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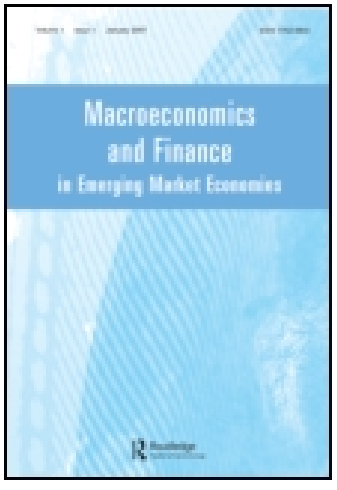

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Output-employment relationship across employment status: evidence from Turkey

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Output–employment relationship across employment status: evidence from Turkey

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This paper investigates output–employment relationships across different employment statuses and formal versus informal employment divisions for Turkey. Even if we fail to find a long-run relationship between aggregate output and total employment, there are long-run relationships between the aggregate output with all of the formal employment statuses. A further investigation for short-run relationships reveals no statistically significant relationships between aggregate output and total employment and between aggregate output and casual employment but there is a significant short-run relationship between aggregate output and total regular employment. Thus, a sustainable economic growth policy should aim to create formal and regular employment.

Keywords: employment; employment statuses; Okun's law; seasonal cointegration

JEL classification: C32; E24; E32

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1. Introduction

The recovery from the global economic crisis reminds us of the 'jobless growth' puzzle − increasing output does not bring increased employment. The major central banks have started to consider the increasing unemployment as a matter of concern, in addition to stabilizing inflation and output growth.[1] It is argued that the structural problems are the reasons for output not bringing higher employment or lower unemployment (see, for example, Bernanke 2003; Groshen and Potter 2003; Khemraj, Madrick and Semmler 2006 for the US; and Bent 1991; Fox and Sekkel 2006; Verme 2006; World Bank 2007, 2008; Nabli et al. 2007 for developing countries). The decline in employment contributes to the increase in unemployment. For this reason, the central question is the job creation ability of increased output. Hiring practices are not the same across different sectors. Moreover, these practices may work differently in the long run versus the short run. These are the issues that we will elaborate in detail later. We provide evidence of the relationship between output and employment for Turkey by imposing long-run versus short-run distinctions on this relationship for different employment statuses. We consider employment across earning statuses and also formal versus informal employment division.

In order to assess the effects of the aggregate output changes on the aggregate employment as well as on employment by different statuses, we gathered the quarterly

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data for Turkey for the period 1988–2009.[2] The main contribution of this paper is the investigation of the relationship between the aggregate output and employment by distinguishing its long-run versus short-run nature and assessing this relationship across different employment statuses. The possible relationships are analysed by employing seasonal integration, cointegration and error-correction models. There are several previous studies investigating a possible relationship between output and employment (or unemployment) such as Madden and Tuckwell (1975), Wah (1997), Lewis-Wren (1986), Smyth (1986) and Pehkonen (2000). Pehkonen (2000) makes the long-run versus the short-run distinction; however, none of these studies examines the effects of output on employment by different statuses from the long-run versus the short-run perspective, as we pursue in this paper.

There are some surprising, as well as expected results in this paper. First of all, even if we fail to find a long-run relationship between aggregate output and total employment, the long-run relationship for the aggregate output exists for three out of five employment classifications which we consider. For the formal versus informal distinction, this relationship exists in 10 out of 12 employment classifications. Second, a further investigation reveals that there is no statistically significant short-run relationship between aggregate output and total employment, and aggregate output and employment for the Unpaid Family Work, Self-Employment and Casual Employment statuses.[3] We also do not find a short-run effect for Informal Unpaid Family Work, Formal Self-Employment, Formal Casual Employment and Informal Casual Employment. Our results provide an insight to the 'jobless growth' phenomenon and the Total Factor Productivity impact. The Self-Employed and Casual Employee categories are usually intensive in the informal sector.[4] So it is meaningful to claim that the low-productivity and the low-wage sectors benefit less from an increase in output. This result displays the 'jobless growth' characteristics. Regular Employment mostly occurs in the formal sectors, and we also observe a long-run relationship between aggregate output and Regular Employment. This strengthens the hypothesis that the high-productivity sectors profit more in terms of employment creation from an increase in the overall output. Further, all of the sectors exhibit 'jobless growth' characteristics in the short run.

In this paper, we consider the relationship between output and employment as inspired by the works of Okun (1962, 1970). Okun's law postulates that a fall of about 3% in the growth rate of real gross national product leads to a 1% increase in the unemployment rate. This specifies the cost of unemployment in terms of output. This proposition is empirically verified by several studies such as Hamada and Kurosaka (1984) in Japan, Kaufman (1988) in the United States, Canada, Japan, the United Kingdom, Sweden, and Germany, Blanchard (1989), Prachowny (1993), Weber (1997), Freeman (2000), Cuaresma (2003), Holmes and Silverstone (2006) in the United States, Moosa (1997) in G7 countries, Attfield and Silverstone (1998) in the United Kingdom, Sögner (2000) in Austria, Sögner and Stiassny (2002) in 15 Organisation for Economic Cooperation and Development (OECD) countries and Villaverde and Maza (2009) in Spain.

This paper is structured and laid out as follows: the next section elaborates on the distinctions that we consider for the employment–output relationship. Section 3 introduces the Turkish labour market and data used in the paper. The methodology employed in the analysis is presented in section 4. Section 5 presents and discusses the estimation results. Concluding remarks appear in section 6.

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2. Employment–output relationship differentials

2.1. Time frame: short run versus long run

The relationship between employment and output may differ depending on the time frame and the horizon that is considered. Morrison and Berndt (1981) and the references cited therein argue that the short-run output elasticity of demand is smaller than unity and is less than that of the long run for several reasons. First, higher aggregate demand may enable firms to increase their production but, this increase may not lead to higher employment. It may only lead to an increase in the number of hours worked for each worker. That is firms may rely on overtime work rather than increase the employment level in the short run because of training costs. Once the increase in aggregate demand is perceived to be permanent, then the firms may increase the number of workers in order to increase production and bear the cost of new employment. Conversely, firms may not lay off workers as the aggregate demand decreases because decreasing employment may be costly due to the firing costs as the economy falls into a slump. Firms may decrease over time work but not decrease the number of workers if the aggregate demand decrease is perceived to be temporary. But, they may decrease employment if the decrease in aggregate demand is perceived to be permanent. Firms are more likely to adjust their number of workers if they perceive the change in aggregate demand for their goods and services as a long-run one or the change in symmetric effect of consumption and investment on aggregate demand is considered persistent.

Second, the effects of the shocks to the labour market may last longer than the effects of the shocks to the output in the short run because of the wage stickiness and other rigidities in the labour market. The elimination of the difference between actual and long-run employment rates may take more time than the clearance of the output gap as mentioned in Layard, Nickell and Jackman (1991, 77). Labour market movements are smaller than the movements in the goods market and the changes in output are accompanied by smaller changes in employment. Therefore, employment creation may be a structural problem in the economy. The employment generation ability of the supply side of the economy may be weak in the short run. However in the long run, goods and labour markets nearly clear with a long memory and an interaction emerges between the two markets.[5]

2.2. Formal versus informal employment for different work statuses

Overall employment is heterogeneous and consists of segmented employment statuses which may respond to aggregate demand changes differently. Formal sectors have higher Total Factor Productivity (TFP), and thus offer higher relative wages (see Heckman and Sedlacek 1985; Gong and Soest 2002). Increases in aggregate demand could increase wages and employment in the formal sectors but not in the informal sectors. With higher aggregate demand, employment increases in the formal sectors (such as regular employment) more than in the informal sectors and employment may even decrease in the sectors where TFP level is low.

