Acta Oeconomica 72 (2022) 1, 105–121
DOI: 10.1556/032.2022.00006

AKADÉMIAI KIADÓ

Real wages and the business cycle in Turkey

ALTAN ALDAN[1]* and HATICE BURCU GÜRCIHAN YÜNCÜLER[2]

[1] Structural Economic Research Department, Central Bank of the Republic of Turkey, Anafartalar Mah. Istiklal Cad. No. 10 06050 Ulus, Ankara, Turkey

[2] Research and Monetary Policy Department, Central Bank of the Republic of Turkey, Turkey

Received: April 2, 2019 • Revised manuscript received: March 29, 2020 • Accepted: June 23, 2020

ABSTRACT

The article analyzes the direction and scope of the responsiveness of real wages to the business cycle in Turkey using longitudinal data from 2005 to 2015. We found that wages in Turkey are procyclical; one percentage point increase in the unemployment rate induces a 0.6% decline in real wages. There is a variation in the patterns along the lines of wage distribution among the subgroups with relations to skills. Less-educated workers have acyclical wages. Compatible with this evidence, we found that the workers who earn around the minimum wage also have acyclical wages. High share of minimum wage earners suppresses wage cyclicality. Consistent with strict employment protection legislation and loose wage determination, wages of relatively high-income employees who mostly have formal work arrangements are procyclical.

KEYWORDS

Turkey, heterogeneity, real wage cyclicality, wage rigidity

JEL CLASSIFICATION INDICES

J30, E23, E26, E32

1. INTRODUCTION

Estimating the business cycle responsiveness of wages is crucial for policy makers as the degree of real wage rigidity and other labour market institutions affect the business cycle characteristics

* Corresponding author. E-mail: altan.aldan@tcmb.gov.tr

The views expressed here are of our own and do not reflect the views of the Central Bank of the Republic of Turkey.

and the effectiveness of monetary policy. In the literature the degree of wage rigidity is measured using both aggregate and micro-level data. An important drawback of using aggregate data is that it is not possible to control for changes in the characteristics of the average workforce in the business cycle. Hence, under the circumstances for which these changes matter, measuring the wage response requires an approach that takes into consideration the compositional shifts in the labour force. With this in mind, we investigate the cyclicality of real wages in Turkey using both aggregate and individual level data. In doing so, we discuss the composition bias inherent in the average wage data and review the impact of institutional rigidities, particularly binding minimum wage and high severance payments, on the dynamics of wages.

Composition bias in real wages may arise due to different responses of industries to the business cycle. Chirinko (1980) found that in the US economy industries that are more sensitive to business cycle have lower wages, creating a counter-cyclical composition bias. Counter-cyclical composition bias may also arise due to the shifts in the productivity of workers during the business cycle. Firms keep their most productive workers with higher general skills (for example, with more years of education) or firm specific skills (for example, with more years of tenure) in the downturns. Correspondingly, during upturns those, who were initially hired, will be less productive workers. Therefore, the average productivity level of workers in economic downturns will be higher compared to upturns, creating a counter-cyclical composition bias. If this composition bias is large, aggregate wage data may display an acyclical or even a countercyclical pattern even if the wage determination process is procyclical. The effect of composition bias and the estimates of real wage cyclicality free of such bias has been extensively documented for the US economy.[1] The evidence points out to the countercyclical composition bias and suggests procyclicality of real wages after correcting the bias (see for example, Coleman 1984; Barsky – Solon 1989; Solon et al. 1994; Pissarides 2009).

An analysis of micro-level data can be used further to uncover the sources of wage cyclicality. It has been argued that most of the procyclicality is due to compensation (extras and bonuses) beyond straight time wages (e.g., Keane et al. 1988; Devereux 2001; Swanson 2007; Shin – Solon 2007). The asymmetry of the wage response in the business cycle has also been analyzed. Martins (2007) for Portugal, and Verdugo (2016) for the Eurozone pointed out the fact that real wages tend to be more procyclical during downturns. Other dimensions studies include the variation in wage response depending on the workers' mobility between jobs (e.g., Devereux 2001; Shin – Solon 2007; Carneiro et al. 2012; Martins et al. 2012); EU membership (Grant 2001); education status, income level and age (Swanson 2007); gender (Solon et al. 1994) and race (Bils 1985; Tremblay 1990).

The literature on real wage cyclicality, which considers the composition bias, is dominated by the evidence from the developed countries. As for the developing economies, Gambetti – Messina (2018) provided evidence on the composition bias for Brazil and concluded that controlling for observable characteristics matters less compared to the developed economies. In general, the evidence for the developed economies may not be valid for the developing countries as labour market characteristics vary in many important aspects. First, unlike in the developed countries, informality is widespread in the developing countries, and Turkey is not an exception.

[1] Abraham – Haltiwanger (1995) provided a thorough discussion of the aggregate and micro data based analysis for the US. Unless otherwise stated, surveyed literature in the paper is on the US economy.

Second, minimum wage is likely to be binding in the developing economies, meaning that the share of workers around the minimum wage is sizable such that the wage distribution is distorted at the minimum wage (as interpreted in Maloney – Mendez 2004). Two decades ago, research for the developed countries showed that the number of workers who earned around the minimum wage was limited. For example, Dickens – Manning (2004) concluded that the effect of minimum wage on the UK labour market is limited since only around 6% of the employees earn around the minimum wage. Neumark et al. (2004) reported that the proportion of the US workers that earn in the neighbourhood of the minimum wage is only about 5%.[2] On the other hand, Maloney – Mendez (2004) showed that the minimum wage in the Latin American countries is binding and argued that the minimum wage has stronger effects compared to the earlier evidence on the US by Neumark et al. (2004).

