

Overtime in the Private Sector in Turkey: an Analyze by Tobit Model

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Abstract

Overtime in the private sector in Turkey is the working hours which excess of 45 hours performed by individuals aged 18 and over. The paper is one of the studies that use the individual overtime periods in the private sector. Our purpose is to see the reasons for doing overtime by applying Tobit analysis with demographic and socioeconomic variables. In this context, it has benefited from the data obtained from the Household Labor Force survey conducted by the Turkish Statistical Institute between 2014-2017. When the results of the analysis were examined, it was found that while the age of a person increases the overtime decreases and illustrates a concave function; as the level of education increases, the overtime decreases, also it is concluded that especially in the service and the mining sector and when the number of employees is between 10 to 20, and those whose wages are below the average wage are doing overtime.

Keywords: Overtime, Tobit Model

JEL Classifications: J01, C24

Introduction

According to economic theory, the choice of people to work is based on the choice of how they prefer to spend their time. This choice consists of either working for a fee or leisure time. The preference of the person to spend their free time is considered as an alternative to the work preference. In the economic theory of the working decision, there are substitution and income effects at the center of the relationship between wage and time spent working. It is assumed that both of these effects are the result of an increase (decrease) in wages and that each has a certain effect on the time that a person is willing to work (Buerhaus 1991). According to the standard labor market theory, overtime hours are the result of both demand and supply factors. The standard labor supply theory states

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that the working hours provided by an employee depend on the externally paid hourly wage and non-labor income. An individual focuses on maximizing benefits in time and budget constraints. The income effect indicates that with the increase of wages, the potential income of the worker increases and the worker will demand more free time. The worker will not offer his/her labor with income effect, he/she will want to work fewer hours. The substitution effect is in the opposite direction. The lower hourly wages have a substitution effect and the increase in hourly wages increases the supply of labor for working hours. In other words, an increase in the hourly wage rate for low-wage workers (e.g. an increase in overtime premium) can encourage more hours of work (overtime).

The aim of this study is to identify the factors that determine the overtime of people working in the private sector in Turkey. The reason why the private sector is examined is to try to see in which sector the overtime period exceeding 45 hours in 2014-2017 and whether low wages are in the smaller firms. As in participation in the labor force or additional working hours or wage theories, were examined determinants of overtime of a person in this study by the Tobit model. The independent variables such as demographic characteristics of the individual and the region where the worker lives were used.

Background

Dembe et. al (2005) analyzed the impact of overtime on occupational injuries in the United States between period of 1987 to 2000. They used National Longitudinal Survey of Youth data to investigate the problem by Cox proportional hazards regression method. They have found that working in jobs with overtime schedules was associated with a 61% higher injury hazard rate compared to jobs without overtime. Thomas and Raynar (1997) have investigated the effects of scheduled overtime on construction labor efficiency. They have used the data collected from four active construction projects. They have found that scheduled overtime results in a loss of productivity. Golden and Wiens-Tuers (2005) investigated who had been forced to work overtime. They have used 2002 General Social Survey data and found that 26 percent of employed work overtime as mandatory. According to their findings mandatory overtime is more common in male and foreign-born and non-urban workers. Bauer and Zimmermann (1999) aimed to show the overtime levels of the group of workers with the highest risk of unemployment in Germany. According to their results obtained from Tobit analysis, factors such as age, marital status, year of education and growth rate had an effect on overtime, while being blue or white collar was not statistically significant on overtime. Böckerman (2002) explained the prevalence of overtime

over the manufacturing industry in Finland using the Tobit analysis method. Güneş et al. (2016) explained the factors affecting the working hours of married women in the labor force and the factors that are effective in the overtime of married women in employment by using tobit and discrete models.

