

Unemployment and Vacancies in Turkey: The Beveridge Curve and Matching Function

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Unemployment and Vacancies in Turkey: The Beveridge Curve and Matching Function*

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Abstract

In this paper, we study the Beveridge curve and the matching function in Turkey. The analysis illustrates that the empirical Beveridge curve for the 2005:M1-2013:M2 period posits a negative relationship between unemployment and vacancies. When the sample period is divided into sub-periods around the recent global financial crisis, the unemployment-vacancies pairs are found to follow a counterclockwise trajectory (around the empirical Beveridge curve) during the transition from trough into the recovery. The estimation of the matching function implies that the congestion externality of unemployment on job finding is in line with the literature. Disaggregation of the Beveridge curve suggests that recent labor market reforms were beneficial for the targeted employment groups.

JEL classification: J20, J63, J64

Keywords: Beveridge curve; unemployment; matching function.

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1 Introduction

The goal of this paper is to examine the cyclical properties of Turkish labor market in the last decade within the context of the Beveridge curve and the matching function. We also investigate the compliance of these two labor market indicators of the Turkish economy with the well documented characteristics of the relationship between unemployment and vacancies in the existing labor economics literature.

In general, the Beveridge curve depicts a negative relationship between unemployment and job vacancies, and is derived from the matching function which posits a relationship between job matches, vacancies, and the number of the unemployed in an economy. Beveridge curve is deemed useful for its role in differentiating between the cyclical and structural components of the labor market. Specifically, while movements along the curve are attributed to cyclical changes in the labor market (in line with the typical real business cycle regularities), shifts of this curve are attributed to structural changes such as permanent labor market shocks or mismatches created by structural factors. These shifts may lead to further insights on the natural rate of unemployment when the Beveridge curve is examined along with job creation.¹

From a policymaking point of view, using Beveridge curve to differentiate between cyclical and structural changes in the labor market is essential. This is because, conventional policy (monetary policy for instance) can only affect the cyclical component of labor market variables, such as unemployment. On the other hand, it is less likely for stabilizing economic policies to have an impact on the structural properties of labor markets, such as skill mismatches. Therefore, policy intervention might yield undesirable outcomes if the labor markets metric used points out misleading signals. In that respect, an accurate reading of the Beveridge curve provides important policy guidance.

Alternative theoretical underpinnings might be considered as foundation to the coexistence of unemployment and vacancies, and the Beveridge curve. Among these, the *real wage rigidity* approach, and *search and matching frictions* approach have been referred the most in the theoretical literature. The basic difference of these approaches derives from

¹For example, see Daly et al. (2011).

their treatment of coexisting vacancies and unemployment as a concept of labor market equilibrium or disequilibrium. In particular, real wage rigidity approach treats unemployment and vacancies as a labor market disequilibrium concept. To that end, the aggregate labor market is thought as the summation of segmented sub-markets, in which excess demand or supply of labor prevails due to real wage rigidity in each segmented labor market. The search and matching frictions approach on the other hand, attributes the coexistence of unemployment and vacancies to the probabilistic nature of filling a job vacancy, due to various search frictions such as skill, ability, expertise, or locational mismatches. Hence, unemployment and vacancies are shown to coexist as a concept of labor market equilibrium (without resorting to any price rigidities in the labor market).

Our empirical exercise comprises of constructing the Beveridge curve for the labor market in Turkey. In order to accomplish that, we use monthly vacancies data from the most comprehensive private recruitment website *kariyer.net*, and monthly unemployment data from the Turkish Statistical Institute (TURKSTAT) for the period 2005:M1-2013:M2. We find that the empirical Beveridge curve implies a negative relationship between vacancies and unemployment in line with the literature. Moreover, when the curve is examined around the last global financial crisis period, consistent with the literature, it follows a counterclockwise trajectory during the recovery. Next, we estimate the matching function of Turkey for the same time period. Again consistent with the rest of the literature, estimation results suggest a positive relationship between the job finding rate, and the tightness of the labor market, which is defined as the ratio of vacancies to the number of the unemployed. We repeat the same analysis with the Turkish Employment Agency (TEA) data for robustness, and find qualitatively similar results. However, the quantitative departure of estimation results for these two data sets is worth noting. Specifically, we estimate the degree of congestion externality of the unemployed on job finding to be much higher when the TEA data are used. One potential explanation for this finding could be that the applicants of the TEA might be less effective in differentiating themselves from other applicants in terms of job skills, ability and experience in contrast with the applicants of *kariyer.net*, who apply via the Internet.

Lastly we extend the analysis of the Turkish labor markets by exploring disaggregated

Beveridge curves along the unemployment reason, unemployment duration, age, and gender dimensions. Disaggregation of the Beveridge curve leads to the conclusion that the recent structural and cyclical labor market reforms have benefited their target employment groups and individuals who suffer skill mismatches more have benefited less from the recovery of the Turkish economy from the global financial crisis.

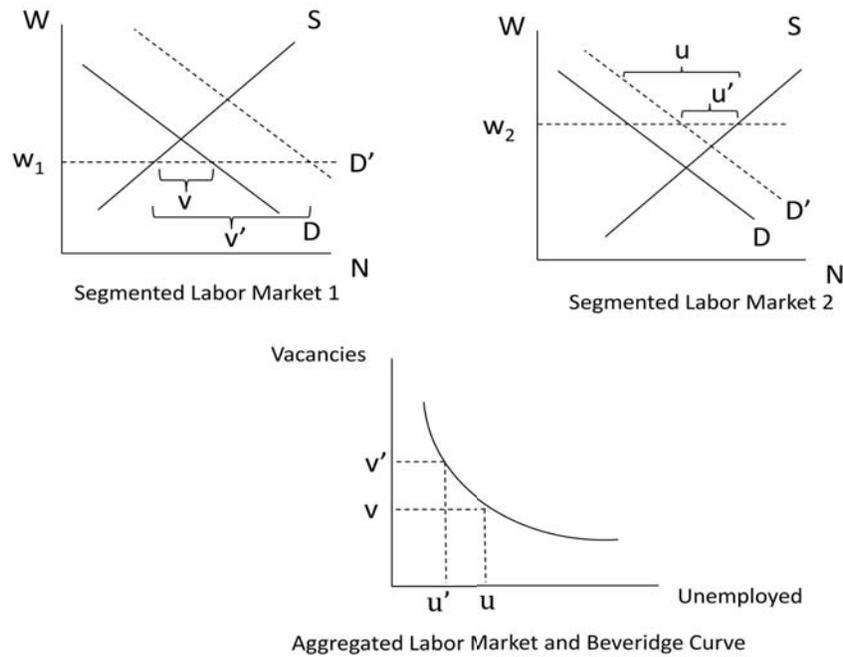
The rest of the paper is organized as follows. In the next section, we briefly summarize the theoretical background of the Beveridge curve. In section 3, we review some part of the related literature. Section 4 illustrates the recent labor market reforms in Turkey and describes the analysis of the Turkish Beveridge curve over the boom-bust period led by the recent financial crisis. In this section, we also estimate the matching function for Turkish labor market. Section 5 makes an extension and studies disaggregated Beveridge curves along dimensions of unemployment reason, unemployment duration, age, and gender. Finally, section 6 concludes.

2 Theoretical Background

The Beveridge curve, named after British economist William Beveridge, basically exhibits a negative relationship between the rates of unemployment and vacancies (see Beveridge (1944)). While the trajectory of data points over the time horizon has explanatory power on the cyclical properties of the labor market, the position of the curve as a whole in the vacancy-unemployment space yields information about the structural aspects of it.

As in Yashiv (2008), it is possible to divide the literature that constructs the theoretical background of Beveridge curve, into two parts. Among these, the first which emerged at the end of 1950s, treats Beveridge curve as a disequilibrium concept of labor markets within the framework of real wage rigidity and segmented labor markets (see Dow and Dicks-Mireaux (1958), Lipsey (1960), Hansen (1970), and others). Immobility of labor among these sub-markets results in the interpretation of excess supply of (demand for) labor in the respective sub-markets as unemployment (vacancies). Since the aggregate labor market is the summation of these segmented sub-markets, unemployment and vacancies co-exist at the macroeconomic level. In Figure 1, we depict this approach with a simple illustration.

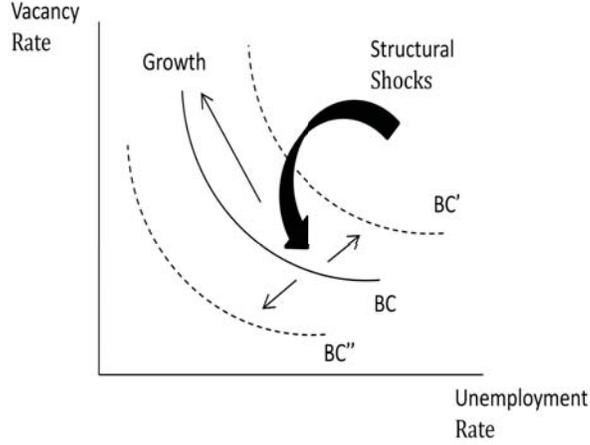
Figure 1: The Theoretical Beveridge Curve



Specifically, the figure shows two segmented labor markets under real wage rigidities, and the Beveridge curve of the aggregated economy. In the top left panel, excess demand for labor emerges at the real wage level w_1 , whereas in the top right panel, there exists excess supply of labor at the real wage level w_2 . This approach simply treats disequilibrium in industry 1 (2) as open vacancies, denoted by v (unemployment, denoted by u). These coexisting labor market objects would coincide a single point on the Beveridge curve.² To obtain the rest of the curve, dynamics in the macroeconomic level should be introduced. To that end, let us consider the impact of an aggregate and positive supply side shock. Such a shock would shift the labor demand curve rightward in both markets, and would result in a higher level of vacancies, v' , and a lower rate of unemployment, u' , at the same real wage levels. Consequently, the downward sloped Beveridge curve obtains. Sector specific shocks, on the other hand, would shift the curve instead of inducing a movement along it

²Note that this might hold even if the aggregate demand for labor equals its supply. Nevertheless, immobility between sectors prevents a unique real wage to clear all of these markets simultaneously.