The institutional structure of the labour market in Turkey is classified as rigid largely due to the strict employment protection legislation stemming from high severance pay (World Bank 2014). On the other hand, wage determination can be considered flexible since only a small fraction of workers is covered by collective bargaining. Together, these factors may indicate rigidity in employment but flexibility in wages. However, informality is widespread in Turkey, which may weaken the effects of the labour market institutions. In addition, minimum wage is binding in Turkey in the sense that a considerable number of workers earn around minimum wage. Hence, it is difficult to determine the degree of wage responsiveness to economic conditions as a priori. We believe that the analysis of the wage response with such different labour market characteristics provides a significant contribution to the existing literature.

There are several micro data-based analyses on the wage structure in the Turkish economy. They estimate the association between wages and unemployment rate focusing on the regional variation in unemployment rates.[3] Ilkkaracan – Selim (2003) and Konyali (2012) estimated a wage curve for Turkey. They found a statistically significant negative correlation between wages and the regional unemployment rate. Similarly, using a pooled cross section of household data and regional variation in the unemployment rate Baltagi et al. (2012a) estimated a wage curve. In the follow up paper, Baltagi et al. (2012b) estimated wage curves for the formal and informal workers separately. They established that the real wage elasticity of informal workers with respect to local unemployment rate is lower. Onaran (2002) estimated a wage equation using panel data at the industry level for the manufacturing sector from 1963 to 1995 and found that real wages were flexible during the post-1980 period characterized by growing integration into the world economy.

In this article, we investigate the cyclicality of real wages in Turkey using the sector level aggregate data for 1988–2018 and individual level panel data for 2005–2015. The focus of the paper is the individual level analysis and the estimates with aggregate data are supplemental. As for the individual level analysis, we estimate real wage cyclicality for the overall sample of

[2]The share of the workers who earn less than 105% of the minimum wage is less than 20% in the European countries except for Turkey where the share is 43% (Adema et al. 2019).

[3]Our study differs from earlier studies on Turkey using micro-data that estimate wage curves. The wage curve is a relation between wages and regional unemployment rates. Hence, the focus of the wage curve is not the cyclical sensitivity of wages but rather it associates wages with structural differences in the local labour market conditions. In this study, we demonstrate the effect of variations over time in the national unemployment rate on wages. In other words, we analyse the business cycle responsiveness of wages.

full-time employees and for the segments of the labour market that differ in terms of age, education level and the informality. We find no indication of wage cyclicality in the analysis while using aggregate data but procyclicality in the analysis with micro data suggesting countercyclical composition bias in the aggregate data. The degree of wage cyclicality shows variations among the subgroups according to the levels of education. Results regarding the adjustment along the lines of wage distribution are compatible with the binding minimum wage argument. Wages are cyclical only for the high-income wage earners for whom the minimum wage is not binding.

Our paper contributes to the existing literature in two ways. First, this is the first paper that estimates wage cyclicality for Turkey using longitudinal micro data. As we will discuss, it is not possible to precisely identify the nature of wage cyclicality using aggregate data due to the presence of a composition bias. Thus, accounting for heterogeneity among workers is important. Second, the literature on wage cyclicality that filters out changes in the characteristics of the average worker focuses primarily on the developed countries, especially the US. We provide an evidence on the cyclicality of real wages and the composition bias on a large developing economy with a labour market characterized by a binding minimum wage, employment protection through high severance payments and a high informality rate. Insofar as the design of the study, in *Section 2*, we discuss the developments of the Turkish economy and various characteristics of the Turkish labour market and institutions. In *Section 3*, we provide estimates of wage cyclicality using aggregate data without controlling for changes in the composition of the workforce. In *Section 4*, we present an individual level analysis. Finally, we conclude in *Section 5*.

2. COUNTRY CONTEXT: CHARACTERISTICS OF THE LABOUR MARKET AND INSTITUTIONAL SETTING

In the individual level analysis, we investigate the responsiveness of real wages to business cycle in Turkey for the period of 2005–2015. Even though the period is short, it covers a full cycle and coincides with the Great Recession. The performance of the Turkish economy for the period under analysis can be separated into three phases (Fig. 1, left panel). Prior to the financial turmoil, the Turkish economy was characterized by high growth rates as a result of structural reforms that took place in 2001 and the availability of global liquidity. The economy was hit hard by the financial turmoil with a modest growth in 2008 and a contraction in 2009. Nonetheless, the recovery was very fast; the output gap was already positive in 2011. Fuelled by the macro prudential policies as a response to the fears of over-heating of the economy, the GDP growth rate slowed down and the output gap fluctuated around zero after 2011.[4] Likewise, the unemployment rate jumped in 2009, but declined rapidly afterwards to below the pre-crisis levels. It started to increase after 2012 due to the slowing down of the economy. Hence, although our sample is short, we have sufficient variation in growth and unemployment dynamics.

Average real wage and unemployment data from the Household Labour Force Survey (HLFS) suggests no evidence of wage cyclicality (Fig. 1, right panel). During the crisis years, average real wages continued to increase at high rates despite the increase in the unemployment

[4]The output gap is the log deviation of GDP estimated using the HP filter between 1998 and 2018.

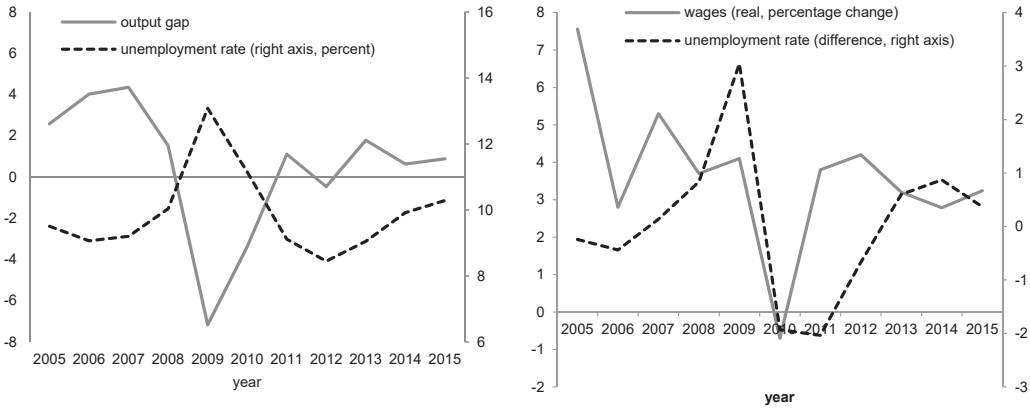

Fig. 1. Left panel: Output gap and the unemployment rate. Right panel: Change in the unemployment rate and the hourly wage rate

Source: TURKSTAT National Accounts and Household Labour Force Survey.