Estimation

Truncation or censoring a population may arise when a study carried out about a subpopulation of the underlying population. Truncation is essentially a characteristic of the distribution from which the sample data are drawn. However, censoring is a feature of the sample data (Greene 2003). When the dependent variable is censored, all observations above or below a certain value are converted to a single value. A censored variable consists of two parts: one is the continuous and the other is the discrete part. Consider a random variable $y^* \sim N(\mu, \sigma^2)$ which is censored at point $y = 0$. The new random variable y^* can be defined as

$$\begin{aligned} y &= 0 & \text{if } y^* \leq 0 \\ y^* &= y & \text{if } y^* > 0 \end{aligned}$$

The probability of y being censored can be defined as

$$\Pr(y^* = 0) = \Pr(y \leq 0) = \Phi\left(-\frac{\mu}{\sigma}\right) = 1 - \Phi\left(\frac{\mu}{\sigma}\right)$$

where Φ is the cumulative Normal distribution function (Greene 2003).

The Tobit model is used when the dependent variable is censored. Standart Tobit model can be expressed as

$$\begin{aligned} y_i^* &= \mathbf{x}_i^T \boldsymbol{\beta} + u_i & , \quad i = 1, 2, \dots, n \\ y &= 0 & \text{if } y^* \leq 0 \\ y^* &= y & \text{if } y^* > 0 \end{aligned}$$

where u_i 's are i.i.d. variables from $N(0, \sigma^2)$. It is assumed that y_i and x_i are observed for $i = 1, 2, \dots, n$ but y_i^* 's are unobserved if $y_i^* \leq 0$ (Amemiya 1985).

If we use ordinary least-squares to estimate a regression to censored observations, the estimates are inconsistent. Therefore, the Tobit model is necessary.

The Data

Most EU Member States and developed countries use the concepts defined by the International Labor Organization (ILO) to obtain comparable statistics on the labor market. With the standards developed by ILO, data collection and international comparisons were made. Since 1988, in the framework of ILO standards Households Labor Force Survey in Turkey with labor market statistics are collected by the Turkish Statistical Institute. The raw data of Household Labor Force Survey 2014-2017 were used in the study. Factors affecting the individuals who work overtime aged 18 and over in the private sector in Turkey is examined. Firstly, the variables to be used in the model will be introduced and then descriptive statistics will be discussed. In addition to individual and demographic variables such as gender, age, education, marital status, tenure, job status, registration to Social Security Institution (SSI), number of the employee at the workplace, sector; we added household size, wage, and the region as independent variables to the model. The dependent variable used in the model is the working hours which exceed 45 hours per week. In the household labor force survey of the 2014-2017 period, the working hours are determined on a weekly basis. The dependent variable specified as weekly working hours varies between 0-99 hours in the raw data set. However, the weekly working hours determined according to Article 63 of the Turkish Labor Law No. 4857 is 45 hours maximum. From this point, the weekly overtime working hours variable consists of individuals who work over 45 hours or more. The number of observations consists of 285,785 people. The truncated variable can be explained such a way that a person who worked 45 hours is doing 0 hours of overtime, and 50 hours of work means 5 hours of overtime. Since the overtime work done by the individuals working in the private sector was examined in the study, the employees in the public sector were excluded from the data set. According to article 8(a) of the Labor Regulations about overtime and overtime periods, persons under the age of 18 cannot be employed overtime as they fall under the category of child labor.

Descriptive Statistics

Descriptive statistics are given in the Table 1. The wages of the employed individuals were deflated based on the year 2014. When we compare the average and median wages, the median is below the average (Mean = 501.187; Median = 460.59), which indicates the existence of a disparity in income distribution. Therefore, the real median wage was used in our analysis. In the following section, interaction terms were created and their effects on the model were investigated

based on our hypothesis that "the smaller the organization or the workplace is the employed person does the more overtime".

When the demographic variables are examined, it is seen that 21% of them are women and 79% are men among the employees whose weekly working hours exceeding 45 hours. When the distribution of these people according to age groups is taken into consideration, it can be seen that the ratio of those who are around 18-24 and 30 years is 14%; while 45 years and over of age, this ratio decreases gradually. Considering the education levels of individuals, the ratio of primary school graduates (5 years) is approximately 39%. As the level of education increases, the percentage of those working for 45 hours or more is decreasing. The percentage of married people is 74%. When we examine the sample according to their employment status; 66% of them are paid, salaried or casual; 46% work in the service sector, 60% work in the firms with 10 or fewer workers. It is seen that 30% is not registered to SSI. The average number of people living in households is 4, while the average of overtime is 11 hours. According to the Turkish Statistics Institute's Level-1 Region classification, 15% of the employees live in the Aegean region. In the 2014-2017 period's raw data, the minimum sample size is in 2017 (approx. 5%). Base categories to be used in the model are given in brackets in Table 1.