Moreover, different types of work may have different hiring and firing practices. Different work statuses such as Unpaid Family Work, Employer, Self-Employment, Regular Employment and Casual Employment may exhibit different responses when there is an upward movement in overall output. Employment generation might be different because hiring or laying down practices might not be the same in different work statuses. For example, hiring is expected to be easier and laying down is the most

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difficult for Unpaid Family Work, while hiring and firing is the easiest for Casual Employment. Employers may have different incentive mechanisms for employment. For instance, the cost of job creation for the supply side of the economy may change depending on the classification of employment. The tax treatment and training needs of the labour force are different depending on the work status. This too further generates different employment responses to aggregate demand changes.

The formal and informal sector wage earners differ by their social security coverage. The formal sector workers are covered by the Social Security Organization. However the informal sector workers have no social security coverage (Tansel 1999). There may be no job security or job protection provisions in the informal sector. Therefore, both the employers and the employees are free from the burden of these costs. These partly make employment creation easier and reduce the job destruction costs for the informal sector workers and employers, and may decrease the duration of unemployment (see Bertola 1990; Agénor 2007, 16–17). Therefore, Unpaid Family Workers and Self-Employed individuals with limited skill levels who are usually involved in informal sector work can easily be hired or laid off. This increases the responsiveness of the informal sector employment to the output fluctuations.

The formal sector is Regular Employee intensive; however the Unpaid Family Workers and Self Employed individuals with limited skill levels mostly work in the informal sector. Stiglitz (2012, 9) claims that there is a case of polarization in US economy where the skilled workers earn less compared to less skilled ones and the economy could not create sufficient jobs for the skilled workers. This contributed negatively to the long-term unemployment rates. Tansel and Kan (2012, 26) also tell that the transition probability from informal to the formal sector is higher than the reverse movement for Turkey. The workers who cannot find job opportunities in the formal sector tend to be employed in informal sector (hidden unemployment) where hiring and firing are easier. Rosenzweig (1988) and Agénor (1995) categorize the formal and informal sectors in terms of urban versus rural sectors respectively. They argue that rural sector has a large share of self-employed and unpaid family workers, while urban employment has informal and formal components. Urban informal sectors may consist of self-employed individuals or small firms.

The labour markets in the developing or emerging economies has a different structure than in the industrial countries which causes the interpretations of the empirical papers to differ. In the urban sector, job security is limited and the wages are not rigid. The labour unions have small effects on these informal sector activities. The informal sector may also be divided into two sub-categories according to Fields (1990): the easy-entry and upper-tier informal sectors. The formal urban sector has a higher scale of production capacity. The job relations are formal with the governmental rules; firms conform to the regulations and wages are subject to rigidity and ceilings.

These differences create non-homogenous nature of the response of employment to the output fluctuations. Thus, the purpose of this research paper is twofold. We first examine the possible relationship between output and employment for the whole economy and next assess the employment creation capacity of total output for different employment statuses. Next, two different time frames are used in carrying out this analysis: short run versus long run. This allows us to assess an important question regarding how total employment and the different employment statuses react to the aggregate demand.

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3. Turkish labour market and the economy and data

This section provides information about the recent developments in the Turkish economy and the labour market. The Turkish labour market has several important characteristics. These characteristics include strong supply side pressures due to rapid growth of the working age population, low employment rates, high unemployment rates, declining labour force participation rates, wide spread employment in small scale establishments and segmentation of wages along several lines.

During the period of study from 1988 to 2009, the real gross domestic product (GDP) increased by 4% while total employment grew only by 1% annually in the Turkish economy. This period characterized two decades of economic expansion although with high volatility. There were several major shocks in the economy since 1988 resulting in several economic and financial crises. The first negative shock occurred in 1991 and was due to the Gulf War. Second crisis occurred in 1994 and was due to the financial mismanagement. GDP dropped by about 6% along with a devaluation of the Turkish Lira by 70% against the US dollar. Inflation rate increased to 90%.

The third crisis occurred in 1999 and was due to both the two major earthquakes in the industrial heartland of the country and the delayed effects of the Russian crisis. The fourth major crisis occurred during the period 2000–1. Per capita GDP declined by about 9.6% in 2001 but recovered quickly with an 8% increase in 2002 and with high subsequent growth rates. However, unemployment increased during this crisis and remained high in spite of the subsequent high rates of output growth. This is referred to as 'jobless growth' phenomenon, which has been an important concern also in the United States (Bailey and Lawrence 2004) and other developed countries recently. Unemployment rates increased and remained high, around 10.11%. The number of employed people declined during the 2001–3 period. Unlike in the previous crises, even the highly educated such as those in the financial and media sectors were adversely affected by unemployment. The youth unemployment rate reached nearly 20% and the educated youth unemployment rate increased to 30% after the 2001 economic crisis. Employment rate declined over 2000–6. The employment rate was 65% for men and 22% for women in 2006, the lowest rates among the OECD countries. Employment in low-productivity agriculture has been declining over the years.

Over the period 2000–6, the labour force increased at a slower rate than the working age population due to declining labour participation rate. Urban male and female participation rates were about 71.5% and 19.3% respectively in 2005. This rate for urban women is particularly low by the international standards. Women withdraw from the labour force when they migrate from rural to urban areas. Their low levels of education and cultural values against their employment are the reasons for their low participation rates in urban areas (Tansel 2001). Approximately 65–70% of the urban labour force is a wage earner. Self-employment for men and unpaid family work for women are prevalent in rural areas. Employment in small scale establishments is wide-spread. Establishments with fewer than four workers account for about 40% of the urban employment. Informal sector employment is declining although it may have increased during the crisis periods. Relatively high non-wage labour costs and weak enforcement of social security laws encourage informal employment. The new labour law was introduced in 2003. It included job security, which applies only to firms with more than 100 workers. Overall, the Turkish labour market is considered flexible.

Finally, the recent global economic crisis affected the Turkish economy adversely similar to major developed and developing countries during the 2008–9 period (see ILO 2010).

During the first quarter of 2009, GDP contracted by 14% and by 3% in the final quarter of the 2009. Unemployment increased to 16%. The global crisis affected the Turkish economy during the last quarter of 2008. The rate of growth was less than 1% in 2008. Production and employment fell due to the decline in both the domestic and the foreign demand. The rate of growth of GDP fell consecutively for four quarters in 2008–9. In 2009, the number unemployed increased by nearly 800,000, reaching 3.5 million. In 2009, the unemployment rate was 14% while the non-agricultural unemployment rate was 16% for men and 22% for women. The global crisis affected workers substantially when real wages declined about 19%. In 2010, real GDP increased by an impressive 9%, employment increased and unemployment fell.

3.1. Data

The Turkish Statistical Institute (TurkStat) uses Household Labour Force Survey results to exhibit the structure of the Turkish labour market.[6] Within this data set, we have determined that it is best to use employment data rather than unemployment data to conduct our analysis.[7] This is because we prefer to analyse employment by different statuses, which would not be possible to do if we were to use unemployment figures, due to data unavailability. Second, since output increases with employment, the difference between labour supply and labour demand (unemployment) increases even if output does not change, as new younger population continually enters the labour market. Thus, the relationship between output and unemployment is weaker than the relationship between output and employment.

The quarterly data used in this article are obtained from the Central Bank Republic of Turkey (CBRT) Electronic Data Delivery system (EDDS) and the Turkish Statistical Institute (TurkStat) for the period from 1988Q3 to 2009Q3.[8] From 1988Q3 to 2007Q3 GDP (expenditure, fixed 1987 prices, TL thousand, TP.UR.G23) is used as a measure of output. From 2007Q4 to 2009Q3 the data is extended by taking the quarterly percentage change in GDP (expenditure, fixed 1998 prices, TL thousand, TP.UR.GG01.S), because TurkStat has changed the methodology for the estimation of GDP data since 2007Q4.