Note: Output gap is the annual average of the log deviation of GDP estimated using the HP Filter for the period of 1998–2019. Hourly wage is calculated from micro data of Household Labour Force Survey and it is deflated by CPI.

rate and declined in the early recovery period, displaying a rather countercyclical pattern. However, as we address in the following sections, this is due to the change in the composition of employees. After 2011, during a period of economic slowdown, the average wage continued to increase despite a rising unemployment rate.

The Turkish labour market has several characteristics that may strengthen or weaken the cyclicality of wages. The binding minimum wage in Turkey may be a determining factor against the cyclicality of wages if minimum wages are not adjusted according to the phase of the business cycle. In 2012, the ratio of the minimum wage to the median wage was around 0.72 in Turkey compared to the OECD average of 0.49 (Gürcihan-Yüncüler – Yüncüler 2016). According to the social security records, around 40% of the formal workers earned the minimum wage in the analysis period (Social Security Institution Statistics).

A council composed of the confederation of trade unions, the confederation of employer associations and the government determines the minimum wage annually at the end of the preceding year. The minimum wage is nationwide; there is no differentiation by industry or region. As a third party, the government has the key role since the trade unions and employer associations, in general, have very distinct minimum wage offers.

Minimum wage policy aims at securing a certain state of welfare and life standard for workers. Article 55 of the constitution of the Republic of Turkey expresses that the state is responsible for taking necessary actions so that employees earn fair wages commensurate with their occupations. In addition, the livelihood conditions of the employees and the economic situation of the country should also be taken into consideration in determining the level of minimum wage. Hence, the legislation is ambiguous regarding the cyclicality of the minimum wage. The government may propose minimum wage in a procyclical manner, higher wage growth during upturns and lower during downturns. On the other hand, it may consider the

political consequences of procyclical determination of minimum wages during downturns and decide not to suppress wages. Moreover, the government may also consider minimum wage as a demand management tool and vote for countercyclical minimum wage updating. As Fig. 2 below shows, there is no sign of countercyclical/pro-cyclical pattern in the minimum wages.

From an institutional viewpoint, the labour market in Turkey is rigid mainly due to strict employment protection legislation (World Bank 2014). The level of severance pay is considered a major contributor of the strict employment protection. A worker with 20 years of service is entitled to 20 months of payment compared to 6 months in OECD, 4 months in Europe and 10 months for the middle-income countries (World Bank 2006). Firms are obliged to pay severance payment in case of firing but those, who quit jobs, are not paid severance payment. Restrictions on hiring workers with fixed term contracts and on extending these contracts are another source of rigidity. Unlike most of the OECD countries, fixed term contracts are prohibited for permanent tasks in Turkey. There must be objective valid cases for fixed term contracts (such as the seasonal nature of a job or hiring for a specific project), and these contracts may be extended only in case of valid reasons. As such, Turkey has the highest score in terms of regulation on fixed term contracts.

While the Turkish labour market is strict in terms of employment protection, it is flexible in terms of wage setting. Only 6.7% of the Turkish formal workers are covered in collective bargaining compared to the OECD average of 32.7%, as of 2015. Similarly, trade union density is quite low; only 8% of the formal workers are members of trade unions (OECD Database 2013). Strict employment protection legislation with flexible wage bargaining procedures may direct firms to adjust to business cycles through wages instead of employment. Workers may accept

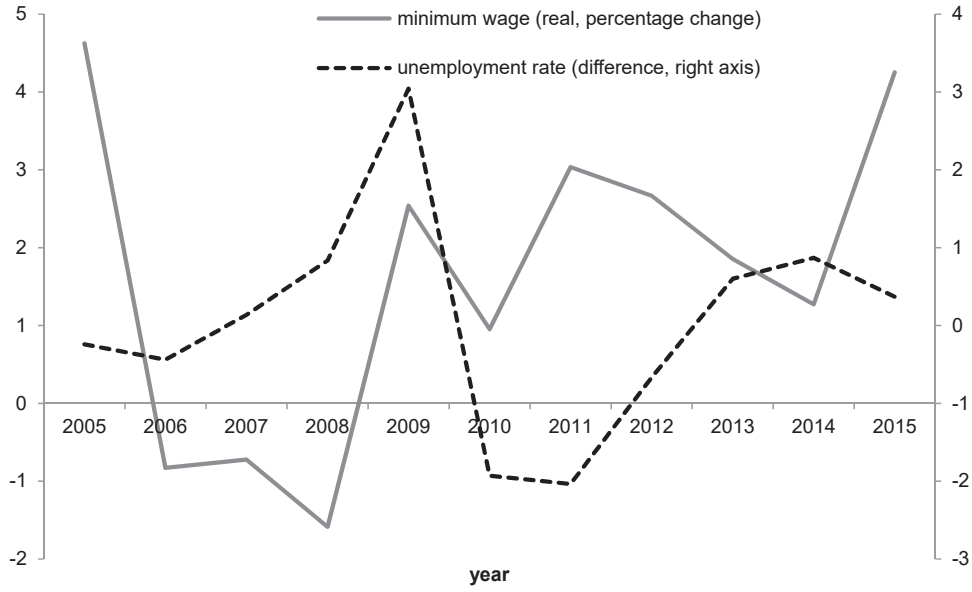

Fig. 2. Real minimum wage and the unemployment rate
Source: Ministry of Labour; Social Security and Household Labour Force Survey.

flexible wages instead of resigning in order not to lose benefits of employment protection legislation, most importantly the severance payment.