Figure 2: The Theoretical Beveridge Curve and Structural Shocks



(see Figure 2).

The second approach that brings theoretical foundation to Beveridge curve is the search and matching framework developed by Diamond-Mortensen-Pissarides (DMP). The main departure of this approach from the real wage rigidities approach is its treatment of unemployment and vacancies as equilibrium concepts of the labor market. Search and matching model basically depends on the idea that the matching process of firms and job seekers is a probabilistic event due to the costs incurred both by firms and the unemployed. Among the sources of these costs, asymmetric information, job skill mismatches, and locational frictions might be listed. For instance, a worker may reject a job offer just because the firm that offers the job is located far from where she wants to live, even the job perfectly matches her skills. To capture the probabilistic nature of matching, DMP model first introduces a matching technology which is a function of vacancies and unemployment in an economy:

$$m(U_t, V_t) = \mu U_t^\alpha V_t^\beta, \quad (1)$$

where m represents realized job matches, and U_t and V_t represent unemployment and vacancies, respectively. Labor force is normalized to 1 to interpret U_t and V_t as the rates of unemployment and vacancies. $\mu \geq 0$ is thought as exogenous matching efficiency and

changes in it depend on the variation in the intensity of search and matching frictions.³ Within this framework, entries into and exits out of the stock of the unemployed shall be equal to the destroyed jobs minus the new matches created, i.e.:

$$\frac{dU_t}{dt} = s \times (1 - U_t) - m(U_t, V_t), \quad (2)$$

where s is the exogenous separation rate of a worker from a filled vacancy.⁴ In this setup, the simplest way to obtain a Beveridge curve is to confine the focus on the long-run equilibrium, where $U_t = U, V_t = V$, and $m(U_t, V_t) = m(U, V) \forall t$. This implies that $\frac{dU_t}{dt} = 0$, and equation (2) reduces to

$$U = 1 - \frac{m(U, V)}{s}, \quad (3)$$

which lays out the Beveridge curve as an implicit function. It is straightforward to verify that since the matching function increases in both U and V , equation (3) implies a negative relationship between unemployment and vacancies. Indeed, an increase in vacancies ensures that matches rise due to $dm/dV \geq 0$. Therefore unemployment reduces, since new matches represent flows out of the stock of the unemployed.⁵

It is essential to differentiate between movements along the Beveridge curve and shifts of the whole curve for the analysis of the labor market. In particular, the boom-bust cycles of the economy are reflected as movements along the Beveridge curve, i.e. during recessions, unemployment increases and vacancies decline. Furthermore, the empirical unemployment-vacancy pairs follow a counter clockwise trajectory around a fitted Beveridge curve. The literature attributes this trajectory to the sluggish response of unemployment to business

³It is assumed that $dm/dU, dm/dV \geq 0, m(0, V) = m(U, 0) = 0$. In theoretical studies, the functional form of $m(., .)$ is generally assumed to be Cobb-Douglas in line with a number of empirical studies (for a comprehensive survey of the literature on matching functions, see Petrongolo and Pissarides (2001)).

⁴A considerable portion of the studies in the literature assume s to be a constant parameter.

⁵Hobijn and Sahin (2012) derive the Beveridge curve from the steady-state turnover condition, which equates the growth of labor force to the changes in the employment, defined as the difference between new hires and separations. Due to data limitations, we cannot analyze the cyclical behavior of separations, therefore we assume a constant separation rate and focus on the steady-state unemployment condition, equation (3).

cycles. On the other, the shift of the curve itself is thought to be caused by structural changes in the labor market such as changes in demographics or matching efficiency as in Hobijn and Sahin (2012).⁶ In the next section, we provide a brief summary of the empirical literature on the analysis of the Beveridge curve.

3 Empirical Literature

The empirical literature which examines labor markets by studying the Beveridge curve is vast. While early studies in this strand of literature have focused on the estimation of solely the Beveridge curve (since it only requires to use stock data for unemployment and vacancies), recent contributions have been estimating the matching function as well, since data regarding flow matches became available. An advantage of this approach is that the matching function does not need to be inferred from the Beveridge curve.

Among the studies that estimate the Beveridge curve for various countries, one can list the works of Samson (1994) (Canada), Edin and Holmlund (1991) (Sweden), Jackman et al. (1989), Wall and Zoega (1997) (Britain), Blanchard and Diamond (1989), Valletta (2005) and Cotti and Drewianka (2007) (US). Finally, related to the current paper, Bayraktar-Sağlam and Günalp (2012) estimate the Beveridge curve for Turkey. In most cases, the estimated equation suggests a log-linear relationship between matches, unemployment and vacancies, implied by a Cobb-Douglas specification for the matching function.

Historically, there has been episodes during which the Beveridge curve has shifted. Studies that analyze this kind of movement in the Beveridge curve, focus their attention on structural/policy changes that affect the labor market. For instance, recently, Hobijn and Sahin (2012) analyze the shifts in the Beveridge curve since the global financial crisis of 2008 in a number of OECD countries including the US, and conclude that the observed rightward shift of the curve might be attributed to skill mismatches and extensions in the unemployment insurance benefits. Similarly, Jackman et al. (1989) argue that the main underlying reasons behind the shifts are skill mismatches and generosity of unemployment

⁶For a theoretical discussion of these aspects of the Beveridge curve, see Hansen (1970), and Blanchard and Diamond (1989).

insurance. On the other hand, Budd et al. (1988) highlight the growth in the proportion of long-term unemployed in the total stock of unemployed as the reason for the shifts. From a different perspective, while most of the studies attribute the shifts in Beveridge curves to structural changes, Wall and Zoega (1997) investigate the potential impact of business cycle conditions on the shifts of the Beveridge curve for Britain, and conclude that business cycles might have nontrivial impact on the shifts.

On the other hand, the Beveridge curve is not immune to any criticism regarding its ability in differentiating between cyclical versus structural changes in the labor market. For instance, as pointed out by Diamond (2013), it is very difficult to base any judgement on whether a stimulus package should be enacted or not, depending solely on the reading of the Beveridge curve. This is mainly because, at the current stage of the labor markets, a significant portion of the new matches are the outcome of on-the-job search, not affecting the stock of the employed, questioning the assumptions of many studies (Diamond (2013)). Furthermore, as suggested by Shimer (2007), movements in and out of the labor force, and substantive analysis of separations and matches in isolation might prove essential in the analysis of labor markets. Shimer (2007) also points out that micro data sets should be used extensively, since it might be tricky to deduce matching efficiency shocks by investigating aggregate data. Nevertheless, despite all these shortcomings of the analysis of the Beveridge curve, it is still a crucial starting point for examining labor markets in economies, in which a diversified set of data on labor markets are absent. Indeed, the shortcomings of relying on the Beveridge curve are not identified in the first place, without studying it with the available data at hand.

In addition to the Beveridge curve, matching function has been studied extensively in the empirical labor economics literature. To provide a very brief survey, Blanchard and Diamond (1989) use US data, and find that average duration of vacancies are two to four weeks which implies a highly effective matching process. Pissarides (1986) and Coles and Smith (1996) on the other hand, use British data for estimating matching function. Pissarides (1986) further uses matching function estimates to investigate the multiplicity and the efficiency aspects of the labor market. Typically, neither linear, nor log-linear estimation results reject the constant returns to scale hypothesis for the matching function. This result

is also robust in many economies around the globe.⁷ However, there are some studies that also depart from this finding. Burda and Wyplosz (1994) for instance, utilize data for many continental European countries, and indeed reach to a diminishing returns to scale property for the matching function. Similarly, Edin and Holmlund (1991) and Anderson and Burgess (2000) indicate that the matching function might display decreasing or increasing returns to scale in some cases. Specifically, Warren (1996) shows that increasing returns to scale is obtained for US manufacturing data. Nevertheless, the constant returns to scale property of the matching function usually prevails, when aggregate data are used.

To the best of our knowledge, the matching function of Turkey has not been estimated. Consequently, apart from analysing the Turkish Beveridge curve in the last decade, we fill this gap in the literature. The work of Bayraktar-Sağlam and Günalp (2012) is the first contribution toward the analysis of the Turkish labor market via a Beveridge curve. Our study departs from the analysis of theirs on several dimensions. (i) We focus on the recent decade for the estimation of the Beveridge curve, (ii) we follow the methodology of Shimer (2005), and (iii) we estimate a matching function for Turkey. Another important departure from that study derives from our use of vacancies data collected by the private sector, in addition to the data that are published by the government employment agency, TEA. Following this brief survey of the literature, we proceed to the description of some characteristics of the Turkish labor market in the neighborhood of the recent global financial crisis.