Total employment and employment by different statuses are gathered from non-institutional civilian populations of the labour force surveys (1000 persons 15+ years of age) from the TurkStat. TurkStat classifies employed persons in line with the International Classification of Status in Employment. We measured employment by the number of employees rather than hours of employment due to data availability.[9] From 1988 to 1999 the semi-annual data gathered by TurkStat are used. We transformed the semi-annual data to the quarterly data with the methodology described in Chow and Lin (1971) for the pre-2000 period. For the post-2000 period, TurkStat started publishing the quarterly data and we collected the quarterly data for the period from 2000Q1 to 2009Q3. We did the same for the disaggregated data of employment by status and formal versus informal classifications. TurkStat, in order to achieve international harmonization, started to collect the regular and casual employment data together during the post-2008 period. For this reason, we used the pre-2007Q4 data for these two variables. For all the employment and output variables used in the paper, their logarithm was taken.

In this study, we prefer to use seasonally unadjusted data for all of the variables following the comments of Ghysels and Perron (1993). We could seasonally adjust the series by using propositions such as X-11, X-12 or Tramo Seats. However, Ghysels and Perron suggest using seasonal cointegration from seasonally unadjusted data. This enables analysis of the long-run dynamics without losing information as a result of seasonal

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adjustment. The seasonal adjustment methods may affect the mean of the series. Once the sample averages of the total employment and employment by different statuses are observed, Regular Employment constitutes an important portion of the overall employment with 37%. Self-Employment has the second highest share, which is nearly 24% of the total employment. The share of the Unpaid Family Work in total employment is nearly 23%. And the Employer and Casual Employee categories both have shares below 10%.[10] The share of informal sector employment is high with a 50.51% share in total employment. This increases the possibility of hidden unemployment in the overall economy.

Figure 1 reports the plot of employment series along with (real) GDP series. It seems that the movements of Regular Employment and the aggregate output are very similar to each other. For the post-2000 period, Casual Employment, and Self-Employment move in opposite directions with income. Movements of the Unpaid Family Work and the real GDP are negative related for the period we are considering.[11] Figures 2 and 3 report the similar graphs for the formal and informal employments respectively. Formal Total Employment and Formal Regular Employment move directly with the output. However,

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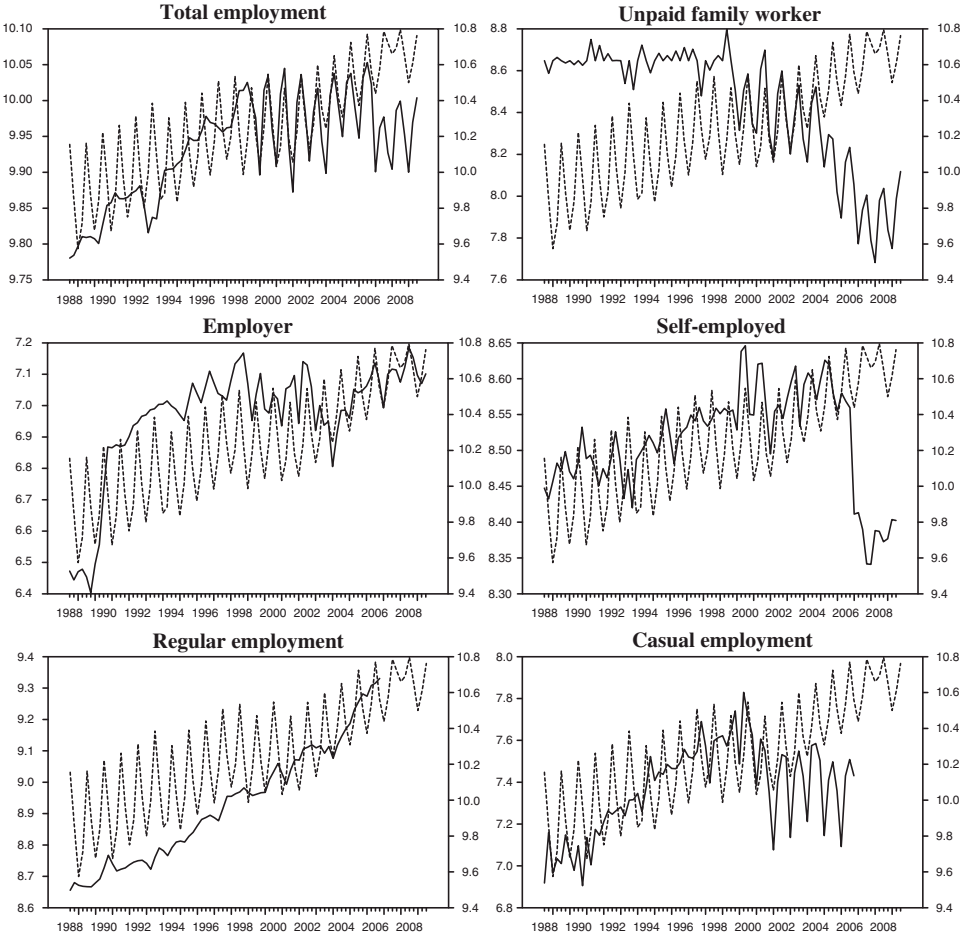

Figure 1. Seasonally unadjusted graphs of the variables.
Note: The dotted line is the output and the right side scale of the graph is for the output variable.