Table 1. Descriptive Statistics

Variables	Frequency	Percentage
Gender		
Woman (BaseCategory)	60,447	21.15
Man	225,338	78.85
Age Groups		
18 to 24	40,173	14.06
25 to 29	6,887	2.41
30 to 34	37,490	13.12
35 to 39	41,989	14.69
40 to 44	42,697	14.94
45 to 49	39,824	13.93
50 to 54	31,577	11.05
55 to 59	22,683	7.94
60 to 64	14,058	4.92
65+ (Base Category)	8,407	2.94

Variables	Frequency	Percentage
Level of Education		
Uneducated	16,343	5.72
Primary School	109,814	38.43
Middle School	58,874	20.60
High School	66,909	23.41
University	31,847	11.14
Graduate School (Base Category)	1,998	0.70
Marital Status		
Single	65,137	22.79
Married (Base Category)	210,812	73.77
Wife/Husband Dead	2,499	0.87
Divorced	7,337	2.57
Employment Status		
Employee (Base Category)	188,569	65.98
Employer	19,187	6.71
Self-Employed	56,098	19.63
Unpaid Family Worker	21,931	7.67
Social Security Status		
Registered (Base Category)	201,921	70.65
Unregistered	83,864	29.35
Sector		
Agriculture	50,216	17.57
Manufacturing	69,482	24.31
Service	134,002	46.89
Mining	1,940	0.70
Construction	30,145	10.55
Region		
İstanbul	33,232	11.63
West Marmara	21,398	7.49
Aegean (Base Category)	41,576	14.55
East Marmara	29,107	10.18
West Anatolia	32,996	11.55
Mediterranean	31,391	10.98
Middle Anatolia	15,546	5.44

Variables	Frequency	Percentage		
West Black Sea Region	22,925	8.02		
East Black Sea Region	12,026	4.21		
Northeast Anatolia	11,262	3.94		
Middleeast Anatolia	13,365	4.68		
Southeast Anatolia	20,961	7.33		
The Number of Employee in the Firm				
10 or less	171,484	60.00		
Between 11-19	16,093	5.63		
Between 20-49	36,199	12.67		
50 or more (Base Category)	60,852	21.29		
Unknown, but more than 10	1,157	0.40		
Median Wage*Num.ofEmployee(10)	50,409	17.64		
Median Wage*Num.ofEmp.(11-19)	8,011	2.8		
Median Wage*Num.ofEmp.(20-49)	18,536	6.49		
Median Wage*Num.ofEmp.(50+)	27,154	9.5		
Median Wage*Num.ofEmp.(10+)	741	0.26		
	Mean	Std. Dv.	Minimum	Max.
Experience	9.5553	10.0546	0	76
Household size	3.8630	1.7890	1	23
Weekly Overtime	10.9521	10.9328	0	99
Number of Observations	285,785			

Tobit Model Estimation of Overtime Hours

The model was firstly estimated by using the ordinary least squares (OLS) method with variables thought to be effective on overtime. However, since the assumption of normality and constant variance violated, a re-estimate was made with robust Tobit model and the evaluations were made according to this model.