4 Structural and Cyclical Aspects of the Turkish Labor Market in the Post-crisis Period

4.1 Structural Reforms

The post crisis period has witnessed comprehensive employment reforms in Turkey. The employment package, law 5763, that has been released by the Grand National Assembly of Turkey (GNAT) on May 15, 2008 involves many modifications to the existing labor market

⁷See Petrongolo and Pissarides (2001) for a broader survey of empirical studies that reach to the conclusion that constant returns to scale fits the best for the matching function.

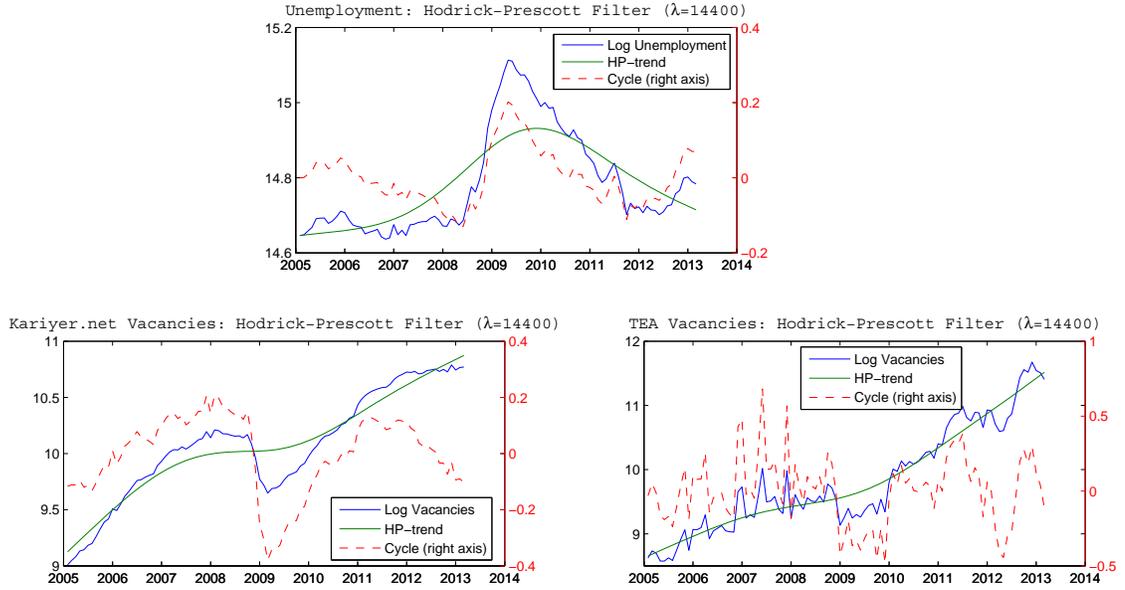
law. Some of the relevant modifications are as follows.⁸

1. Employers' are entitled to a 5% subsidy toward their social security contribution, funded by the Undersecretariat of Treasury. In addition, the past due social security contributions are restructured and modified into installed payments. In law 5921, which is announced on August 18, 2009, social security contribution subsidies are expanded for individuals who are employed in the last quarter of 2009, during which the repercussions of the global crisis was reflected the most to the Turkish economy.
2. The unemployed that are registered with the TEA are entitled to vocational education, consulting on job search and employment planning services provided by the TEA. The law mandates that these programs shall be funded by the Unemployment Insurance Fund (UIF).
3. A Wage Guarantee Fund has been established within the UIF in order to compensate the three months' unpaid wage to workers who are not compensated by their employers in the event of a legal bankruptcy.
4. The UIF is operationalized to compensate for the unpaid hourly wages of the employed in the event of a reduced-hours hiring of an employer due to the adverse macroeconomic outlook.
5. The UIF subsidizes the social security contribution of employers with regard to the employment of males between the ages of 18 and 29 and females older than 18.
6. Starting from the end of 2009, all government vacancies are required to be listed within the vacancies of the TEA.

On the structural front, these reforms are meant to reduce the payroll tax burden on the employers (presumably in order to fight the shadow economy) and to boost the employment of the younger individuals and females. On the cyclical front, the reforms are meant to both fight with the abrupt labor market conditions in the post global financial crisis period and to create buffers that respond to future potential business cycles.

⁸The modifications under law 5763 can be obtained in Turkish at the link, <http://www.tbmm.gov.tr/kanunlar/k5763.html>

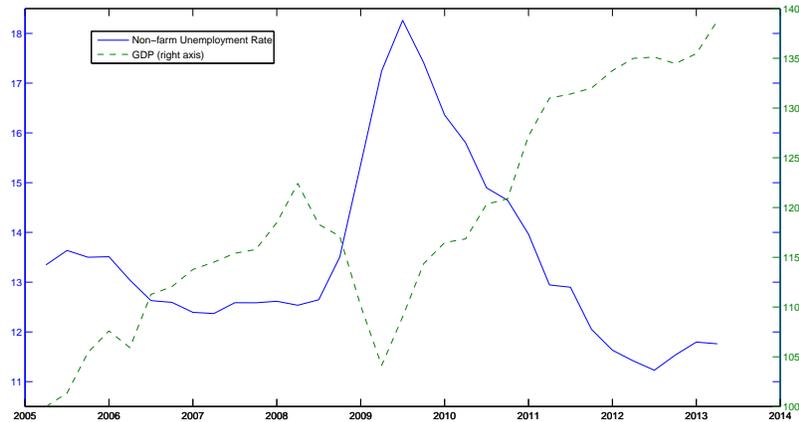
Figure 3: HP-Detrended Unemployment and Vacancies



4.2 Cyclical Developments

We begin with briefly discussing the business cycle properties of the Turkish labor market variables during the sample period 2005:M1-2013:M2. To that end, we include Figure 3 in which the time series of levels, trends, and deviations from the trend of unemployment and vacancies in natural logarithms are plotted. As mentioned in the Introduction, we use TURKSTAT data for unemployment, and *kariyer.net* and TEA data for vacancies. The cyclical component in each case is filtered by the HP method, by using a smoothing parameter of 14400, which is standard in the analysis of business cycles at monthly frequency. The upper panel of Figure 3 illustrates that up until mid-2008, unemployment has been gradually reducing below its trend (as much as 15%). Yet, with the inception of the global financial turmoil, the dynamics of unemployment point out to a sharp reversal that reaches up to 20% above its trend by mid-2009. Finally, during the recovery, it reverts back to levels around its trend.

Figure 4: GDP and Nonfarm Unemployment of Turkey



Vacancies series collected by *kariyer.net* on the other hand, is pretty much like the mirror image of the unemployment series (see the bottom left panel of Figure 3). That is, there is a secular increase in the cyclical component of vacancies between 2005 and 2008. This is followed by a sharp collapse of 40% below its trend value in the first quarter of 2009, and a gradual increase between the first half of 2011 that amounts to a cumulative of 50% rise. The vacancies series collected by TEA captures the general theme of boom and bust in the 2005-2012 period, yet it displays more volatile deviations from its trend compared to the *kariyer.net* data (see the bottom right panel of Figure 3). The investigation of Figure 3 suggests that there is a negative relationship between unemployment and vacancies in the period 2005:M1-2013:M2, which might lead to an empirical Beveridge curve for the Turkish economy in this period.⁹

Since the vacancies data collected by *kariyer.net* are in monthly frequency and only available for the period 2005:M1-2013:M2, our analysis spans this time interval. Arguably, it is useful to study the labor market dynamics of Turkish economy around this period because it encompasses a clear boom-bust episode as laid out in Figure 4. In this figure, we plot the quarterly real GDP and nonfarm unemployment rate, and show that the whole

⁹The jump in the TEA vacancies above the trend since the beginning of 2011 can be attributed to the modification in the TEA legislation at the end of 2009, which suggests that all public vacancies are registered with the TEA. For a full text of the law, see http://mevzuat.meb.gov.tr/html/27314_0.html

period can be divided into three parts in terms of the state of the economic activity: (i) 2005:Q1-2008:Q1, a period of boom with an average quarterly GDP growth rate of 1.72%, (ii) 2008:Q2-2009:Q1, a period of bust during the global financial crisis with an average quarterly GDP contraction rate of 3.45%, and (iii) 2009:Q2-2013:Q1, the recovery period with an average quarterly GDP growth rate of 2.01%.¹⁰ After documenting main cyclical properties of the Turkish labor market during the recent global financial crisis, we proceed to the next section, in which we estimate a fitted Beveridge curve to the data described in this section, and discuss its properties guided by the labor economics literature on unemployment and vacancies.

4.3 Beveridge Curve for Turkey

To construct the Beveridge curve for an economy, unemployment and vacancies data have to be used. For that matter, there are three relevant data sources in Turkey. (i) the TURKSTAT, Turkish Statistical Institute for data on nonfarm unemployment, (ii) *kariyer.net*, the most popular private recruitment agency that provides data on vacancies, and (iii) the TEA, the government employment agency for data, again on vacancies. Adding privately collected vacancies data on the work of Bayraktar-Sağlam and Günalp (2012) provides us with the opportunity to discuss differences between alternative Beveridge curves, which rely on data sources that potentially differ in applicant characteristics.