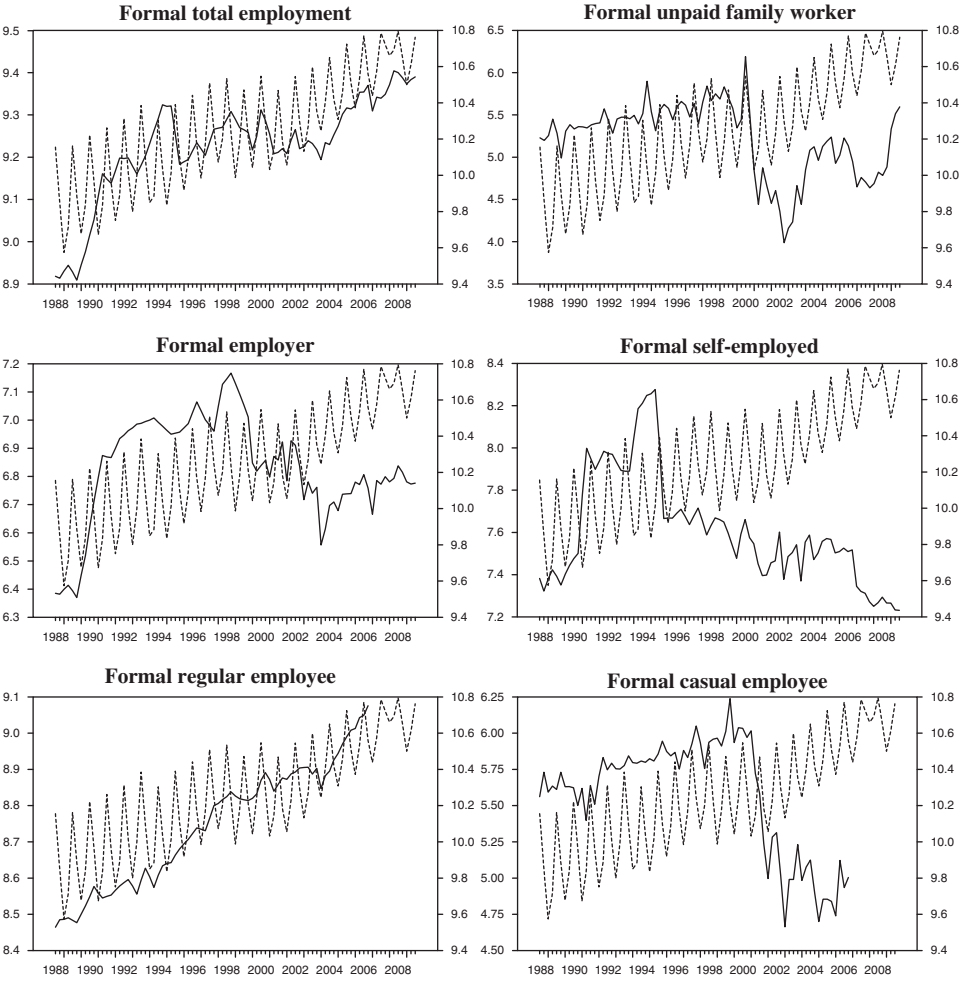

Figure 2. Seasonally unadjusted graphs of the variables.
Note: The dotted line is the output and the right side scale of the graph is for the output variable.

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Formal Self-Employment and Formal Casual Employment seems to be negatively related to output. Figure 3 suggests that Informal Unpaid Family Work decreases with output; Informal Employment increases with output. On the other hand, it seems that there is a structural change in the relationship of the other informal employment with output.

4. Methodology

The seasonal integration test assumes that the string $\{x_t\}\, t = 1, 2, \ldots, T$,is transformed into four parts for capturing the seasonal behaviour of the data.[12] Therefore Equations (1) through (4) are the observed series adjusted for the seasonal unit roots at $\theta = 0, \pi, (\pi/2 \; and \; 3\pi/2)$ frequencies where we test hypothesis of non-seasonal, seasonal unit root at biannual frequency and seasonal unit root at annual frequency.[13] The variable B *is* for the lag operator:[14]

$$x_{1,t} = (1+B)\left(1+B^2\right)x_t = \left(1+B+B^2+B^3\right)x_t \tag{1}$$

The second string is observed series adjusted for the unit roots at $\theta = 0, \pi/2, \pi, 3\pi/2$:

$$x_{2,t} = -(1-B)\left(1+B^2\right)x_t = -\left(1-B+B^2-B^3\right)x_t \tag{2}$$

The third string is observed series adjusted for the unit roots at $\theta = 0, \pi$:

$$x_{3,t} = -\left(1-B^2\right)x_t \tag{3}$$

And the last string is defined by Equation (4):

$$x_{4,t} = \left(1-B^4\right)x_t \tag{4}$$

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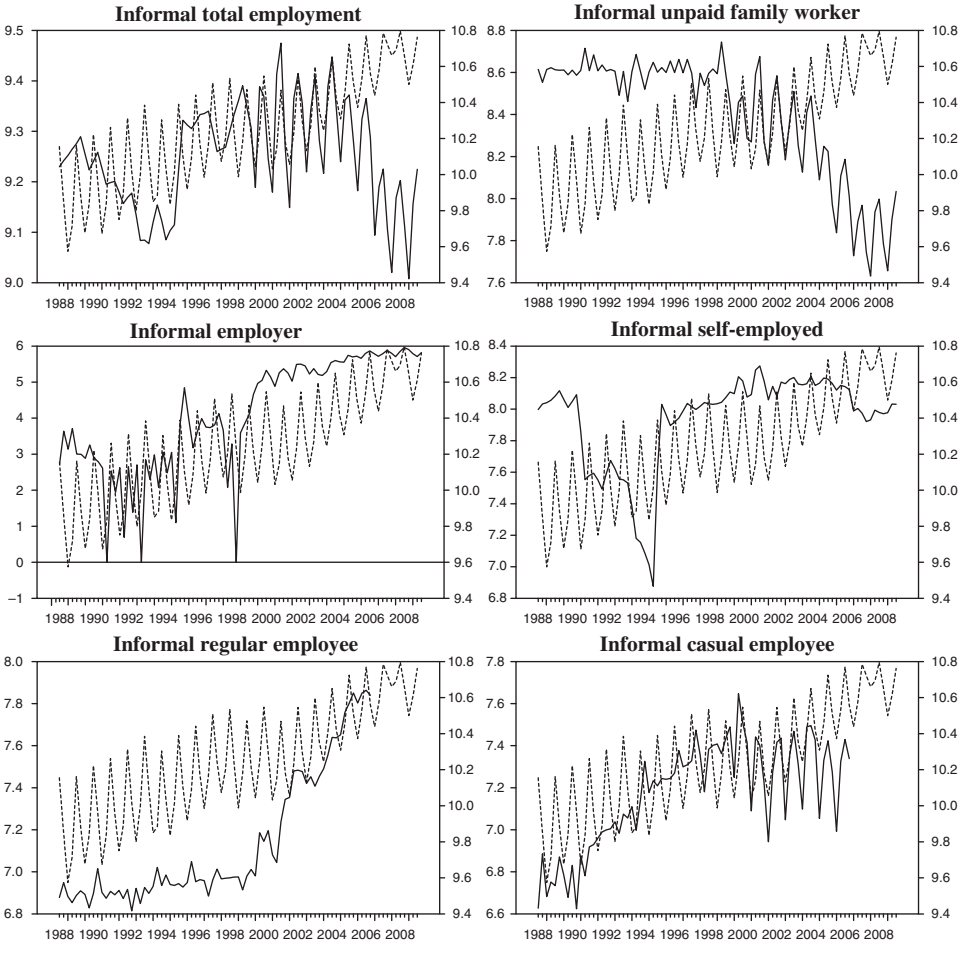

Figure 3. Seasonally unadjusted graphs of the variables.
Note: The dotted line is the output and the right side scale of the graph is for the output variable.

The underlying auxiliary regression is run for the first three series on the fourth sequence. Therefore Equation (5) leads HEGY unit root statistics for different frequencies:

$$x_{4,t} = C + \Lambda_1 x_{1,t-1} + \Lambda_2 x_{2,t-1} + \Lambda_3 x_{3,t-1} + \Lambda_4 x_{3,_{t-2}} + \sum_{i=1}^{p} \phi_i x_{4,t-i} + e_t \tag{5}$$

Deterministic parts of the Equation (5) are expressed by the parameter C which has four possible differentiated cases: {Intercept (*I*)}, {Intercept (*I*), Seasonal Dummies (*SD*)}, {Intercept (*I*), Seasonal Dummies (*SD*), Trend (*Tr*)}. The significance of the parameters shown in Equation (5) Λ_1 through Λ_4 are tested by the t and F statistics.

Non-seasonal unit root is valid if the ordinary least square (OLS) regression results for Λ_1 is equal to zero.[15] If the parameter Λ_2 is zero, then there is a one seasonal unit root. In case of a zero value for the last two parameters, which is tested by F-statistics, we may argue that there is a conjugate pair of complex unit roots in the variable considered.

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5. Empirical evidence

In this section we first perform a battery of unit root tests. Then we employ two types of cointegration tests: seasonal cointegration test and Engle-Granger type cointegration test. The reason for performing the latter cointegration test is that the former test does not allow us to determine the direction of the effect of output on employment directly.