The level of informality is high in Turkey. According to Schneider et al. (2010), the share of shadow economy in Turkey doubles that of the OECD average. As of 2015, 34% of all employees and 21% of employees in the non-agricultural industries work informally in Turkey.[5] Firms are very flexible in adjusting informal employment as a response to business cycle. This may lead to a lower wage flexibility in the informal sector. In addition, the minimum wage can be used as a reference for informal workers, whose wages are at the lower end of the wage distribution (Khamis 2013; Gürcihan-Yüncüler – Yüncüler 2016).

In summary, the Turkish labour market has several characteristics that may support or inhibit the cyclicality of wages. On the one hand, strong employment protection legislation with weak wage bargaining power of workers may result in high elasticity of wages to business cycle. On the other hand, the binding minimum wage and high share of informality may weaken the cyclicality of wages.

3. CYCLICALITY OF AGGREGATE WAGE SERIES

Our primary objective is to obtain a composition bias free estimate of wage responsiveness to the business cycle using longitudinal individual data. We first look at the relation between aggregate wage figures and unemployment over a longer period compared to the consequent individual level analysis. A longer time span in aggregate data has the advantage of providing a more general picture of wage cyclicality as we are able to capture several episodes of economic downturns and upturns. For this purpose, we calculate the average annual wage per employee for major sectors by dividing the sector-level wage payments to sector-level employment. The analysis is carried out using annual data frequency for the period of 1988–2018.[6] We estimate the relation between change in average real wages and change in the unemployment rate as follows[7]:

$$\Delta w_{it} = \beta_0 + \beta_1 * \Delta U_t + \beta_2 \,\text{Recession} * \Delta U_t + \beta_3 * X + \varepsilon_{it} \quad (1)$$

where Δw_{it} is the logarithmic change in annual real wages at sector i and ΔU_t is the change in the unemployment rate between years t and t-1.

[5]Source: Household Labour Force Survey (HLFS) results released by TURKSTAT. Informality is widespread in small firms and declines with firm size; 39% of the workers in the non-agricultural firms with less than 10 employees work informally whereas the share declines to 3% in the firms with more than 50 employees. The rate of informality is higher among female (24%) and young (34%t) workers compared to male (20%) and older workers (19%).

[6]We aggregate sectors under NACE. Rev2. Classification into five major sectors: BDE (Mining and quarrying, Electricity, gas and water supply related activities); C (Manufacturing); F (Construction); GHIJ (Trade, Transportation and storage, Accommodation and Food service activities, Information and communication); KLMN (Financial and insurance activities, Real estate activities, Professional, administrative and support service activities). Agriculture and the sectors related to public services are excluded.

[7]The data source for the sector-level wage payments is the National Accounts Statistics, sector-level employment levels and unemployment rate are taken from the HLFS results. Wage payment data is deflated using the GDP deflator.

Table 1. Cyclicality of real wages (aggregate data)

	(1)	(2)	(3)
Explanatory variables			
ΔUR	0.207	0.208	–0.692
	(1.34)	(1.3)	(1.3)
ΔUR*Recession	–1.92	–1.79	0.503
	(1.91)	(1.96)	(2.24)
# of observations	150	150	150
Recession dummy	2009	2008–2009	2008–2010

Notes: ***, **, and * refer to 1%, 5% and 10% significance levels, respectively. Standard errors in the parenthesis are robust to clustering at a year level.

In order to see whether the Great Recession had an impact on wage cyclicality, we include an interaction term between change in the unemployment rate and a dummy variable for the recession. We use three alternative dummy variables for the recession. The first dummy variable equals to 1 only for 2009, when Turkey was hit hardest by the crisis, and tests whether there was a temporary jump in the cyclicality of wages. The second and third dummy variables extend to the period of the temporary jump between 2008–2009 and 2008–2010, respectively. The vector X represents other control variables, namely, sector-level time trends and dummy variables for earlier crisis in Turkey (1994 and 2001).

Table 1 shows the estimated results. The coefficient of change in the unemployment rate is insignificant, and there seems to be no change in wage response due to the recession under all specifications. Therefore, the analysis with aggregate data suggests acyclical real wages.

4. EVIDENCE FROM LONGITUDINAL PANEL

4.1. Data

The main data source in this study is the Survey of Income and Living Conditions (SILC) published by the TURKSTAT. The SILC has a rotating panel structure. Each year, a quarter of the sample is replaced with new participants; participants are surveyed in at most four consecutive years. We use the SILC panel data sets between the years 2006 and 2016. We only use the information of the participants surveyed for at least 2 years. In the analysis, we exclude self-employed and unpaid family workers and only use the observations of the full-time wage earners.[8] As a result, we end up with an unbalanced panel of 96,437 observations.

In the SILC, information on several income components, including wages, is collected on an annual basis based on the participant responses to income related items in the questionnaire.

[8]Full time wage earners refer to those working more than 35 h per week.

The reference period for income is the preceding calendar year of the survey. In this regard, our analysis is based on the wage data for the period of 2005–2015. We deflate wages using the consumer price index (CPI) of the respective reference year. Using the available data on the number of months spent in employment and usual weekly working hours, we convert annual income into hourly wage. Wage here is the gross wage. Detailed decomposition of wages into net wage and extras is not available.