A caveat in obtaining the Beveridge curve is in order. The number of vacancies reported by either *kariyer.net* or TEA falls way short of the number of the unemployed reported by the TURKSTAT. This creates a scaling problem when the Beveridge curve is meant to be drawn by using unemployment and vacancy *rates*. Consequently, we follow the methodology of Shimer (2005), who encounters the same problem, and obtain the Beveridge curve by plotting the *cyclical deviations* of deseasonalized unemployment and vacancies series from their log trend. We use the HP routine for filtering, and set the smoothing parameter in the procedure equal to 14400, the typical value for the analysis of data in monthly

¹⁰We use nonfarm unemployment throughout the analysis. This is because agricultural unemployment is relatively less responsive to business cycle dynamics of the Turkish economy than nonfarm unemployment.

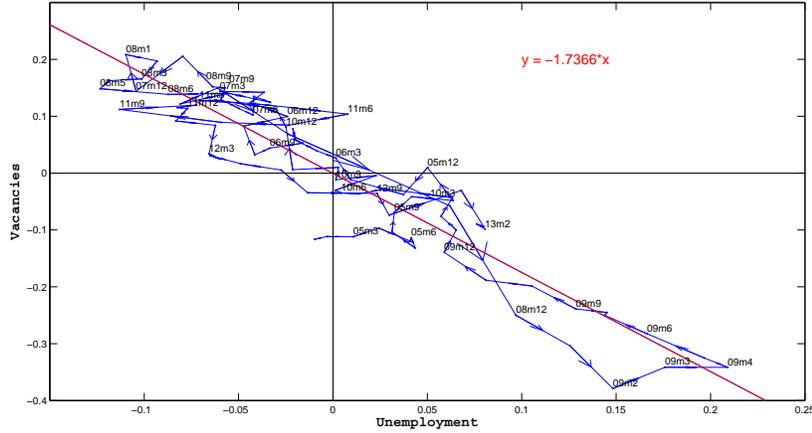
frequency.¹¹ Figure 5 displays cyclical deviations of unemployment and vacancies on the horizontal and vertical axes, respectively. Notice that since data points correspond to deviations from trend, they are spread around the origin, which coincides to the case in which both unemployment and vacancies are at their respective trend level. There is a clear negative relationship between the two variables and, as suggested by the literature, the OLS-fitted empirical Beveridge curve has a slope coefficient of -1.74, with a strong explanatory power in terms of the R^2 measure (86%). This result is also in line with the finding of Bayraktar-Sağlam and Günalp (2012), who estimate a negative relationship between unemployment and vacancies by using annual data reported by the TEA and the TURKSTAT for the period 1951-2008.¹²

A second test of the consistency of the obtained Beveridge with theoretical underpinnings is to examine the evolution of data points across time. For that end, in Figure 5, we keep track of the unemployment-vacancy pairs along the time horizon, and notice that in the first sub-period of growth (i.e. 2005:M1-2008:M3), unemployment has declined and vacancies have risen simultaneously. However, since the inception of the global financial crisis, there is a sharp reversal in labor markets, driving a surge in unemployment (a collapse in vacancies) of up to 20% (30%) above (below) its (their) HP trend. In addition to this, there is a slight counterclockwise movement in the evolution of unemployment-vacancies pairs when the collapse period of 2008-2009, and the recovery period of 2009-2012 are analyzed together. This observation is also thought to be consistent with the finding of the theoretical investigation of the Beveridge curve that unemployment responds sluggishly during recoveries (Hansen (1970), Blanchard and Diamond (1989)).

¹¹In the Appendix, we relax this restriction and use alternative values for the smoothing parameter on both ends. Specifically, as in Shimer (2005), first we set the smoothing parameter in the HP routine equal to 10^5 , which implies a low frequency filter. Secondly, inspired by the idea suggested by Rand and Tarp (2002) that the trend component of economic time series in emerging economies might be more volatile, we also examine lower smoothing parameter values. The results imply that the qualitative properties of the empirical Beveridge curve are not sensitive to this parameter (see Figure 14 in the Appendix), as far as either *kariyer.net* or the TEA data for vacancies are concerned.

¹²The empirical Beveridge curve that we obtained by using TEA data has a slope coefficient of -1.26, and an R^2 of 17% for the OLS fit (see Figure 11 in the Appendix).

Figure 5: The Beveridge Curve of Turkey



Horizontal and vertical axes present seasonally adjusted, unemployment and vacancies series, respectively. $\lambda = 14400$ is used as a smoothing parameter in the HP routine.

For completeness, we reproduce and plot the Turkish Beveridge curve with nondetrended data in the Appendix (see, Figures 12 and 13). Similarly, the data points used to obtain these curves span three different economic phases. When levels are used, the distinction of the three phases, and the counterclockwise trajectory during the recovery are more emphasized. Another interesting observation is that a rightward shift is evident when the Beveridge curve is drawn in levels, either when *kariyer.net* or the TEA data are used (see, Figures 12 and 13). Nevertheless, since our data sample covers a short period of time, it is hard to attribute this shift to structural changes in the labor market. Indeed, skill mismatches that stem from high turnover during global financial crisis might have played a serious role behind this shift (see Hobijn and Sahin (2012)). This closes our discussion of the Turkish Beveridge curve and we now proceed to the estimation of the matching function for Turkey using alternative data sources for vacancies.

4.4 Matching Function Estimation for Turkey

Matching function, $m(U, V)$, is an important aspect of the search and matching theory of labor economics, which relates created matches to unemployment and vacancies. Appli-

cation of the law of large numbers to this framework suggests that the ratios $m(U, V)/U$ and $m(U, V)/V$ represent the rates of job finding and the vacancy yield, respectively.¹³ Pissarides (2000) and Petrongolo and Pissarides (2001) suggest that these ratios might be interpreted as a depiction of externalities created by the aggregate pool of the unemployed/vacancies, on the job finding/filling likelihood of an individual unemployed/firm. This is because U and V represent the aggregate level of unemployment and vacancies, and are taken as given during the search process at the individual level. This idea might be formalized after making reasonable assumptions on the matching function to create a measure of this externality. Specifically, when matching function $m(U, V)$ is assumed to satisfy the Cobb-Douglas form and constant returns to scale property, dividing both sides of equation (1) by U_t yields,

$$\frac{m(U_t, V_t)}{U_t} = f_t = \mu \left(\frac{V_t}{U_t} \right)^{1-\alpha}, \quad (4)$$

which isolates the job finding rate as a nonlinear function of the market tightness, i.e. vacancy-to-unemployment ratio. The benefit of this representation is that one can solve for the elasticity of job finding with respect to the aggregate unemployment as:

$$\frac{\partial f_t}{\partial U_t} \frac{U_t}{f_t} = \alpha - 1 < 0. \quad (5)$$

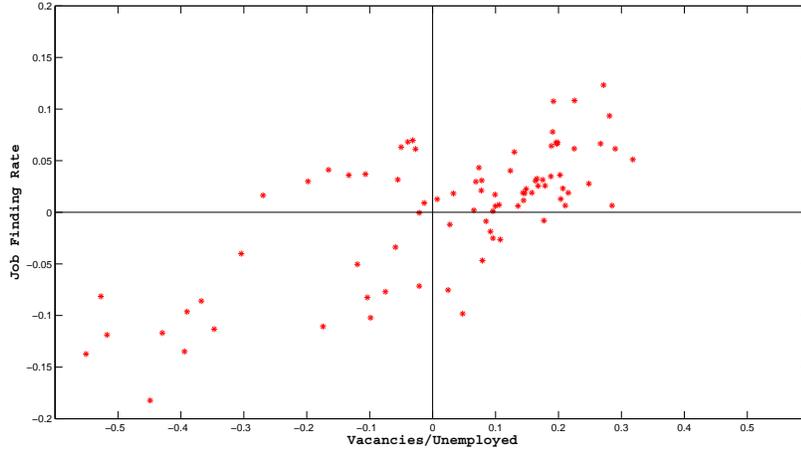
In this framework, the absolute value of $\alpha - 1$ represents the degree of the negative congestion effect of the pool of unemployed on the job finding likelihood of an individual job searcher. That is, the larger $\alpha - 1$ in absolute value, the more difficult it becomes for an individual unemployed to match with a vacancy. As pointed out by Petrongolo and Pissarides (2001), the flip side of this externality is the positive spillover effect of vacancies. Particularly, the elasticity of job finding with respect to vacancies is solved as:

$$\frac{\partial f_t}{\partial V_t} \frac{V_t}{f_t} = 1 - \alpha > 0. \quad (6)$$

The intuition behind this externality idea is that if the aggregate pool of unemployed gets larger, regardless of the private actions of an individual job searcher, her likelihood to find

¹³Therefore, the inverse of these ratios represent the mean durations of job finding and job filling.