Figures 1–3 suggest that there is structural change in almost all the series we consider. Similar concern on the apparent break in the trend is also expressed by Westerlund et al. (2009). Thus, we employ the seasonal HEGY type unit root test that takes into account the structural change as developed by Westerlund et al. (2009). It is an extension of Popp (2007), and Narayan and Popp (2011). It allows for a break in both the seasonal mean and linear trend of a quarterly the series where the break point is determined by the test. Table 1 reports these seasonal unit root (HEGY) tests for the total output and total employment in their logarithms.[16] We consider lag orders of 4, 6 and 8 in Equation (5) for the robustness of our test results. After reporting variable names and lags, the next column reports the endogenous break dates that the test suggests and their test statistics. The table suggests that the null hypothesis of unit root is rejected in Total Employment for all frequencies and for all lags. We do not reject the null of unit root in total output for zero frequency at 4 lags, for πat 6 and 8 lags and for $\pi/2$ and $3\pi/2$ frequencies at all lags. Thus, we claim that the output has a unit root. It seems that both the total employment and total output are integrated of different orders and cannot be cointegrated. Note that the unit root tests we employ so far take the null as unit root and we have rejected the null of unit root for employment. However it is possible that even if the series are I(1), we may reject it wrongly (*Type-I* error). Thus, we could employ a set of tests that test the null of stationarity. We employed the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test for the total employment and the various employment series. For most of the employment series we reject the null of stationarity (not reported to save space). Thus we could employ the cointegration tests. The endogenous break dates are also provided in Table 1 and we use them in the cointegration tests for possible break points.

Since the data have seasonal unit roots, next we carried out the residual based cointegration test developed by Engle et al. (1993).[17] The model between total employment and output is first estimated for the zero frequency:

Table 1. HEGY seasonal unit root tests: total employment and output.

Variables	Lags	Endogenous break date	Statistics	$t(\Lambda_1)$	$t(\Lambda_2)$	$F(\Lambda_3 \cap \Lambda_4)$
Output	4	2007:03	6.1032**	−1.2543	−2.5388**	0.8444
	6	2007:03	6.5858**	−2.4036**	−1.3335	0.0766
	8	2007:03	6.2818**	−1.8848*	−1.3400	0.1461
Total Employment	4	1999:04	13.4615**	−2.7832**	−4.0765**	9.2712**
	6	1999:04	13.4377**	−3.2673**	−3.9143**	6.3849**
	8	1999:04	13.8059**	−3.9975**	−2.6382**	8.0011**

Notes: ** The null hypothesis is rejected at a 1% significance level. * The null hypothesis is rejected at a 5% significance level. $t(\Lambda_1)$is the statistics for the $\Lambda_1 = 0$; $t(\Lambda_2)$is the statistics for the $\Lambda_2 = 0$and $F(\Lambda_3 \cap \Lambda_4)$ is for the $\Lambda_3 = \Lambda_4 = 0$.

$$\left(1 + B + B^2 + B^3\right) employment_t = C + \beta_1 \left[\left(1 + B + B^2 + B^3\right) y_t\right] + u_t \tag{6}$$

C represents the deterministic part of the specification consisting of constant, three seasonal dummies and trend dummy for the months between 2005:01 and 2009:03 (note that the specified deterministic term is the same for all types of cointegrating regressions.). u_t is the residual of the cointegrating equation. Equation (7) is the auxiliary regression of Δu_t on $u_{t-1}$and Δu_{t-i}:

$$\Delta u_t = \tau_1 u_{t-1} + \sum_{i=1}^{p} \psi_i \Delta u_{t-i} + \varepsilon_{1,t} \tag{7}$$

We first chose 4 lags in the Equation (7). Analogous to the Augmented Dickey Fuller unit root test, we make inference based on the estimated coefficient ofu_{t-1}. If we can reject the null of unit root, we claim that in the long run there is cointegration between these two variables. The critical value of the coefficient of u_{t-1} is gathered from Engle and Granger (1987). Thereafter, we applied the same procedure for the other possible frequencies: π, $\pi/2$ and $3\pi/2$.

For the biannual (π) frequency the following equation is estimated:

$$-\left(1 - B + B^2 - B^3\right) employment_t = C + \beta_2 \left[-\left(1 - B + B^2 - B^3\right) y_t\right] + v_t \tag{8}$$

Then, the auxiliary regression is specified as:

$$v_t + v_{t-1} = \tau_2(-v_{t-1}) + \sum_{i=1}^{p} \Gamma_i (v_{t-i} + v_{t-1-i}) + \varepsilon_{2,t} \tag{9}$$

In Equation (9) we test the null of unit root using the coefficient τ_2. The null hypothesis of no cointegration at frequencies ($\pi/2$), ($3\pi/2$) is tested jointly. In order to do that the cointegrating Equation (10) and auxiliary regression (11) are estimated:

$$-\left(1 - B^2\right) employment_t = C + \beta_3 \left[-\left(1 - B^2\right) y_t\right] + \beta_4 \left[-\left(1 - B^2\right) y_t\right]_{t-1} + w_t \tag{10}$$

We test the null of the unit root in residuals by using the joint F-statistics. If $\tau_3 \neq \tau_4$, then the conjugate pair of complex unit roots can be rejected and we may assert that there is a cointegration between the specified variables:

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$$w_t + w_{t-2} = \tau_3(-w_{t-2}) + \tau_4(-w_{t-1}) + \sum_{i}^{p} \lambda_i(w_{t-i} + w_{t-2-i}) + \varepsilon_{3,t} \tag{11}$$

Table 2 reports the seasonal cointegration test statistics for the 0, π, $\pi/2$ and $3\pi/2$ frequencies. The results indicate no statistically significant cointegration relationship between output and total employment at the 5% level for all of the frequencies when the 4, 6 and 8 lags (3 different p values) are considered except for the zero frequency at 8 lags. Thus, we conclude that there is no cointegrating relationship between output and total employment implying that there is no long-run relationship between output and total employment.

The effect of aggregate demand on employment by different statuses may be heterogeneous and different from each other. There may be several reasons for this. When the economy grows, its relation with the labour market may not always be procyclical if different employment statuses are considered. First, the quality of labour force is not uniform across the sectors and the substitutability of labour for the supplies across sectors may differ. Thus, the hiring practices and employment reaction may differ among the sectors. Second, the non-wage costs of employment are considered high in Turkey due to tax practices and social security contributions. Thus it will be easier to increase employment in the informal sector compared to the formal sector. Third, unemployment in Turkey is considered to be a structural problem (Bulutay 1995). Education levels and jobs usually do not match. Thus, as a result of a demand increase, employment in the sectors where there is excess supply of labour may increase more than in the sectors where there is an excess demand.[18] Fourth, the TFP and wages are higher in the formal sector than in the informal sector. Workers tend to move from informal sectors to formal ones since formal sector jobs are more desirable. Government policies also encourage or force employers to register their workers. When the economy expands, this leads to more employment opportunities in the formal sector than in the informal sector. Thus, we repeat our exercises for the formal and informal employment separately.[19]

Next we investigate the cointegration relationships for the disaggregated data.[20] We find cointegration relations for the Total Unpaid Family Work (at zero frequency for the 4, 6 and 8 lags; and π frequency for the 4, 6 and 8 lags), Total Employer (0, for four lags; and $\pi/2$ & $3\pi/2$, for 4 and 6 lags); and Total Regular Employment (at $\pi/2$ & $3\pi/2$, for 4, 6 and 8 lags) with output. However, we could not find a similar relationship for the Total Self-Employment and Total Casual Employment with output. Therefore, we

Table 2. Cointegration test results for aggregate output and total employment relationship.†

Frequencies	0	π	($\pi/2$ and $3\pi/2$)	
Variables	β_1	β_2	β_3	β_4
Total employment	−0.0737	0.1647	−0.2670	0.2293
4	[–3.1725]	[–3.2664]	[3.5916]	
6	[–3.2429]	[–2.3147]	[2.4090]	
8	[–3.8811]*	[–1.9402]	[2.5533]	

Notes: The test statistics for seasonal cointegration are reported in brackets. Critical values are gathered from Engle and Granger (1987, Table III) and Engle *et al.* (1993, Table A.5). †The coefficients do not change according to the lag selection but test statistics changes. **The null hypothesis is rejected at a 1% significance level. *The null hypothesis is rejected at a 5% significance level.