Our sample reflects the main key facts on the labour force. In summary, informality – defined as the share of workers not registered with a social security institution – is high among workers; the participation of women in employment is low and majority of the workforce has a poor educational background.[9]

4.2. Econometric model

Following Verdugo (2016), we estimate the relationship between wages and unemployment rate with the (individual) fixed effects model. As in the previous studies, we use unemployment rate as a proxy for cyclical variations. The main parameter of interest is the coefficient of unemployment rate. It is important to realize that the unemployment rate is common in a year across all individuals. If errors are correlated within a year, then the estimate of the standard error of this coefficient would be biased. We correct this bias by using cluster robust standard errors as did Carneiro et al. (2012).[10] We adjust the critical values using t-distribution with degrees of freedom equal to the number of years minus one, rather than a standard normal, following Cameron – Miller (2015) in order to account for a limited number of clusters. In summary, we estimate the following model:

$$w_{it} = \beta_1 + \beta_2 * U_t + \beta_3 * \text{trend} + \beta_4 * \text{trend}^2 + \beta_5 * \text{tenure} + \beta_6 * \text{tenure}^2 + \alpha_i + \varepsilon_{it} \qquad (2)$$

where w_{it} is the logarithm of hourly real wage of individual i at year t and U_t is the unemployment rate at year t. In order to focus on the cyclical components of the wage and unemployment rate, we include a quadratic time trend as found in Solon et al. (1994). Individual fixed effects are captured by α_i, and ε_{it} is the error term.

The OLS estimate of the equation (2) is subject to the endogeneity bias. In order to have unbiased estimates in OLS, the individual fixed effects should be uncorrelated with the unemployment rate once the observable individual characteristics are controlled for. This assumption is quite strong and is violated if individuals with lower wage profiles (conditional on observed characteristics) are more likely to become unemployed or leave the labour market. Therefore, reliable estimates can only be obtained by utilizing a fixed effects panel data regression.[11]

[9]Basic summary statistics on the sample used in the analysis is added in the appendix (Table A1-1). These facts for the overall labour force can be directly observed from the HLFS results.

[10]Another approach for addressing this bias is using a two-step procedure as in the case of Solon et al. (1994) and Verdugo (2016). The first step in this method is to obtain compositionally adjusted average real wages for each year using a fixed effects regression. In the second step, compositionally adjusted real wages are regressed on annual unemployment rate. Since our time frame is short, we do not follow this approach.

[11]Solon et al. (1994) used first differencing instead of the fixed effects regression. However, the recent studies such as Carneiro et al. (2012) and Verdugo (2016) used fixed effects regressions in order to avoid restricting the sample to individuals working over two consecutive periods. We obtain qualitatively similar results using first differencing.

4.3. Results

Having shown that aggregate data does not reveal a sign of real wage cyclicality, we proceed with the estimation of equation 2. The first two columns of Table 2 present the results for monthly wages, and last two columns present the results for hourly wages. The first column shows the OLS regression results of equation (2) without taking into account the panel dimension. In column 2, we estimate equation (2) with fixed effects regression. In columns 3–4, we redo the same exercise for hourly wages.

OLS estimate in column 1 shows no sign of wage cyclicality in line with the macro-level results in Table 1. On the other hand, monthly wages are found to be pro-cyclical when worker fixed effects are controlled for, suggesting the presence of counter cyclical skill bias. The results for hourly wages in columns 3 and 4 point out to similar evidence.[12] If we take compositional changes into account, a 1 percentage point increase in the unemployment rate is associated with a 0.56 percentage point decline in the real wage growth. Our results indicate that wages are less procyclical in Turkey with respect to the US, the UK and Korea but comparable with the estimates on the Eurozone countries.[13]

In summary, we find that real wages respond to the state of the economy and the direction of the response is procyclical. However, if we do not exploit the panel dimension of the data, we

Table 2. Cyclicality of real wages (individual data)

Dependent variable: Real hourly earnings (natural log)				
	Real monthly wages		Real hourly wages	
	1 OLS	2 FE	3 OLS	4 FE
Explanatory variables				
UR	0.0689	-0.564**	0.247	-0.563**
	(0.200)	(0.240)	(0.204)	(0.246)
# of observations	96,437	96,437	96,437	96,437

Notes: ***, **, and * refer to 1%, 5% and 10% significance levels, respectively. Standard errors in the parenthesis are robust to clustering at a year level. All equations include a linear and a quadratic time trend and a linear and quadratic years of tenure variables.

[12]We also estimate cyclicality of working hours and find no sign of cyclicality when the fixed effects are taken into account. This is consistent with almost identical cyclicality of monthly and hourly wages.

[13]Micro evidence for the US points out to highly procyclical wages most of the time. In the empirical literature reported elasticities for all employees in the US range between –0.7 and –2.4 (Solon et al. 1994; Pissarides 2009). The same figure for the UK is estimated to be around –1.7 (Devereux –Hart 2006) and more than –2 for Korea (Shin 2012). In a recent paper, Verdugo (2016) estimated the average elasticity for eight Eurozone countries to be in the range of –0.6 to –1. De la Roca (2014) estimated an elasticity of –0.4 for Spain where the labour market institutions are considered rigid.

cannot find a significant negative response of wages to the unemployment rate.[14] These results suggest that monitoring aggregate wage data as a measure of demand pressures might be misleading for policy makers.

Earlier studies found that the cyclicality of wages may differ in several dimensions. For example, Swanson (2007) found that wages of lower income, younger and less-educated workers exhibit a greater procyclicality in the US, Martins (2007) also experienced a higher wage cyclicality for the younger workers in Portugal. Similar to them, we also estimate the cyclicality of hourly wages along the lines of age and education level. Furthermore, given that a considerable share of employees is working informally in Turkey unlike the developed countries, we also estimate the variation in cyclicality along formality dimension.[15] Focusing on the subgroups, we estimate four equations using the following model:

$$w_{it} = \gamma C_j + \beta_1 \left(U_t{*}C_j\right) + \beta_2 \left(U_t{*}(1 - C_j)\right) + \beta_3 \,\text{trend} + \beta_4 \,\text{trend}^2 + \beta_5 \left(\text{trend}{*}C_j\right) + \beta_6 \left(\text{trend}^2{*}C_j\right) + \beta_7 \,\text{tenure} + \beta_8 \,\text{tenure}^2 + \beta_9 \left(\text{tenure}{*}C_j\right) + \beta_{10} \left(\text{tenure}^2{*}C_j\right) + \alpha_i + \varepsilon_{it} \tag{3}$$

where C_j is an indicator variable equal to one if the individual belongs to *Category j* and zero otherwise. Subscript j stands for under-educated, young and informal workers in each equation. A worker is considered as under-educated if he/she does not have a high school diploma and as young if he/she is less than 30 years old. In our estimations, we allow for different constants and trends within each category.