Figure 6: The Matching Function for Turkey with *kariyer.net* Data



a job reduces. Similarly, a larger pool of job vacancies increases the odds of a job seeker to fill a vacancy again regardless of her actions. Consequently, this approach renders the estimation of the matching function (which is essentially summarized by the coefficient α under constant returns to scale assumption) essential, in measuring the extent of these congestion externalities in the labor market. To that end, we use equation (4) that suggests a log-linear relationship between job finding rate and labor market tightness in the estimation of matching function for Turkey. Therefore, we have

$$\log f_t = \log \mu + (1 - \alpha) \log \left(\frac{V_t}{U_t} \right). \quad (7)$$

Figure 6 depicts the positive relationship between cyclical components of the job finding rate and the vacancy-unemployment ratio using *kariyer.net* data for vacancies.¹⁴ Since *kariyer.net* data do not encompass job matches, we use the job finding rate series constructed by Şengül (2012).¹⁵ The vacancy-unemployment ratio on the other hand, is computed by using *kariyer.net*, and TURKSTAT data as in the rest of the paper. Following the illustration of the positive relationship, we proceed to the estimation of the matching function, equation (7). We carry out the estimation via the OLS method and check for

¹⁴The exercise is repeated with TEA data and the relationship between the two variables are plotted in Figure 15, in the Appendix.

¹⁵We would like to thank Gönül Şengül for sharing her data.

Table 1: Matching Function Estimation Results

Dependent Variable (job finding rate)	Vacancies/Unemployment (V/U)	\overline{R}^2
Kariyer.net (2006-2012)	0.20 (0.04)***	0.86
TEA (2005-2013:M2)	0.54 (0.05)***	0.72

Values in parenthesis represent standard errors.

*** implies significance at 0.01 level

autocorrelation of residuals, as in Shimer (2005). The function is also estimated by using the TEA data, which happen to report the number of matches. Therefore, we compute job finding rates in this case by dividing number of matches to the number of the unemployed.¹⁶

Estimation results are reported in Table 1. In both cases, $1 - \alpha$ is estimated to be positive and statistically different than zero at 1% significance level. The adjusted R^2 values turn out as 86% and 72% for the *kariyer.net* and TEA cases, respectively. The estimation that uses *kariyer.net* data implies a value for $1 - \alpha$ of 0.20, which is indeed very close to the range referred in the literature.¹⁷ By following the definitions laid out in equations (5) and (6), this estimate suggests that a one percent increase in the vacancies (unemployment) increases (decreases) the likelihood of finding a job by a two-tenths of a percent. The TEA data, on the other hand, implies again a positive, but a much larger value for $1 - \alpha$ of 0.54. This indicates that within the TEA sample, a one percent increase in vacancies (unemployment) increases (decreases) the job finding probability by about half of a percent.¹⁸ Arguably, the estimation of the matching function for Turkish labor markets

¹⁶While using the TEA data, we exclude public sector open positions, since the government's vacancy opening behaviour would be much less sensitive to macroeconomic conditions as opposed to the private sector.

¹⁷Shimer (2005) estimates $1 - \alpha$ in the range of [0.25,0.30] for the US. Pissarides (1986) estimates the same coefficient to be 0.30 for the UK. For estimation results on other countries, see Petrongolo and Pissarides (2001).

¹⁸One might suspect that the recent structural reforms toward creating incentives for TEA applicants to obtain vocational training programs might have an effect on the difference in the estimated matching function

via these different sources helps clarify a key difference between the two sources of vacancies data. To that end, one might argue that potential differences in the applicant profiles of each agency is the key driving force leading to different estimates of the the congestion effect explained above. Specifically, we argue that the applicant pool of the TEA (the public employment agency) might display much less differentiation in terms of skill, ability and experience of the applicants, compared to the applicant pool of *kariyer.net*, who collects applications via the Internet.¹⁹ The less diversified applicant pool of TEA in turn, shall imply a larger degree of negative congestion externality of unemployment on the job finding probability (i.e., a larger $1 - \alpha$ value is estimated in the case of TEA).²⁰

5 Extension: Disaggregating the Turkish Beveridge Curve

In this section we make an extension and explore whether disaggregation of the obtained Beveridge curve for the Turkish labor market leads to deviations from the aggregate Beveridge curve. The disaggregation is carried out along the unemployment dimension with respect to the reason for unemployment, duration of unemployment, age, education, and gender. Disaggregated curves are obtained by assessing the relationship between aggregate vacancies (published by *kariyer.net*) and the respective series for unemployment (published by the TURKSTAT). We follow the methodology adopted by Ghayad and Dickens (2012) regarding the disaggregation of the US Beveridge curve, and do not HP filter the unemployment and vacancies series.²¹ The main characteristics of the aggregate Beveridge curve in

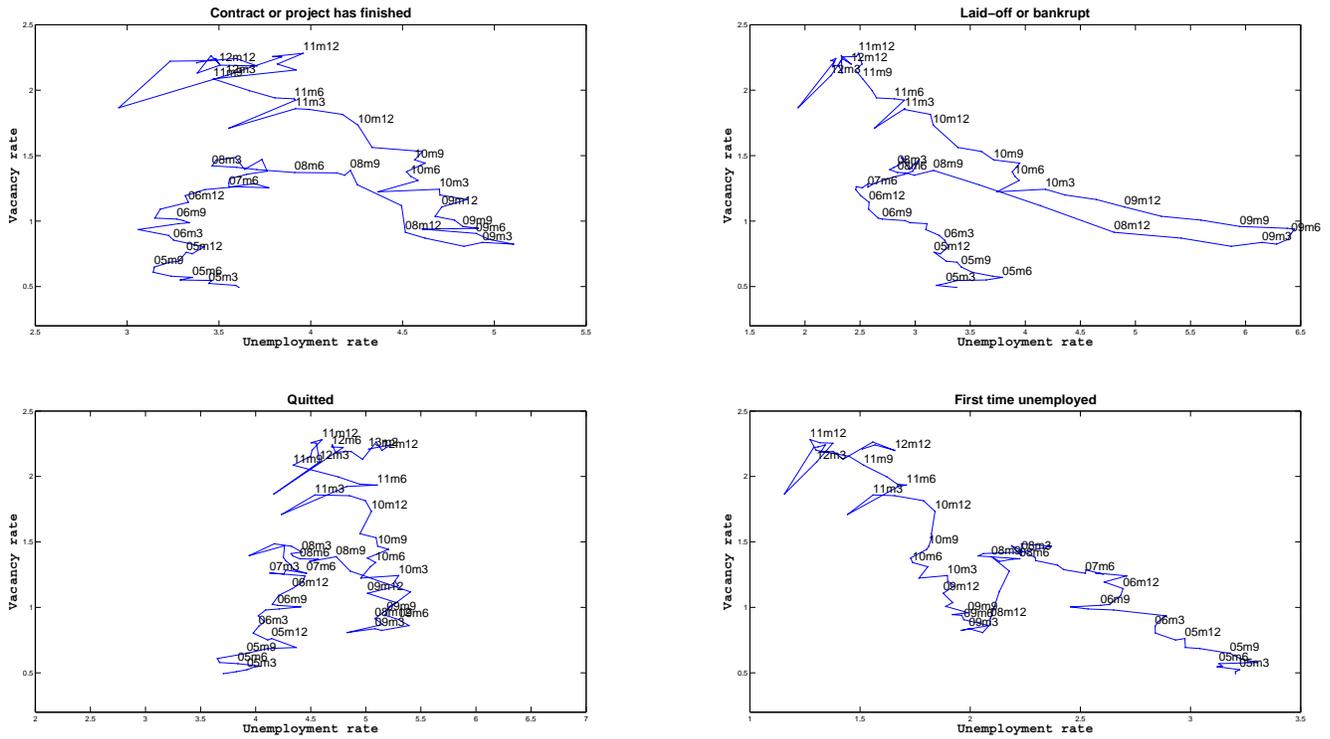
when the TEA data are used. Specifically, the number of TEA applicants who have obtained vocational training has increased from about 10-15 thousand per annum between 2005 and 2008 to about 200 thousand per annum between 2009 and 2012. As a robustness check, we estimated two different matching functions for these sub-periods, and consistently found that the unemployment elasticity of job finding rate is in the range of 0.51-0.54.

¹⁹Another supportive argument is that most of the positions advertised via the TEA are blue-collar positions, which might govern the reduced diversity in the applicant pool of this agency.

²⁰From a data limitation perspective, the discrepancy might also be attributed to the lack of new matches data in the *kariyer.net* sample.