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claim that employment creation in each of the employment statuses differs from each other.

Overall, Table 3 suggests a set of cointegration relationships between output and some of the employment classification variables. Thus, for these set of results, we can claim that there is a long-run relationship between output and employment in various classifications at different frequencies. We find long-run relationships between aggregate output and Unpaid Family Work, Employer and Regular Employment but not with aggregate output and Self-Employment and Casual Employment.

During the expanding phase of the economy, the formal sector benefits more than the informal sector because of its low level of effective labour density and higher TFP. The marginal productivity in unpaid family work is low but the labour in this class tends to migrate to higher TFP sectors and areas. This flow of labour force reduces the capital per labour ratio in the capitalized regions in the sense of Barro and Sala-i-Martin (1991). For this reason, the responses of the formal and informal employment to total output may differ. Note that informal employment has a higher share of unpaid family work and self-employment in total employment. However, the formal employment has a high share of regular employment in the total. Therefore, the labour market flexibility conditions may create a heterogonous response in employment creation.

The seasonal cointegration tests for the formal or informal employment series are also performed (not reported to save space). First, we observe a cointegrating relationship between output and Formal Total Employment but not with Informal Total Employment.

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Table 3. Cointegration test results for aggregate output and employment status categories.†

Frequencies	0	π	($\pi/2$ and $3\pi/2$)	
Variables	β_1	β_2	β_3	β_4
Total unpaid family worker	−0.4784	0.2451	−0.9237	0.6555
4	[–3.4537]*	[–4.3605]**	[4.5467]	
6	[–3.5704]*	[–4.3168]**	[3.8918]	
8	[–3.6625]*	[–3.9281]*	[3.2581]	
Total employer	1.1562	−0.0238	−0.2956	0.2228
4	[–3.6249]*	[–2.2326]	[12.2990]*	
6	[–3.1301]	[–1.5517]	[9.7305]*	
8	[–1.9011]	[–1.7215]	[7.7598]	
Total self-employed	−0.0364	0.1873	−0.0709	0.1571
4	[–2.8920]	[–3.3907]	[7.1625]	
6	[–3.1631]	[–2.8484]	[5.5519]	
8	[–2.9098]	[–2.9122]	[4.0709]	
Total regular employee	−0.0426	0.1702	0.0161	0.1539
4	[–1.8577]	[–2.8063]	[22.6721]**	
6	[–2.5451]	[–1.2534]	[16.7203]**	
8	[–2.6404]	[–1.8332]	[11.3135]*	
Total casual employee	0.6950	0.6654	−1.0912	1.2232
4	[–3.2028]	[–2.4921]	[4.4823]	
6	[–3.2774]	[–1.5891]	[5.6342]	
8	[–2.5023]	[–1.6798]	[3.4609]	

Notes: The test statistics for seasonal cointegration are reported in brackets. Critical values are gathered from Engle and Granger (1987, Table III) and Engle *et al.* (1993, Table A.5). † The coefficients do not change according to the lag selection but test statistics changes. ** The null hypothesis is rejected at a 1% significance level. * The null hypothesis is rejected at a 5% significance level.

For all of the six formal employment statuses, there are cointegrating relationships with output. Similarly there are cointegrating relationships for Informal Unpaid Family Work, Informal Employer, Informal Self-Employment and Informal Regular Employment but not for Informal Casual Employment. We will elaborate on these findings of the long-run relationship between output and employment later. We now assess if there are short-run relationships between output and each of the employment statuses by specifying the error correction model in Equation 12 due to Engle et al. (1993):

$$\Delta_4 employment = \sum_{j=1}^{q} \delta_j \Delta_4 y_{t-j} + \sum_{i=1}^{p} \beta_i \Delta_4 y_{t-j} + \gamma_{11}(employment_{1,t-1} - \alpha_{12} y_{1,t-1} - C) + \gamma_{12}(employment_{2,t-1} - \alpha_{22} y_{2,t-1} - C) - (\gamma_{13} + \gamma_{14} B)(employment_{3,t-2} - \alpha_{32} y_{3,t-2} - \alpha_{41} employment_{3,t-3} - \alpha_{42} y_{3,t-3} - C) + C + \varepsilon_t \tag{12}$$

Here $(employment_{1,t-1} - \alpha_{12} y_{1,t-1} - C)$ is for zero frequency, $(employment_{2,t-1} - \alpha_{22} y_{2,t-1} - C)$ is for the error correction term at π frequency and the last term is for the $\pi/2$ and $3\pi/2$ frequencies: $(employment_{3,t-2} - \alpha_{32} y_{3,t-2} - \alpha_{41} employment_{3,t-3} - \alpha_{42} y_{3,t-3} - C)$. The estimates include the first differences of series, constant term, seasonal dummies and the time trend. We include the error correction terms only if there is a cointegration relationship for a particular frequency. If there is no cointegration relationship at 0, π and $\pi/2$ and $3\pi/2$ frequencies then none of the error correction terms are included. Estimates are reported in Table 4. The estimated coefficients on each of the error correction terms are mostly negative as excepted. In order to assess the effect of output on employment we test if each of the δcoefficients are jointly zero so that we test the null H_0: $\delta_1 = \delta_2 = \ldots = \delta_q = 0$. We consider 4, 6 and 8 lags for different time-frames. Table 4 suggests that there is no statistically significant short-run relationship between Total Output and Total Employment as well as between Total Output and Total Unpaid Family Worker, Total Self-Employment and Total Casual Employment.

We also estimate the specifications for the sub-classifications by formal and informal distinctions in order to observe the short-run behaviour of the interaction with the seasonal error correction model. The estimates are reported in Table 5. The estimated coefficients on each of the error correction terms are mostly negative. Concerning the short-run dynamics, there is no statistically significant relationship between output and Informal Unpaid Family Worker, Formal Self-Employment, Formal Casual Employment and Informal Casual Employment for all lags. As a result, one can claim that there is a long-run but not a short-run relationship between aggregate output and different employment categories by the status of employment and localization (formal versus informal) of the employment.

It is not possible to obtain the effects of the changes in output level on the employment levels directly from the estimates of Equations 6 through 12 because these equations allow us to estimate the sum of the employment elasticities of output across the quarters rather than the conventional elasticity estimates. Engle and Granger (1987) type non-seasonal cointegration/error correction specifications permit us to evaluate these. Even if this method does not address the seasonality directly, we indirectly assess the seasonality by employing seasonal dummies in the specification. Estimated parameters for this are reported in Table 6. Panel A shows the estimates of the coefficient on the output. Here, we did not report the estimated coefficients of the constant term, three seasonal dummies, a

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Table 4. Estimation results for the seasonal error correction model across broad categories.