The results are provided in Table 3. The first column shows that wages of young workers are acyclical, but the wages of workers aged 30 and over are cyclical. However, the difference is small and statistically insignificant. The results with respect to education level suggest cyclicality of wages come from higher-educated workers (with high school diploma or higher), whereas wages of low-educated workers display no sign of cyclicality. Moreover, the difference is statistically significant. These results are in contrast with the earlier findings of Swanson (2007) who argues that the wages of the less-educated workers have higher procyclicality. One possible explanation is that the less-educated experience more employment variation along the cycle and less variation in wages.[16] Given that informality is higher among the low-educated workers (Annex Table A1–1),

[14]We run an OLS model including control variables, namely industry and occupation fixed effects, gender, age and education group dummies, firm size, tenure, tenure squared and informal work dummy (Appendix 2, Table A-2). Including controls in the OLS regression, we obtain a negative coefficient estimate for the unemployment rate pointing out the procyclical nature of the real wages. However, the effect is smaller compared to the FE estimation results with the same control variables except those constants over time. The drawback of OLS with controls is that the controls refer to the same year when the survey is conducted whereas the reference period for income is the preceding calendar year. Hence, using controls in a synchronized manner shortens the sample. We also observe that the FE estimates with the control variables (column 3 of Table A-2) are similar to the FE estimates using the same restricted sample – but without controls (column 4). Given that including controls has no impact in the case of the FE, we continue the analysis without the controls.

[15]We define a worker as formal (informal) if she/he works formally (informally) throughout the sample. Hence, we neglect the observations that shift from informal employment to formal employment and vice versa. In doing so we lose only a small portion of observations (7.6%) pointing out the dual structure of the Turkish labour market.

[16]De la Roca (2014) used this argument for low level of wage cyclicality of women compared to men in Spain.

Table 3. Cyclicality of real wages for subsamples

Dependent variable: Real hourly earnings (natural log)			
	j = Young	*j = Under-educated*	*j = Informal*
Explanatory variables			
UR * (Category$_j$)	–0.514	–0.395	–0.319
	(0.353)	(0.264)	(0.245)
UR * (1-Category$_j$)	–0.575**	–0.707**	–0.613**
	(0.228)	(0.245)	(0.270)
# of observations	96,437	96,437	89,061
Difference in response to UR	0.0609	0.312**	0.294
(Category$_j$ = 1)–(Category$_j$ = 0)	(0.181)	(0.102)	(0.308)

Notes: ***, **, and * refer to 1%, 5% and 10% significance levels, respectively. Standard errors in the parenthesis are robust to clustering at a year level. Sample is restricted to wage earners that work more than 35 h per week. In all estimations individual level data from SILC survey is used. Data is an unbalanced panel for the period of 2005–2015. Under-educated refers to high school dropouts and below. Young covers those between 15 and 30 years old.

heterogeneity in wage cyclicality with respect to the education level may come from heterogeneity with respect to informality. The results for informality reveal that wages respond to the business cycle only in the formal sector.[17] The lack of significant wage cyclicality of informal workers suggests that employment is relatively more volatile, while wages are relatively less volatile compared to the rest of the population (Annex Table A1–2).[18] However, we should note that the difference in wage cyclicality between the formal and informal employees is not statistically significant.

The binding minimum wage might be another reason behind the acyclical wages of young and low-educated workers. As we discussed in *Section 2*, minimum wage in Turkey is binding and does not seem to be updated procyclically. Wages of under-educated workers tend to lie in the lower end of the wage distribution, and hence, may be more affected by the minimum wage (Appendix 1, Table A1-1). In addition, there is an evidence that minimum wage is used as a reference in the informal sector, although it is not binding for the informal workers (Gürcihan-Yüncüler – Yüncüler 2016). To test the impact of the minimum wage on wage cyclicality, we estimate equation (2) along the wage distribution. We partition the sample into four groups: workers who earn less than 80% of the minimum wage constitute group 1; workers who earn between 80% and 120% of the minimum wage constitute group 2. We then split the remaining sample into roughly two equal parts. Workers who earn between 120% and 220% of the

[17]We restrict the sample to those workers reported as either always formal or always informal. We do this so that results are not biased by those workers who shift between working formally and informally.

[18]Table A1-2 shows that mobility of the informal workers between different states of the labour market is much higher compared to the formal workers.

Table 4. Cyclicality of real wages along the wage distribution

	Group 1 $w \leq minw * 0.8$	Group 2 $minw * 0.8 < w \leq minw * 1.2$	Group 3 $minw * 1.2 < w \leq minw * 2.2$	Group 4 $w > minw * 2.2$
UR	0.439	–0.134	0.108	–1.090***
	(0.941)	(0.315)	(0.206)	(0.307)
# of observations	5,305	20,063	35,740	35,330

Notes: ***, **, and * refer to 1%, 5% and 10% significance levels, respectively. Standard errors in the parenthesis are robust to clustering at a year level. Sample is restricted to wage earners that work more than 35 h per week. In all estimations individual level data from SILC survey is used. Data is an unbalanced panel for the period of 2005–2015. All equations include a constant, trend, trend squared, tenure and tenure squared. *minw* is an abbreviation for the minimum wage.

minimum wage constitute group 3 and workers who earn more than 220 times the minimum wage constitute group 4. Workers are assigned a group according to their first wages observed and they remain in the same category so that switches across groups do not affect the results.

The results show that wages around and below the minimum wage are acyclical and wage cyclicality is due to high-wage earners (Table 4). The acyclical nature of wages for those who earn less than the minimum wage supports the earlier findings that the minimum wage is used as a reference for determining the wages of the low-income workers, even if they work informally. Hence, we may argue that the binding minimum wage suppresses wage cyclicality in Turkey.