²¹The rightward shift in the aggregate Beveridge curve is more predominant in levels as opposed to cyclical components. In order to compare potential shifts in disaggregated curves with those in the aggregate curve and to make our analysis comparable with the work of Ghayad and Dickens (2012), we do not HP filter

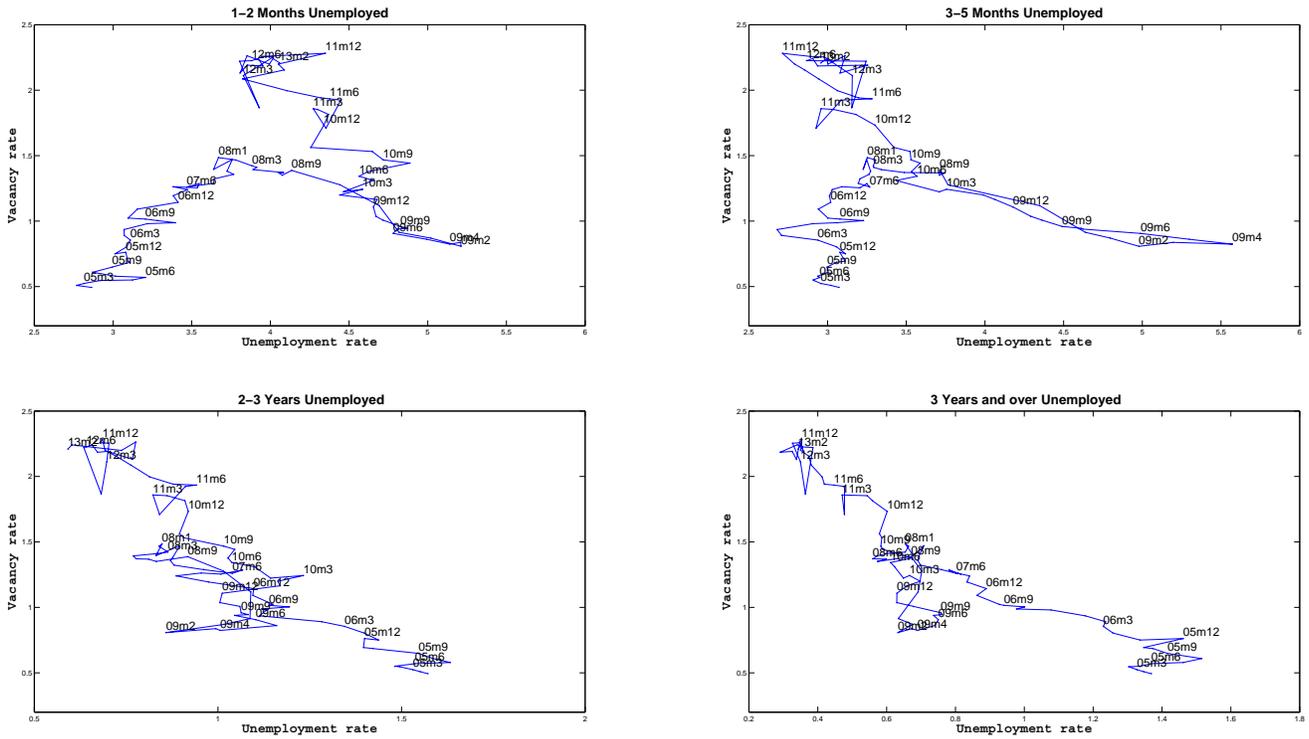
Figure 7: Disaggregated Beveridge Curves and Reason of Unemployment



levels are that (i) it is downward sloped, (ii) it shifts rightward following the global financial crisis of 2008, and (iii) the inception of recovery from the crisis displays a counterclockwise movement along the Beveridge curve (see Figure 12 in the Appendix).

When the reason for unemployment is considered, the relationship with the particular unemployment reason and cyclicity shall be highlighted (see Figure 7). Specifically, the Beveridge curve of the unemployed who have *quitted* their job, shifts rightwards, but is strikingly vertical. This shall be attributed to quitters' decision being less responsive to the business cycle. On the other hand, the Beveridge curve of individuals who are *laid-off* resembles that of the aggregate pool of the unemployed, that is, there is a rightward shift around the crisis with a counterclockwise movement with the inception of the recovery. Therefore, it might be thought that the business cycle responsiveness of firms' lay-off unemployment and vacancies data throughout the analysis of disaggregated Beveridge curves.

Figure 8: Disaggregated Beveridge Curves and Unemployment Duration



decision drives the main dynamics of the aggregate Beveridge curve. Another interesting observation is that the Beveridge curve that represents people, who became unemployed because they enter the labor force for the first time, shifts *leftward* with a *clockwise* movement along the recovery. This leads to the conclusion that the unemployment of those particular individuals responded *faster* than vacancies, to the recovery. One might think that this could be a demand driven phenomenon due to the lower bargaining power of new entrants into the labor force, so that firms have directed their attention to them especially during the recovery from the crisis.

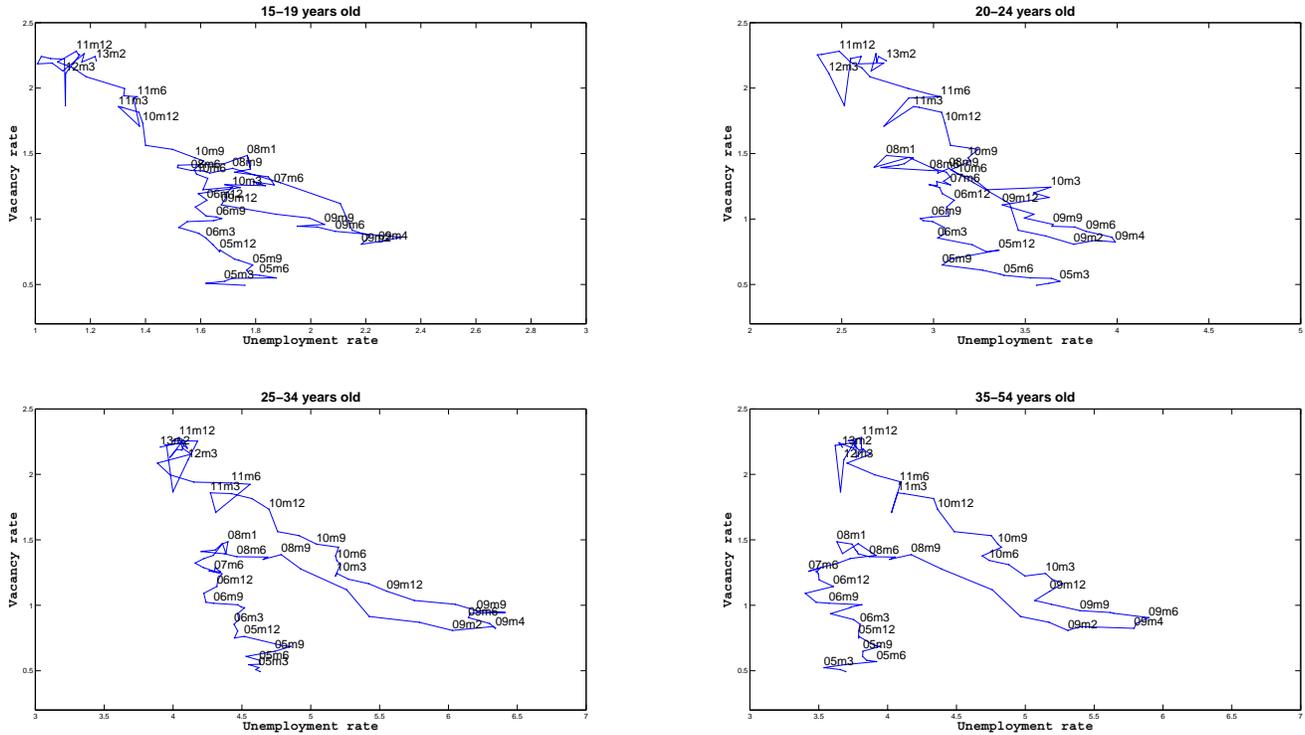
We assess the duration of unemployment as a disaggregation dimension by reporting the Beveridge curves for the short-term unemployed (up to 1-2 months and between 3-5 months), and the long-term unemployed (between 2-3 years and more than 3 years) in Figure 8. A striking pattern of short-term unemployment duration curves is that during the

boom period prior to the crisis, there is a positive relationship between unemployment and vacancies and this pattern starts to reverse with the global crisis, and turns into a negative relationship along the recovery (see the upper panels of Figure 8). The Beveridge curves of the long-term unemployed, on the other hand, display a negative relationship between unemployment and vacancies during boom and the recovery, but are relatively vertical during the crisis. Hence, newly unemployed did not benefit from new job openings during the boom period prior to crisis and the response of long term unemployment is relatively muted during the recovery.

A possible interpretation of these disaggregated patterns might be as follows. In general, one would expect the short-term unemployed to benefit more from economic expansion periods as their human capital is depreciated less. For example, this is what we observe in the US economy, recently (see Ghayad and Dickens (2012), Figure 8). Moving to the case of Turkey, the period between 2005 and 2008 captures attention as a high growth era. However, the rate of unemployment displayed a flat figure in this period. When the group of the less-than-5-months-jobless is considered in this period, it is observed that these individuals keep looking for a job until they got discouraged. This could be one reason why the number of unemployed in this group kept increasing during the 2005-2008 period. On the other hand, individuals who have been jobless for more than 2 years, arguably turn into discouraged workers much more rapidly than the short-term unemployed. This might be a reason for the fact that the number of unemployed in this group did not increase as much during 2005-2008. Lastly, the relatively vertical nature of the Beveridge curve around recovery for the longer term unemployed might be attributed to the idea that these individuals are subject to skill depreciation more than the shorter term unemployed, and hence, their unemployment displays less responsiveness to the recovery.