	4 lags				6 lags				8 lags			
Variables	No short-run effect^{+}	γ_{11}	γ_{12}	$(\gamma_{13}+\gamma_{14}B)$	No short-run effect^{+}	γ_{11}	γ_{12}	$(\gamma_{13}+\gamma_{14}B)$	No short-run effect^{+}	γ_{11}	γ_{12}	$(\gamma_{13}+\gamma_{14}B)$
Total employment	(0.1941)				(0.2347)				(0.3349)	0.0627 [0.7977]		
Total unpaid Family worker	(0.3520)	−0.0008 [–0.6293]	−0.4015* [–3.8663]		(0.5279)	−0.0005 [–0.3241]	−0.4022* [–3.7141]		(0.8828)	−00007 [–0.4150]	−0.4140* [–3.8108]	
Total employer	(0.0027)**	0.0755 [2.1878]		−0.8409 [–5.7560]	(0.2319)			−0.6132 [–4.3019]	(0.1390)			
Total self-employed	(0.4401)				(0.2630)				(0.2185)			
Total regular employee	(0.0001)**			−0.7983 [–6.2886]	(0.0008)**			−0.7639 [–5.6331]	(0.0008)**			−0.8184 [–6.3751]
Total casual employee	(0.3814)				(0.2794)				(0.0768)			

Notes: Test statistics are reported in brackets and p values in parenthesis. ** The null hypothesis is rejected at a 1% significance level. * The null hypothesis is rejected at a 5% significance level. $^{+}$ The test statistics for no short-run effect is performed for H_0: $\delta_1 = \delta_2 = \ldots = \delta_q = 0$, H_A: not H_0.

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Table 5. Estimation results for the seasonal error correction model across employment status categories.

	4 lags				6 lags				8 lags			
Variables	No short-run effect^{+}	γ_{11}	γ_{12}	$(\gamma_{13}+\gamma_{14}B)$	No short-run effect^{+}	γ_{11}	γ_{12}	$(\gamma_{13}+\gamma_{14}B)$	No short-run effect^{+}	γ_{11}	γ_{12}	$(\gamma_{13}+\gamma_{14}B)$
Formal total employment	(0.3747)		−1.0763** [–5.9628]	−0.3185 [–1.9333]	(0.0205)*				(0.0480)*			
Informal total employment	(0.3523)				(0.0001)**				(0.0010)**			
Formal unpaid family worker	(0.0016)**	0.1068 [3.0572]	−0.5720** [–5.6578]	−0.4242 [–4.6476]	(0.0319)*	0.0868 [1.6730]			(0.0648)			
Informal unpaid family worker	(0.3409)		−0.4664** [–4.5566]		(0.5444)	0.1675 [2.3746]	−0.4747** [–4.6085]		(0.8089)	−0.0010 [–0.5680]	−0.4588** [–4.0485]	
Formal employer	(0.0158)*			−0.8722 [–5.2997]	(0.0002)**				(0.0039)**			
Informal employer	(0.1022)				(0.0218)*	0.0493 [0.7613]			(0.0306)*			
Formal self-employed	(0.8299)	0.1411 [3.3622]		−1.0356 [–7.8844]	(0.4285)	0.1353** [3.0522]		−1.0107 [–7.4946]	(0.4537)	0.1164 [2.4749]		−0.9331 [–6.1572]
Informal self-employed	(0.1185)		−1.0760** [–6.7997]	−0.2421 [–1.9250]	(0.0001)**	−0.0408 [–0.9053]			(0.0003)**			
Formal regular employee	(0.0001)**			−0.7432 [–5.7264]	(0.0001)**			−0.7703 [–6.2750]	(0.0001)**			−0.8035 [–6.6919]
Informal regular employee	(0.0723)			−0.7732 [–5.7077]	(0.0231)*	0.2892* [3.4880]			(0.1105)			
Formal casual employee	(0.1494)		−0.3146 [–3.3383]	−0.5525 [–4.5352]	(0.2837)	0.1604* [2.4696]			(0.3348)			
Informal casual employee	(0.9296)				(0.9983)				(0.8880)			

Notes: Test statistics are reported in brackets and p values in parenthesis. ** The null hypothesis is rejected at a 1% significance level. * The null hypothesis is rejected at a 5% significance level. $^{+}$ The test statistics for No short-run effect is performed for H_0: $\delta_1 = \delta_2 = \ldots = \delta_q = 0$, H_A: not H_0.

Table 6. Estimation results of Engle and Granger's error correction model across employment status categories.

	Panel A	*Panel B*	
Variables	y_t	*TSR*	*ECT*
Total employment		0.3950*	
		[2.1711]	
Formal total employment	0.4258**	−0.0371	−0.1333**
	[8.2006]	[–0.1996]	[–2.6809]
Informal total employment		0.5031	
		[1.4824]	
Total unpaid family worker	−0.2385**	0.8938	−1.0015**
	[–2.7913]	[1.4246]	[–4.2258]
Formal unpaid family worker	0.8419**	−1.1710	−0.4385**
	[3.0051]	[–0.8177]	[–3.6601]
Informal unpaid family worker	−0.2817**	0.9360	−0.9204**
	[–3.2512]	[1.4337]	[–4.0688]
Total employer	0.8705**	0.9738*	−0.2195**
	[7.8487]	[2.6011]	[–3.1900]
Formal employer	0.7878**	0.8010*	−0.1688**
	[5.9579]	[2.2923]	[–3.2754]
Informal employer	2.9979**	1.3365	−0.5184**
	[3.0365]	[0.2573]	[–3.2135]
Total self employed		0.0438	
		[0.2116]	
Formal self-employed	0.1756	0.4788	−0.5913**
	[0.6742]	[0.9538]	[–6.0360]
Informal self-employed	−0.1259	0.1299	−0.6092**
	[–0.4154]	[0.2567]	[–8.9917]
Total regular employee	0.8307**	0.1272	−0.3977**
	[18.3499]	[0.8314]	[–3.5240]
Formal regular employee	0.8565**	0.1111	−0.3298**
	[21.4647]	[0.7050]	[–2.9624]
Informal regular employee	0.4149**	0.4840	−1.0456**
	[5.7938]	[1.1032]	[–5.4217]
Total casual employee		1.2183	
		[1.6135]	
Formal casual employee	0.5781**	0.2901	−0.7940**
	[3.1605]	[0.2568]	[–4.8808]
Informal casual employee		0.7575	
		[0.8912]	

Note: Test statistics are reported in brackets. ** indicates the level of significance at the 1% level and * indicates the level of significance at the 5% level. TSR indicates total employment effect in the short run. ECT is for the error correction term.

dummy variable for the post-2005 period and a time trend variable in order to save space. Table 6 suggests that in the long run increases in output significantly decreases the Total Unpaid Family Work and Informal Unpaid Family Work. The largest decrease is observed in Informal Unpaid Family Work. This makes sense because Unpaid Family Workers are not paid for their work. In addition Unpaid Family Workers usually work in the agricultural sector with low productivity. Thus, it makes sense that Informal Unpaid Family Work declines by the largest amount when the economy grows. These jobs are not the workers' best choice and they may have better opportunities to work somewhere else. On

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the other hand, casual employees work with daily wages. Their working style is irregular, not sustainable, seasonal or transitory. Consequently we may claim that when the economy grows employment in low-paid and low-productivity sectors decrease. Further, informal employments in agriculture and construction are rather high in Turkey and they are seasonal jobs. Creating employment is easier in these sectors however, they are declining sectors.

On the other hand, in the long run as output increases employment increases for (1) Formal Total Employment, (2) Formal Unpaid Family Work, (3) Total Employer, (4) Formal Employer, (5) Informal Employer, (6) Total Regular Employment, (7) Formal Regular Employment, (8) Informal Regular Employment and (9) Formal Casual Employment. This also make sense because as the economy grows workers tend to move by migrating to higher paying and more permanent jobs. As mentioned by Fuller and Vosko (2008), casual employment is temporary; however regular employment is permanent. This is supported by the marked increase in Informal Regular Employment which benefited most from the increase in output. However, in Turkey the proportions of informal regular employment and self-employment are high. The number of taxable revenue classes is small and thus the tax payments of informal sectors are lower. As the economy grows, employment in these low tax-paying informal sectors increase more than in the high tax-paying formal sectors. The error correction terms for these long-run relationships are all negative and significant as expected. For the short run, the total employment effects are reported in Panel B of Table 6 which are not statistically significant except for the Total Employment, Total Employer and Formal Employer.