Table 2. Tobit Model Outputs

	Coefficient	Std. Err.	<i>t</i>	P> <i>t</i>	[95% Conf. Interval]	
Household Size	0.3385	0.0148	22.77	0.000	0.3093	0.3676
Male	2.8627	0.0589	48.56	0.000	2.7471	2.9782
Ages groups						
Age 18 to 24	1.8426	0.1865	9.87	0.000	1.4768	2.2083
Age 25 to 29	-0.8141	0.2225	8.71	0.000	1.1983	1.8948
Age 30 to 34	1.5465	0.1776	8.71	0.000	1.1983	1.8948
Age 35 to 39	1.2136	0.1712	7.09	0.000	0.8780	1.5493
Age 40 to 44	1.2115	0.1696	7.14	0.000	0.8789	1.5441
Age 45 to 49	1.0025	0.1688	5.94	0.000	0.6715	1.3334
Age 50 to 54	1.2549	0.1700	7.38	0.000	0.9215	1.5883
Age 55 to 59	0.9464	0.1736	5.45	0.000	0.6059	1.2868
Age 60 to 64	0.7030	0.1847	3.80	0.000	0.3408	1.0652
Education levels						
Uneducated	8.4965	0.2993	28.38	0.000	7.9097	9.0833
Primary Sch.	7.6864	0.2807	27.38	0.000	7.1362	8.2366
Middle Sch.	7.3156	0.2824	25.90	0.000	6.7621	7.8691
High Sch.	6.0801	0.2802	21.70	0.000	5.5310	6.6293
University	3.1327	0.2831	11.07	0.000	2.5778	3.6876
Marital Status						
Married	0.1898	0.0726	2.61	0.009	0.0474	0.3323
Divorced	0.8212	0.1580	5.20	0.000	0.5115	1.1309
Wife/Hus. Dead	0.3847	0.2741	1.40	0.160	-0.1525	0.9220
Unregistered	0.6935	0.0676	10.26	0.000	0.5610	0.8260
Employment status at this job						
Experience	-0.0736	0.0034	-21.54	0.000	-0.0803	-0.0669
Employer	6.6274	0.1014	65.35	0.000	6.4286	6.8262
Self-Employed	4.9376	0.0881	56.02	0.000	4.7648	5.1103
Unpaid Family Worker	6.1575	0.1262	48.79	0.000	5.9102	6.4049
(median wage) *(number of employees in the workplace)						
Med.Wage*(10)	2.0706	0.0690	29.98	0.000	1.9352	2.2060
Med.Wage*(10+)	3.1470	0.4468	7.04	0.000	2.2712	4.0228
Med.Wage*(11 to 19)	1.1188	0.1298	8.61	0.000	0.8642	1.3734
Med.Wage*(20 to 49)	0.0724	0.0871	0.83	0.406	-0.0984	0.2432
Code of the main activity of the						

	Coefficient	Std. Err.	<i>t</i>	P> <i>t</i>	[95% Conf. Interval]	
organization						
Agriculture	1.4384	0.1043	13.79	0.000	1.2339	1.6429
Mining	3.0127	0.2636	11.43	0.000	2.4959	3.5295
Construction	1.4993	0.0789	18.99	0.000	1.3445	1.6540
Service	4.8139	0.0553	87.05	0.000	4.7055	4.9223
Satistical Regions of Turkey (SE Level 1)						
Istanbul	0.2070	0.0910	2.27	0.023	0.0285	0.3855
West Marmara	2.1149	0.1077	19.64	0.000	1.9038	2.3260
Aegean	-0.1702	0.0899	-1.89	0.058	-0.3464	0.0060
West Anatolia	1.2542	0.0973	12.88	0.000	1.0633	1.4450
Medditerrenean	1.3963	0.1017	13.73	0.000	1.1970	1.5956
Middle Anatolia	0.8795	0.1094	8.03	0.000	0.6650	1.0941
West Black Sea	3.2733	0.1110	29.47	0.000	3.0556	3.4910
East Black Sea	-0.9800	0.1262	-7.76	0.000	-1.2274	-0.7325
Northeast Anat.	7.0171	0.1483	47.30	0.000	6.7263	7.3078
Middleeast Anat.	3.8171	0.1315	29.01	0.000	3.5592	4.0750
Southeast Anat.	4.1526	0.1212	34.24	0.000	3.9149	4.3903
Year dummies						
Year 2014	2.6418	0.1052	25.09	0.000	2.4355	2.8482
Year 2015	1.7957	0.1033	17.37	0.000	1.5930	1.9983
Year 2016	0.9600	0.1027	9.34	0.000	0.7585	1.1614
Constant	-9.6727	0.3517	-27.50	0.000	-10.3622	-8.9832