Disaggregation of Beveridge curves along the age dimension highlights heterogeneities as well (see Figure 9). Specifically, the Beveridge curve of the youngest group (between 15 and 19 years old) displays a clockwise pattern with no rightward shift as the economy recovers from bust, suggesting faster response of unemployment than vacancies. This might again be attributed to firms' demand for potentially young searchers who might have less bargaining power. On the other hand, as individuals get older than 20-24 years old, the

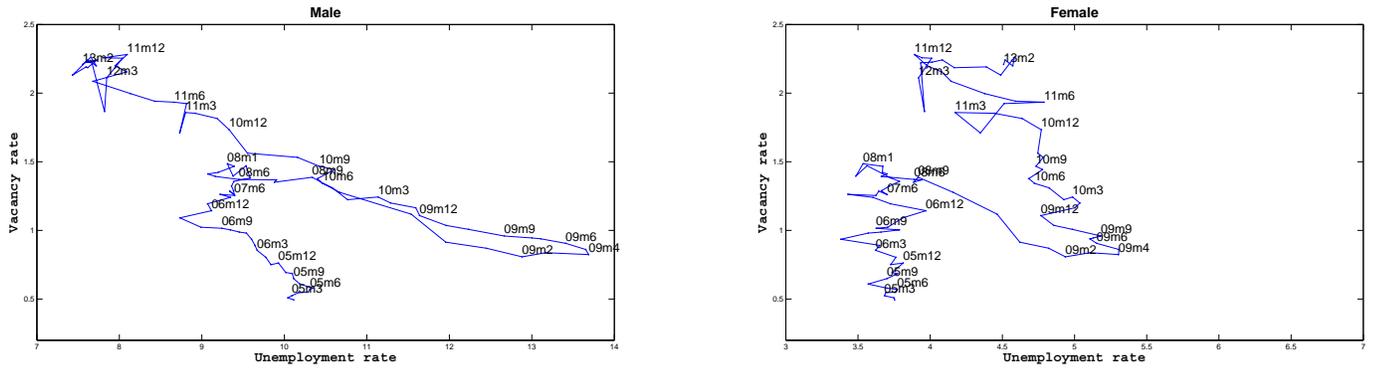
Figure 9: Disaggregated Beveridge Curves and the Age of the Unemployed



clockwise movement disappears and the Beveridge curve starts to shift to the right. As unemployed individuals get older, the counterclockwise movement and the rightward shift become even more predominant.

The pattern of the more severe employment losses as individuals get older might also be attributed to other structural labor market aspects such as skill mismatches and reforms that promote the employment of the younger. In particular, the likelihood of an unemployed individual to suffer skill mismatch is arguably higher if that individual is older. This is presumably because older individuals accumulate skills in a particular sector in their previous employment episode. Since this effect is less intense for younger individuals, their unemployment might have reacted faster than vacancies over the business cycle as opposed to older individuals. Furthermore, the reforms that we have listed in Section 4.1 suggest that social security contributions of employing younger individuals are subsidized. Consequently, these individuals might have had an upper hand in finding another job in case they become unemployed during the recent crisis.

Figure 10: Disaggregated Beveridge Curves and the Gender of the Unemployed



Lastly, when the gender dimension is considered, it is clear that both for males and females, Beveridge curve shifts to the right during the recovery and the transition from bust to recovery involves a counterclockwise movement along the curve (Figure 10). Yet, it might be remarkable to note that the responsiveness of females' unemployment to vacancies have increased substantially (in spite of the recent increased labor force participation of females) with the inception of the global crisis and during the recovery. This reversal in the slope (from a vertical one during the bust into a downward sloped one during the boom) of the Beveridge curves for the younger and females might be attributed to the structural reforms that reinforce the employment of females and the younger in the recent period (see Section 4.1).

To summarize, there is a clockwise movement along the Beveridge curve (and even a leftward shift of the whole curve on some occasions) for the sub-groups of the total pool of unemployed (such as younger individuals or females), who have benefited from the recent labor market reforms enacted by policymakers. On the other hand, we observe that for some other segments of the labor force who include individuals that suffer more from skill mismatches, Beveridge curves appear to be relatively vertical during the recovery.²²

²²There is not a sharp differentiation across disaggregated Beveridge curves constructed along the education dimension, and for the sake of brevity, we do not report them. Disaggregated Beveridge curves along the education dimension are available upon request.

6 Conclusion

In this paper, we analyze the Turkish Beveridge curve for the period 2005:M1-2013:M2, which points out to a well defined business cycle centered around the recent global financial crisis of 2008. We find that the empirical Beveridge curve for Turkey suggests a negative relationship between job vacancies and unemployment, which is consistent with theoretical findings. When we divide the sample period into three subperiods on the basis of decomposing the cycle, we observe that the unemployment-vacancy pairs around the fitted curve follow a counterclockwise trajectory as the economy is transiting from contraction into the recovery. This finding is also consistent with the labor economics literature in that the response of unemployment to recovery is more sluggish than that of vacancies. We obtain similar results from using alternative data sets that are compiled by the private sector and the government, respectively.

We also estimate the matching function of Turkey for the same sample period. Estimation results suggest a positive relationship between the job finding rate and the tightness of the labor market, consistent with the rest of the literature. The quantitative difference between the estimated congestion externalities of unemployment implied by alternative data sources might be attributed to the defining applicant characteristics of these data collectors.

This study lastly contributes to the literature on labor markets of Turkey by documenting disaggregated Beveridge curves for the period neighboring the recent financial crisis. Disaggregation of the Beveridge curve along the dimensions of the reason for unemployment, unemployment duration and age suggests that the recent structural and cyclical labor market reforms have benefited their target employment groups and individuals who suffer skill mismatches more have benefited less from the recovery of the Turkish economy from the global financial crisis.

The informal economy which is estimated to constitute about a quarter of the non-farm employment points out to an important caveat for the analysis of the labor markets in Turkey. Naturally, this segment of the market causes us to underestimate the vacancy rate. For that matter, we framed our benchmark analysis around the cyclical component of vacancies rather than the vacancy rate, motivated by the idea that the informal labor

market (which is presumably less rigid than the official economy) would at least evolve mainly in line with the general economic outlook. Yet, it is of no question that better availability of data on job matches, on-the-job-search, vacancies, and unemployment would lead to fruitful future research on the analysis of the Beveridge curve, which might suggest important clues on the cyclical stance of the Turkish labor market.