The Turkish labour market has gone through a set of structural changes recently (see Figures 1, 2 and 3) In order to partially account for this, we estimate the same models for the sub-period starting from the break dates. The estimates are not reported here to save space. The direction of effect of output on employment generation is unchanged but the magnitudes are higher. Thus, we claim that the basic results of our paper are unchanged.

6. Conclusion

This paper investigates the long-run versus the short-run relationships between the aggregate output and the Total Employment, and then investigates the same relationships between aggregate output and the employment disaggregated by different employment statuses as well as by the formal and informal sector division for Turkey. Interestingly, as output increases, jobs in low-paid, low-productivity sectors decrease and jobs high-paid, high-productivity sectors increase. As the economy grows, Informal Unpaid Family Work (22.36% of the labour force) decreases even if Formal Unpaid Family Work increases (its share is only 0.98% of the total employment), Total Unpaid Family Work decreases. However, Formal (30.64% of the total employment) and Informal (6.94% of the total employment) Regular Employment both increase. This supports the proposition that as output increases, there will be a move from informal to high-productivity sectors. Similarly, Total Employer (formal and informal) also increases with output, especially entrepreneurship. We could not gather any regularity in economic terms for the short-term relationship between output changes and employment classification. One of the reasons could be that employment changes may differ across sectors and the hiring and training practices before employing a worker full time varies.

The results give us an opportunity to evaluate and extract several economic implications. First, short-term easing policies are not structural measures to increase employment in the long run. Policies to lower unemployment or increase employment must be of the

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long-run structural nature rather than short-run income policies. Sustainable income policies should be adopted to solve the puzzle of 'jobless growth'. Second, since the highest employment with a given increase in aggregate demand comes from the formal sector, the supply-side policies such as tax-breaks and social security premium assistances for the newly hired labour may help to accelerate employment generation process.[21] Third, government sponsored training programmes for youth and women may help to lower the firms' cost for newly hired labour and this might be arranged with the long-term perspectives of various sectors. Fourth, target-oriented employment policies may serve to improve the overall employment growth. For instance, employment in the formal sector that boots employment in the Regular Employment category increases in response to aggregate demand policies. Since the TFP is higher in formal sectors than in informal sectors, this policy will also let the economy use its sources more efficiently and help to attain higher welfare (wage income). Informal sectors survive because of their low tax payments mostly due to tax evasion. This policy may help to lower the effective tax rates for the formal sectors because a higher tax revenue collection could be possible with this policy. In order to prevent the economy from unemployment hysteresis, high TFP employment opportunities should be created in the formal employment sectors and the overall growth rates should be increased.

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Notes

1. Stiglitz (2012, xii) argues that unemployment is a consequence of the failure of the markets and it creates an inequality and inefficiency in the economy. Krugman (2012, 24–32) also elaborates his concerns about the increasing structural unemployment, diminishing aggregate demand and the low employment creation capacity of the output in US economy.
2. During the investigation of the relationship between aggregate output and aggregate unemployment, we failed to find a statistically significant relationship for Turkey. This failure may be due to the nature of the data used on which we elaborate in the data section. We then switched to specifying a model whereby the activities in the labour market as measured by the employment rate is related to the activities in the goods market as measured by the aggregate output. A number of authors such as Akerlof and Shiller (2009, 2) point out that when evaluating the labour market, it may be more meaningful to use employment rates rather than the unemployment rates. Similarly, in the case of Turkey, as a developing country, it is argued that unemployment rate and the employment rate are not the mirror images of each other as indicators of the labour market conditions. Employment rate may better reflect the slack or the boom in the labour market than the unemployment rate in Turkey (World Bank 2006a, 13). Accordingly, we focus on the employment rate rather than the unemployment rate in the analysis in this paper.
3. The level of significance is at the 5% unless otherwise mentioned.
4. Tansel and Kan (2012, 4) note that in Turkey, informal self-employment is prevalent in the agricultural sector, while non-agricultural sector tends to be more formal. Informality in the agricultural sector is almost 90 % while in the non-agricultural sector it is about 30–35%.
5. Wilson (1960) and Brechling (1965) elaborated similar issues as early as 1960s.
6. The first data collection on the labour market in Turkey dates back to 1955 when information was collected together with the General Population Census. Later, between 1966 and 1987 labour force surveys were conducted intermittently. In 1988 a new series of surveys was initiated together with the financial and technical contributions of the United Nations Development Programme (UNDP) and International Labour Organization (ILO). These surveys conformed to the ILO norm and standards. During 1988–99 the surveys were conducted

twice a year and provided data for rural and urban areas. During the 2000–3 period, surveys were conducted to provide quarterly data. Since 2004 monthly surveys interview about 13,000 households and provide data on a monthly basis (since 2005) for various regions of the country at NUTS1 and NUTS2 regional levels.

7. Stiglitz (2012, 11, 291) notes that the unemployment rate in the US economy may not reflect the real unemployment rates because some individuals who cannot find full-time jobs accept part time jobs, and due to the discouraged worker effect, some individuals drop out of the labour force.
8. Employment data for the Regular Employment and Casual Employment are not available for the post-2006 period. Thus, we end the sample in 2006:Q4 for these two series.
9. Smets and Wouters (2003, 1139) also stress the similar concerns about the unavailability of aggregate hours worked data for Euro Area and rather benefit from employment data. They claim that the response of employment to the economic shocks is slower when the hours worked data are used.
10. Innovation is important for growth and employment (OECD 2004, Chapter 4). Entrepreneurship may be supported in Turkey, especially in innovative sectors to produce high value added goods and enhance growth.
11. We also look at the series after the seasonal adjustment; the inferences are almost the same. Therefore, we did not report them here to save space.
12. Hylleberg, Engle, Granger and Yoo (HEGY, 1990) claim that economic data contain substantial seasonality and there is a high possibility that there can be unit roots at other frequencies such as the seasons besides the annual frequency. HEGY allows us to test both seasonal and non-seasonal unit roots.
13. A cycle is defined by 2π. The frequencies are defined as 0, 0.25, 0.5, and 0.75 of this cycle (Engle et al. 1993, 276).
14. Note that π refers to six months when we consider it with the unit circle.
15. See also Dickey and Fuller (1979) for roots of this frequency.
16. The tables for the *t*-test statistics for the zero and $\pi/2$ and the *F*-test statistics are for $\pi/2$ and $3\pi/2$ are taken from Hylleberg et al. (1990, Tables 1a and 1b). See also Enders (2010, 222–6) for the seasonal unit roots and the test procedure.
17. Integration of order one at any one of the frequencies indicates unit root.
18. One may need to match the employment and production in each sector and examine the effect of the production increases on employment. We did not pursue this avenue. First, the available statistics on employment and production do not match. Second, we are not interested in the input–output relationship but rather we want to observe how the employment generation will be for each sector as the aggregate demand increases.
19. Last, as the aggregate demand increases there might be sectoral or regional migration from low-wage sectors to high-wage sectors. Even employment may decrease in some sectors.
20. We perform the seasonal unit root tests for these cointegration tests as well as the test statistics for the cointegration tests that are not reported here to save space, however they are available from the authors upon request. These unit root tests suggest that each sector of employment that we consider has a unit root.
21. Increasing formal employment compared to informal employment is necessary for a small open economy such as Turkey because of the higher productivity in the formal sectors (see World Bank 2006b).

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