, the predicted estimate covariance and the predicted state, respectively.

In order to apply EKF, the matrices in the state-space representation above should be written in terms of functions, which depend on the unknown parameter vector θ. In other words, let the matrices be represented by $\Phi_k(\theta)$, $G_k(\theta)$ and $H_k(\theta)$. Furthermore, let θ be a random walk process. In this case, the above equations can be written as:

$$x_{k+1} = \Phi_k(\theta_k)x_k + G_k(\theta_k)w_k \tag{10}$$

$$y_k = H_k(\theta_k)x_k + v_k \tag{11}$$

and the parameter vector is:

$$\theta_{k+1} = \theta_k + \zeta_k \tag{12}$$

The state-space representation using functional form is:

$$\begin{bmatrix} x_{k+1} \\ \theta_{k+1} \end{bmatrix} = \begin{bmatrix} \Phi_k(\theta_k)x_k \\ \theta_k \end{bmatrix} + \begin{bmatrix} G_k(\theta_k)w_k \\ \zeta_k \end{bmatrix} \tag{13}$$

$$y_k = \begin{bmatrix} H_k(\theta_k)x_k & 0 \end{bmatrix} \begin{bmatrix} x_k \\ \theta_k \end{bmatrix} + v_k \tag{14}$$

where equations 13 and 14 denote the state-space representation for the state and the observation vector, respectively. The above model is nonlinear and the EKF can be readily applied. ζ_k shows the white noise process for which the covariance matrix is assumed to be $cov(\zeta_k) = S_k = S > 0$. In the particular case where $S = 0$, the parameter vector is assumed to be time-invariant, where EKF cannot be operative. If EKF algorithm is applied to equations 13 and 14, depending on the following starting values

$$\begin{bmatrix} \hat{x}_0 \\ \hat{\theta}_0 \end{bmatrix} = \begin{bmatrix} E(x_0) \\ E(\theta_0) \end{bmatrix} \tag{15}$$

and $P_0 = \begin{bmatrix} cov(x_0) & 0 \\ 0 & s_0 \end{bmatrix}$ \tag{16}

We obtain

$$
\begin{bmatrix} \hat{x}_{k|k-1} \\ \hat{\theta}_{k|k-1} \end{bmatrix} = \begin{bmatrix} \Phi_{k|k-1}(\hat{\theta}_{k-1})\hat{x}_{k-1} \\ \hat{\theta}_{k-1} \end{bmatrix}
\tag{17}
$$

$$
P_{k|k-1} = \begin{bmatrix} \Phi_{k-1}(\theta_{k-1}) & \frac{\partial}{\partial\theta}(\Phi_{k-1}(\theta_{k-1}))\hat{x}_{k-1} \\ 0 & I \end{bmatrix} P_{k-1} \begin{bmatrix} \Phi_{k-1}(\theta_{k-1}) & \frac{\partial}{\partial\theta}(\Phi_{k-1}(\theta_{k-1}))\hat{x}_{k-1} \\ 0 & I \end{bmatrix}'
$$
$$
+ \begin{bmatrix} G_{k-1}(\hat{\theta}_{k-1})\hat{\theta}_{k-1}G'_{k-1}(\hat{\theta}_{k-1}) & 0 \\ 0 & S_{k-1} \end{bmatrix}
\tag{18}
$$

$$
K_k = P_{k|k-1}\begin{bmatrix} H_k(\hat{\theta}_{k-1}) & 0 \end{bmatrix}P_{k|k-1}\begin{bmatrix} \begin{bmatrix} H_k(\hat{\theta}_{k-1}) & 0 \end{bmatrix}P_{k|k-1}\begin{bmatrix} H_k(\hat{\theta}_{k-1}) & 0 \end{bmatrix}' + R_k \end{bmatrix}^{-1}
\tag{19}
$$

$$
P_k = \begin{bmatrix} I - K_k \begin{bmatrix} H_k(\hat{\theta}_{k-1}) & 0 \end{bmatrix} \end{bmatrix}P_{k|k-1}
\tag{20}
$$

$$
\begin{bmatrix} \hat{x}_k \\ \hat{\theta}_k \end{bmatrix} = \begin{bmatrix} \hat{x}_{k|k-1} \\ \hat{\theta}_{k|k-1} \end{bmatrix} + K_k \begin{bmatrix} y_k - \begin{bmatrix} H_k(\hat{\theta}_{k-1})\hat{x}_{k|k-1} \end{bmatrix} \end{bmatrix}
\tag{21}
$$

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Özet

Türkiye ekonomisi için NAIRU hesaplaması

Türkiye ekonomisi küresel kriz sonrasında pek çok riske maruz kalmıştır. Bu riskler, daha çok, gelişmiş ülkelerdeki alışılmadık para politikası uygulamaları, Euro bölgesindeki borç krizi ve küresel krize karşı uzunca bir süre uygulanan olağanüstü önlemlerden çıkış gibi dış etkenlerden kaynaklanmıştır. Ancak, bu risklere karşı alınan politika önlemleri Türkiye ekonomisinde belirgin bir yavaşlamaya neden olarak, orta gelir tuzağı sorununu gündeme getirmiştir. Buna ek olarak, Türkiye, 2012 yılından itibaren Suriye'deki iç savaşa bağlı olarak yoğun mülteci akımına uğramış ve bu zorunlu göç emek piyasası ve genel fiyat düzeyi üzerinde çeşitli etkilere sebep olmuştur. Buna göre, bu çalışmada söz konusu süreçte değişmiş olduğu düşünülen enflasyonu artırmayan işsizlik oranı NAIRU hesaplanmaya çalışılmaktadır. NAIRU istikrarlı enflasyon oranıyla uyumlu işsizlik düzeyini ifade ettiği için para politikasının duruşu açısından önemli bir göstergedir. Yapılan analiz, NAIRU'nun bu gelişmeler doğrultusunda işsizlik oranından daha fazla arttığını, enflasyon oranının ise bu süreçte görece istikrarlı kaldığını göstermektedir. Buna ek olarak, son dönemde enflasyonun işsizlik açığına olan duyarlılığının durağan seyretmesi, işsizlik açığının enflasyona olan katkısının azaldığını ima etmektedir. Bu durum emek piyasasının yapısı ve para politikasının yürütülmesi açısından önemli çıkarımlar ifade etmektedir. Ayrıca, NAIRU'yu artıran mülteci akımının, enflasyonu baskılayan etkilere sahip olması da para politikası uygulamalarında göz önünde bulundurulmalıdır. Öte yandan, politika tasarımında bu sonuçların kısa vadeli bakış açısına dayandığı ve uzun vadeli etkilerin — özellikle mülteci akımına ilişkin olarak— daha geniş kapsamlı olacağı dikkate alınmalıdır.

Anahtar kelimeler: Küresel kriz, Borç krizi, Suriyeli mülteciler, Göç, Para politikası.

JEL kodları: C32, C63, E24, E31.