In the robust Tobit model from Table 3, only employees who work 45 hours and more were taken into the model and non-overtime workers were censored with zero. The number of observations is 44,658 after left censoring. According to the results in Table 3, as the number of people living in the household increases the number of overtime hours will increase. All the age groups except the 25-29 are statistically significant. It is observed that young people work more than those aged 65 and over. The fact that an individual works more overtime when young, coincides with economic and social expectations. Güneş et al. (2016) have obtained similar results. Men do more overtime than women. Because of the patriarchal family structure in Turkey, men handle cost of living, and for that reason, men work more overtime. According to Böckerman (2002), women work less than men. As the level of education increases, overtime hours decreases and coefficients also supporting this result statistically. The higher the education level of the people, the lower the working hours. Compared to those with master and doctoral degrees, the most overtime workers are those who did not graduate from

any level of school and have a low level of education. According to Bauer and Zimmermann (1999), the time spent in education increases with one year and the overtime hours decrease. Similar results were obtained from this study. The person works less as his/her tenure increases. It is seen that individuals who are not registered to SSI work more overtime. Persons who need a job and are not registered as unemployed or who are working illegally might be forced to work overtime by their employers. When the results are evaluated in terms of marital status, it is seen that married and divorced individuals work more than single. Bauer and Zimmermann (1999) found similar results. The employer, the unpaid family worker, and the self-employed are working more overtime than wage earners. Güneş et al. (2016) obtained similar results. Those who work in small enterprises employing 10 to 20 employees and whose wages are below average are working more overtime. When the sector-based analysis was performed, it was seen that overtime is the highest in the service sector and mining sector compared to the manufacturing sector. When the individuals are analyzed in terms of regions, the effect of all regions except Eastern Black Sea and Aegean region is statistically significant. In general, people living in rural areas are expected to work more overtime. Individuals living in these regions may undertake more overtime due to their own preferences or employer's request as they have lower wage under general conditions. Apart from this, people may prefer to work overtime as they need more financial income in order to benefit from the opportunities to live in big cities or metropolises. Gralla et al. (2017) found that in their study, the inhabitants of the developed parts of Germany work more than those in the less developed parts.

Discussion and Conclusion

Overtime is more than 45 hours of work done by individuals who are older than 18 years of age, with their own preferences or employer's wishes or obligatory circumstances. The yearly limit of overtime is 270 hours and the pay is paid to the employee as 50% more wage. While average weekly working time is 48.7 hours in Turkey, it is 36.8 hours in the OECD countries. Working for long hours gives severe social and socio-economic damage to individuals. The results of working for long hours may be fatigue, occupational accidents, and health problems. As overtime hours increase, there is a decrease in productivity. Regulation of overtime hours will be more beneficial for both employees and employers. The level of education of individuals working overtime plays an important role on overtime in nowadays.

The models were estimated by OLS and robust Tobit. While overtime is seen much more at low education level and at younger ages, decreases by advanced age and experience. It has been observed that men do more overtime than women. The hypothesis "For those workers who work for establishments which have 10 to 20 workers and those below average wage do more overtime." is not rejected. It has been found that those who work in the service sector and in the mining sector, or self-employed or who are employers or unpaid family workers do more overtime. With reference to the obtained results, overtime in Turkey is significantly higher than the average in the OECD countries. However, from the past to the present, a decrease in overtime hours has been observed. For example, as seen from the model in Table 2, there is a decreasing trend in overtime from 2014 to 2016. However, the effect is still positive.

The general tendency in the world is that the actual weekly working time decreases. Compared with other countries, it can be said that the working time in Turkey is much more. In order to overcome this situation, a sector should have which meets the structural reforms of globalization and realizes the transformation of the information age and keeps up with the technological developments. Thereby, it can create economic growth in the sector and the problems of employment and income distribution difference can be overcome. There are some points not included in this study. These are: the concept of overtime by employer perspective, measuring social factors and employee's productivity. However, since the Turkish Statistical Institute's Household Labor Force Survey is not included this data, these variables are not included in the model.

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