5. CONCLUSION

In this paper, we estimated the degree of real wage response to the business cycle in Turkey using the individual level panel data for the recent period of 2005–2015. Empirical literature on wage cyclicality focuses on the developed countries. We contribute to the existing literature with an example from a developing country characterized by a high share of minimum wage earners, strict employment protection legislation and a high informality rate.

Our results suggest that there is a significant countercyclical composition bias inherent in the aggregate data and that the wages in Turkey are procyclical when compositional changes during the cycle are accounted for. Therefore, macroeconomists and policy makers should consider the fact that aggregate wage figures might be misleading as a measure of demand pressure in the economy during the times of severe swings in the economy. For an average employee, 1 percentage point increase in the unemployment rate is associated with a 0.6 percentage point decline in the real wage growth.

Looking at the subgroups, we find that wages of the under-educated and young workers are not responsive to the unemployment in Turkey, as opposed to the earlier findings for the US. We find that a higher degree of employment responsiveness of these groups and the binding minimum wage are likely the factors behind this result. Finally, we also find that the wages of the

informal workers are not responsive to the business cycle. Our analysis of wage distribution gives compatible conclusions. Wages are responsive to the business cycle only for the high-wage earners.

We argue that the characteristics of the Turkish labour market cause heterogeneous wage cyclicality estimates across the worker groups. Strict employment protection legislation with flexible wage bargaining procedures increases wage cyclicality of the formal, high-educated and older workers. These workers may be forced to accept wage offers in order not to lose their rights stemming from the strict employment protection legislation. On the other hand, informality and the minimum wage weakens this effect for the low-wage earners.

Our results suggest that increasing the minimum wage in bad times could result in higher unemployment for the low-wage workers, which constitute a significant portion of the labour force. For the rest of the labour force, wage rigidity is less binding and expected to have a lesser adverse impact on employment.

REFERENCES

Abraham, K. G. – Haltiwanger, J. C. (1995): Real Wages and the Business Cycle. *Journal of Economic Literature*, 33(3): 1215–1264.

Adema, J. – Giesing, Y. – Schönauer, A. – Stitteneder, T. (2019). Minimum Wages across Countries. *IFO DICE Report*, 16(4): 55–63.

Baltagi, B. H. – Baskaya, Y. S. – Hulagu, T. (2012a): The Turkish Wage Curve: Evidence from the Household Labor Force Survey. *Economics Letters*, 114(1): 128–131.

Baltagi, B. H. – Baskaya, Y. S. – Hulagu, T. (2012b): How Different Are the Wage Curves for Formal and Informal Workers? Evidence from Turkey. *Papers in Regional Science*, 92(2): 271–283.

Barsky, R. B. – Solon, G. (1989): Real Wages over the Business Cycle. *NBER Working Paper*, No. 2888.

Bils, M. J. (1985): Real Wages over the Business Cycle: Evidence from Panel Data. *Journal of Political Economy*, 93(4): 666–689.

Cameron, A. C. – Miller D. L. (2015): A Practitioner's Guide to Cluster-Robust Inference. *Journal of Human Resources*, 50(2): 317–372.

Carneiro, A. – Guimarães, P. – Portugal, P. (2012): Real Wages and the Business Cycle: Accounting for Worker, Firm, and Job Title Heterogeneity. *American Economic Journal: Macroeconomics*, 4(2): 133–152.

Chirinko, R. S. (1980): The Real Wage Rate over the Business Cycle. *The Review of Economics and Statistics*, 62(3): 459–461.

Coleman, T. S. (1984): *Essays on Aggregate Labor Market Business Cycle Fluctuations*. Ph.D. Thesis, University of Chicago, Department of Economics.

de la Roca, J. (2014): Wage Cyclicality: Evidence from Spain Using Social Security Data. *Series: Journal of the Spanish Economic Association*, 5(2-3): 173–195.

Devereux, P. J. (2001): The Cyclicality of Real Wages within Employer-Employee Matches. *Industrial & Labor Relations Review*, 54(4): 835–850.

Devereux, P. J. – Hart, R. A. (2006): Real Wage Cyclicality of Job Stayers, Within-Company Job Movers, and Between-Company Job Movers. *ILR Review*, 60(1): 105–119.

Dickens, R. – Manning, A. (2004): Has the National Minimum Wage Reduced UK Wage Inequality? *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 167(4): 613–626.

Gambetti, L. – Messina, J. (2018): Evolving Wage Cyclicality in Latin America. *The World Bank Economic Review*, 32(3): 709–726.

Grant, D. (2001): A Comparison of the Cyclical Behavior of Union and Nonunion Wages in the United States. *Journal of Human Resources*, 36(1): 31–57.

Gurcihan-Yüncüler, H. B. – Yüncüler, C. (2016): *Minimum Wage Effects on Labor Market Outcomes in Turkey*. CBRT Working Papers, No. 1614.

Ilkkaracan, I. – Selim, R. (2003): The Role of Unemployment in Wage Determination: Further Evidence on the Wage Curve from Turkey. *Applied Economics*, 35(14): 1589–1598.

Keane, M. – Moffitt, R. – Runkle, D. (1988): Real Wages over the Business Cycle: Estimating the Impact of Heterogeneity with Micro Data. *Journal of Political Economy*, 96(6): 1232–1266.

Khamis, M. (2013): Does the Minimum Wage Have a Higher Impact on the Informal than on the Formal Labour Market? Evidence from Quasi-Experiments. *Applied Economics*, 45(4): 477–495.

Konyali, G. (2012): Wage Curve Evidence from Turkey's 2007–2009 Income and Living Conditions Survey. *Investigaciones Regionales*, 24: 199– 210.

Maloney, W. – Mendez, J. (2004): Measuring the Impact of Minimum Wages. Evidence from Latin America. In: *Law and Employment: Lessons from Latin America and the Caribbean.* University of Chicago Press, pp. 109–130.