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Appendix

Figure 11: The Beveridge Curve of Turkey with the TEA data, $\lambda = 14400$

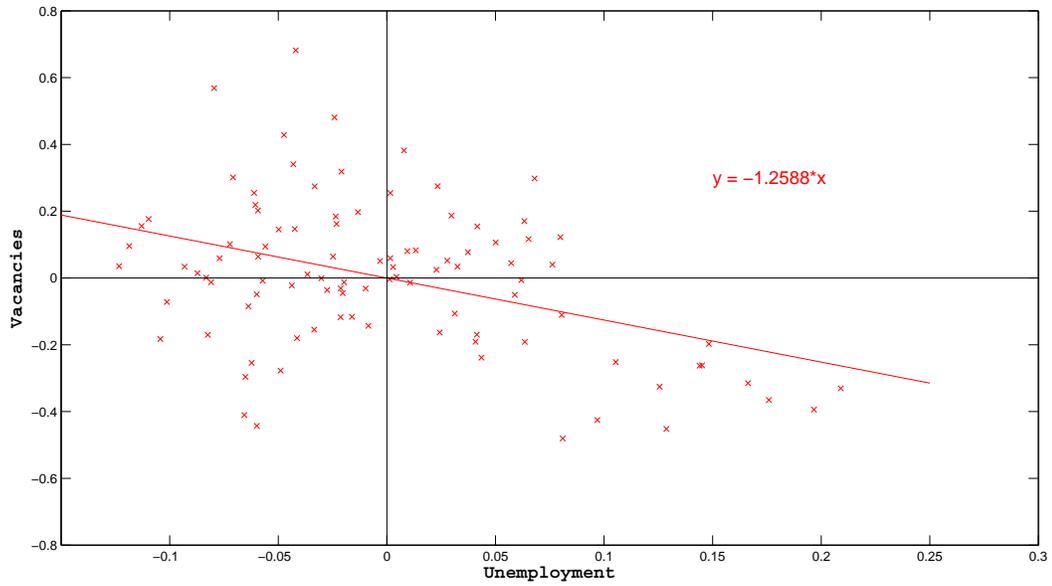


Figure 12: The Beveridge Curve of Turkey in Levels with *kariyer.net* Data

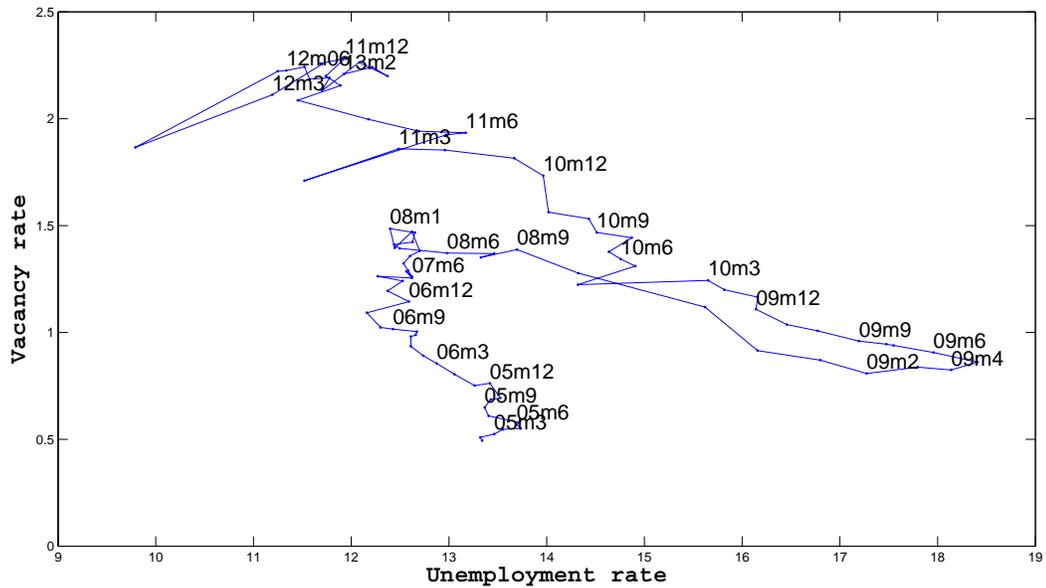


Figure 13: The Beveridge Curve of Turkey in Levels with the TEA Data

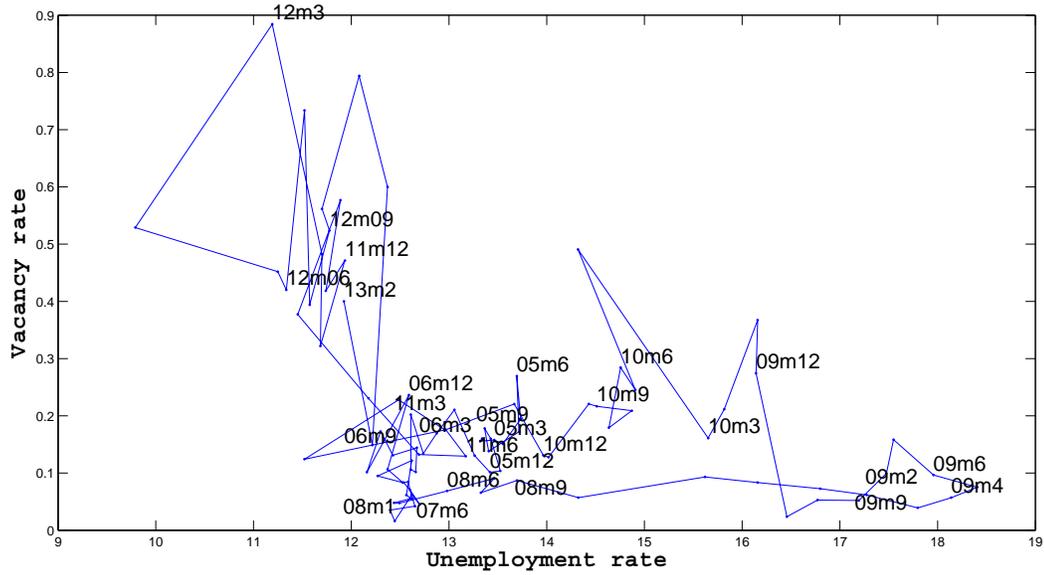
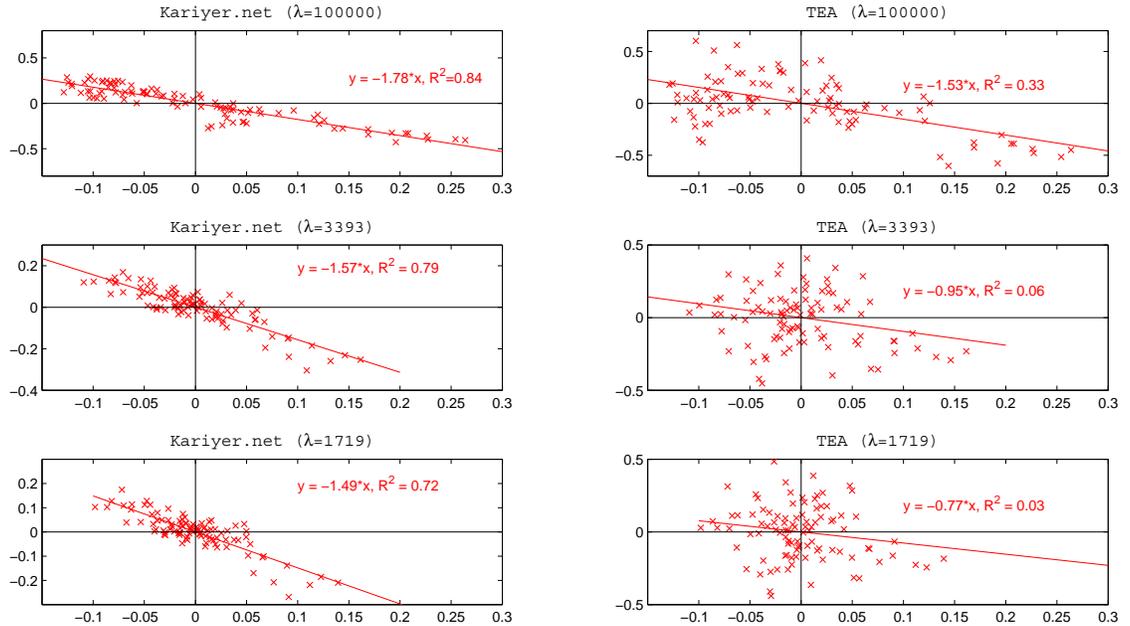


Figure 14: Beveridge Curve for Turkey with Alternative HP-filter Smoothing Parameters



Left and right columns use *kariyer.net* and the TEA data, respectively.

Figure 15: The Matching Function for Turkey with the TEA Data

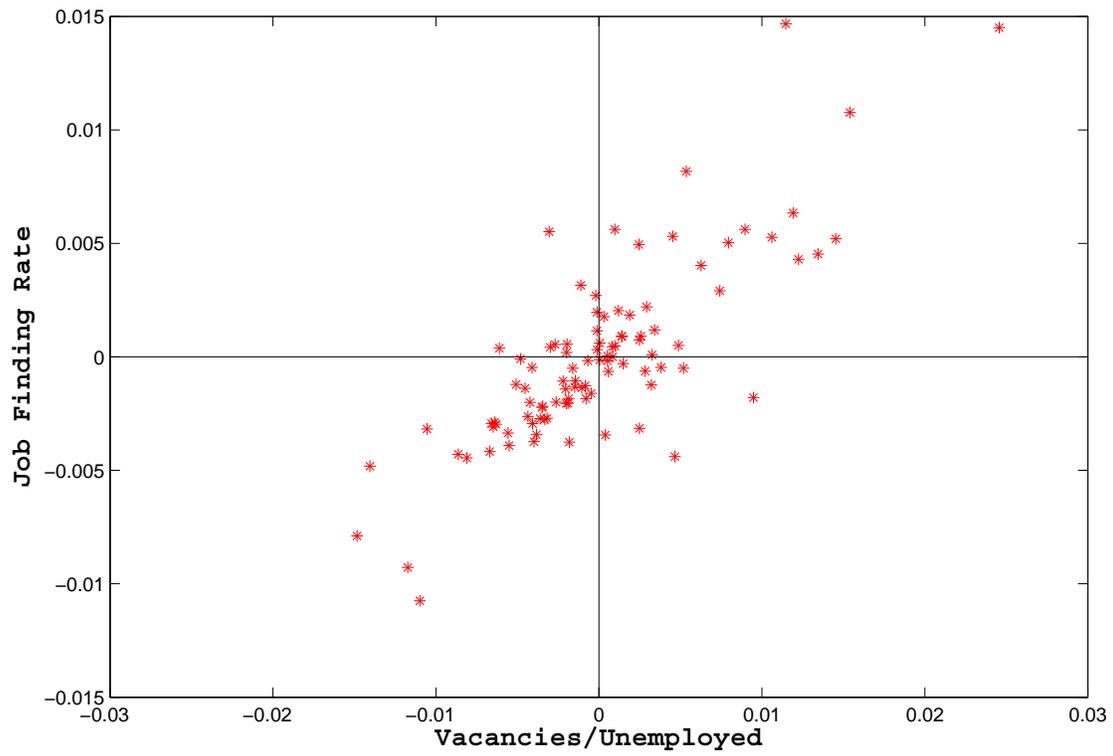


Table 2: Descriptive Statistics on Disaggregated Unemployment Groups (Shares)

Reason of unemployment	2005*	2013*
Project or contract has finished	24.2	30.9
Laid off	24.6	19.3
Quitted	28.4	39.0
First time	22.7	10.8
Duration of unemployment		
1-2 months	21.6	33.1
3-5 months	21.7	31.0
6-8 months	12.1	16.2
9-11 months	3.8	3.9
1-2 years	18.0	17.0
2-3 years	10.9	5.3
over 3 years	10.0	2.7
Age of the unemployed		
15-19 years old	12.6	9.4
20-24 years old	24.4	21.1
25-34 years old	33.5	33.4
35-54 years old	27.2	32.4
55 years and over	2.3	3.8
Gender of the Unemployed		
Male	73.1	64.8
Female	26.9	35.2

*Yearly averages for 2005 and the average of the first 4 months of 2013.

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