Martins, P. S. (2007): Heterogeneity in Real Wage Cyclicality. *Scottish Journal of Political Economy*, 54(5): 684–698.

Martins, P. S. – Solon, G. – Thomas, J. P. (2012): Measuring what Employers do about Entry Wages over the Business Cycle: A New Approach. *American Economic Journal: Macroeconomics*, 4(4): 36–55.

Neumark, D. – Schweitzer, M. – Wascher, W. (2004): Minimum Wage Effects throughout the Wage Distribution. *Journal of Human Resources*, 39(2): 425–450.

OECD (2013): *OECD Employment Outlook*. OECD Publishing.

Onaran, Ö. (2002): Measuring Wage Flexibility: The Case of Turkey Before and After Structural Adjustment. *Applied Economics*, 34(6): 767–781.

Pissarides, C. A. (2009): The Unemployment Volatility Puzzle: Is Wage Stickiness the Answer? *Econometrica*, 77(5): 1339–1369.

Schneider, F. – Buehn, A. – Montenegro, C. E. (2010): Shadow Economies All Over the World: New Estimates for 162 Countries from 1999 to 2007. *World Bank Policy Research Working Paper Series*, No. 5356.

Shin, D. (2012): Cyclicality of Real Wages in Korea. *The BE Journal of Economic Analysis & Policy*, 12(1): 1–19.

Shin, D. – Solon, G. (2007): New Evidence on Real Wage Cyclicality within Employer – Employee Matches. *Scottish Journal of Political Economy*, 54(5): 648–660.

Social Security Institution Statistics, http://www.sgk.gov.tr/wps/portal/sgk/tr/kurumsal/istatistik/sgk_istatistik_yilliklari.

Solon, G. – Barsky, R. – Parker, J. A. (1994): Measuring the Cyclicality of Real Wages: How Important Is Composition Bias? *The Quarterly Journal of Economics*, 109(1): 1–25.

Swanson, E. T. (2007): Real Wage Cyclicality in the Panel Study of Income Dynamics. *Scottish Journal of Political Economy*, 54(5): 617–647.

Tremblay, C. H. (1990): Wage Patterns of Women over the Business Cycle. *Quarterly Review of Economics and Business*, 30(1): 90–102.

Verdugo, G. (2016): Real Wage Cyclicality in the Eurozone Before and During the Great Recession: Evidence from Micro Data. *European Economic Review*, 82: 46–69.
World Bank (2006): *Turkey: Labor Market Study*. Washington, DC.
World Bank (2014): *Turkeys Transitions: Integration, Inclusion and Institutions*. Washington, DC.

APPENDIX 1: Summary statistics of the sample

Table A1–1. Summary statistics of the sample

	2005	2015	2005–2015 average	Share within quartiles of hourly real wage (%)			
				1	2	3	4
Female[a]	18	25	20	26	22	17	24
Informal[a]	35	16	20	53	20	11	2
Youth/Old	41/32	16/16	23/19				
Under/High educated	49/15	29/4	34/6				
Youth[a]	37	29	31	41	36	30	16
Low-skilled[a]	59	48	51	78	66	48	13
Tenure (years)	14	16	15	14	14	15	17
Age groups[a]							
15–29	37	28	30				
30–55	60	66	65				
55+	3	6	5				
Education groups[a]							
Below high school	59	48	51				
High school	25	24	24				
University and above	16	28	26				
Labour force participation rate[b]	44.1 (44.8)	46.6 (51.3)	45.9 (46.9)				
Men	70.9 (68.8)	70.2 (71.6)	70.4 (69.4)				
Women	17.8 (21.7)	23.0 (31.4)	21.6 (25.7)				
Unemployment rate (UR) [b]	9.3 (9.5)	7.4 (10.3)	7.9 (9.9)				
UR Youth	16.9 (17.5)	14.5 (18.6)	15.2 (18.1)				

Notes: (a) Figures reflect shares (%) within wage employed used in the analysis. Youth refers to age groups 15–29 years, under skilled refers to level of education less than high school degree. (b) Calculated using full sample. Figures in parentheses are officially released numbers from the HLFS.

Table A1–2. Labour market mobility and transition in labour market status (2005–2015)

	Wage employed (formal)	Self-employed (formal)	Wage employed (informal)	Self-employed (informal)	Unemployed	Inactive
Wage employed (formal)	90	0	2	1	3	4
Self-employed formal	3	84	2	7	1	3
Wage employed (informal)	12	1	65	4	6	12
Self-employed (informal)	3	3	4	80	1	9
Unemployed	19	1	16	3	28	34
Inactive	2	0	2	1	2	93

Source: Authors' calculations using SILC data base. Figures represent the average of the transition probabilities for each consecutive year constructed for the period from 2005 to 2015.

APPENDIX 2: Real wage cyclicality: OLS with controls and FE Model, and First Differencing

Table A2.1. Real wage elasticity: OLS with controls and FE Model and First differencing

Dependent variable: Real hourly earnings (natural log)					
	OLS	OLS	Fixed effect (FE)	Fixed effect (FE)	First difference
Explanatory variables					
UR	0.467	–0.346*	–0.459*	–0.469*	–0.937*
	(0.174)	(0.172)	(0.236)	(0.258)	(0.522)
Controls	–	x	x	–	–
# of observations	58,676	58,676	58,676	58,676	52,709

Notes: ***, **, and * refer to 1%, 5% and 10% significance levels, respectively. Standard errors in the parenthesis are robust to clustering at a year level. SILC Data is an unbalanced panel for the period of 2005–2015. Sample is restricted to wage earners that work more than 35 h per week. All equations include a quadratic trend. Controls include industry and occupation fixed effects, gender, age and education group dummies, firm size, gender, years of tenure and its Square and informal work dummy. The fixed effects regression in the fourth column uses the same model in our benchmark model (Table 2, column 2) but uses the sample where wage data is synchronized with individual controls, as in the model in the third column. First difference specification in the final column includes a linear trend and tenure variable.