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Real Minimum Wage and Informal Employment in Iran

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Abstract
This study investigates the effects of real minimum wage on informal employment in rural and urban areas of provinces of Iran between 2005 and 2018. For this aim, by applying microdata on the income-expenditure plan of urban and rural households and with the aid of the minimum wage index, the ratio of informal employment to total employment was calculated. Preliminary data analysis shows that one-third of urban employees and more than half of rural employees are engaged in informal occupations during this period. Then, the research model was estimated using the panel data method. Estimating the random effects model shows that the real minimum wage and tax burden positively affect informal employment in urban areas. In rural areas, the estimation using the Fixed effects method (and FGLS estimator) shows that real minimum wage, tax burden, and Gini coefficient positively affect informal employment. Furthermore, the interactive effect coefficient of real minimum wage considering the unemployment rate illustrates that in urban areas, the increase of unemployment rate increases the positive effect of real minimum wage. In rural areas, the increasing unemployment rate reduces the positive effect of the real minimum wage.

Highlights

- One-third of urban employees and more than half of rural employees are working in informal jobs.
- The impact of the minimum wage on informal employment is equal in urban and rural areas.
- Income inequality only affects informal employment in rural areas.
- In rural areas, the tax burden on informal employment is greater than in urban areas.

1. Introduction

Minimum wage is one of the labor market laws that is enforced in most countries in different ways. Minimum wages have been defined as the minimum amount of remuneration that an employer is required to pay wage earners for the work performed during a given period, which cannot be reduced by collective agreement or an individual contract (ILO, 2014). A typical purpose of minimum wage policies is to support low-wage workers and fight inequality and poverty (Belser & Rani, 2015). In Iran, according to law[1], the Supreme Labor Council is supposed to determine the minimum wage considering declared inflation percentage by the Central Bank and the minimum living costs of an average population household. Therefore, the minimum wage is determined regardless of labor productivity and supply and demand conditions in the labor market. Although increasing the minimum wage appears to benefit low-income laborers, the minimum wage law should be reconsidered if it decreases labor demand and increases unemployment (Pazhuyan & Amini, 2001). There are also concerns in developing countries that the minimum wage will promote the labor force in the informal market (Danziger, 2010). The World Bank report (1990) announced a decline in formal employment due to the rising minimum wage, which leads to workers entering low-wage informal labor markets and increasing employment in this sector.

Studies conducted by Nayeb (1999), Baba Heydari (2001), Arbabian (2008), and Zenoz and Mehr Azin (2011) revealed that the share of informal employment in the labor market of Iran is very considerable (more than one-third of total employment). Although informal employment can improve the income status of individuals in society, on the other hand, it can cause destructive effects on government and society. Some disadvantages of informal employment are the incorrect estimation of GDP, decrease in government's obtained tax and consequently its harmful effect on its policies and income distribution, growth of class distinction, and finally reducing social welfare (Salimifar & Keivanfar, 2010). Therefore, it is necessary to investigate the effective factors on informal employment and prevent its spread.

Regarding the importance of the informal employment issue and the probable impact of minimum wage on it, this study attempts to examine the effects of minimum wage on informal employment in the provinces of Iran by urban and rural areas between 2005 - 2018. This study is distinguishable from previous ones due to its focus on the effects of minimum wage and other effective factors on informal employment in urban and rural areas separately and investigating factors other than employees' characteristics and their effect on informal employment.

The structure of the paper has been organized as follows: In the second section, a theoretical framework and literature review are presented. Then, in the econometric model section, introducing indicators of the minimum wage to different informal and formal employees, the ratio of informal employment to all

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[1] Article 41 of the labor law of the Islamic Republic of Iran.

the employment in urban and rural areas of provinces of Iran is calculated. In the next stage, primary processing and data analysis are done. Finally, along with estimating the model by panel data method, the results and implications of the study are presented.

2. Theoretical Framework & Literature Review

There are two theories regarding the effect of the minimum wage on employment. The first one is the Neoclassical theory suggests that in a perfect competition labor market with homogeneous labor and full compliance with minimum wage legislation, setting the minimum wage above its market-clearing level would be equivalent to a negative labor demand shock, which would lead to job losses (Stigler, 1946). However, in the second theory, Keynesians believe that the effects of minimum wage on employment are theoretically unclear. Any increase in the minimum wage has two different effects: On the one hand, it increases aggregate demand, which can increase investment and employment; and on the other hand, it increases the cost of production, which may reduce investment or pave the way for technological change, which in turn reduces employment (Herr et al., 2009). In developed countries, the minimum wage policy is relatively higher, so employers may decide to lay-off workers as they face increasing labor costs a minimum wage hike. However, the assumption of full coverage of the minimum wage policy is questionable, especially in developing countries where an informal sector not complying with the minimum wage policy exists (Siregar, 2020).

The informal labor market is a salient feature of developing countries. The International Labor Organization (ILO, 2002) defines an informal worker as 'one whose labor relationship is not subject to labor legislation and tax rules and has no access to social protection or right to certain benefits of the labor (Canelas, 2014). Thus, it is not expected that the minimum wage law causes improvement in the informal employees' conditions. The channel of the influence of the minimum wage on informal employment is after the introduction of the minimum wage, which increases the formal sector wage, some workers become unemployed in the formal labor market. Some of these workers might decide to remain unemployed and wait for a job in the formal sector. Other displaced workers might seek employment in the informal sector. This would increase the labor supply in the informal labor market and thereby drive down the informal sector wage. The informal labor market would clear at a wage level below the competitive wage (Khamis, 2013). The minimum wage impact here would increase formal wages and a decrease in informal wages. The effects are opposite in terms of employment: decrease in the formal sector and increase in the informal sector (Harrison & Leamer, 1997).

Concerning other variables affecting informal employment, we can first mention the tax rate variable. Increasing the tax burden creates a strong incentive to operate in the informal market. While taxation is an important source of government spending, the government plays an important role in economic

development by tax collection and directing it to infrastructure investments, but high tax rates lead to tax evasion by individuals. It subsequently leads people to work in the informal sector (Bakhtiari & Khoobkhahi, 2011). Unemployment can also affect informal employment. Unemployment is the result of a surplus of labor supply over labor demand. This labor market imbalance can be due to population growth, youth population, increasing social security costs, declining per capita income, and changing the size and composition of the population and the age of entry into the labor market. The growth of the unemployment rate has a great impact on the expansion of informal activities, and this factor influences the individual's decision to choose between working in the formal and informal sector and increases the motivation to work in the informal sector (Ahn & Delarica, 1997). Another thing that compels most people to work in the informal sector is poverty, and the low incomes of such jobs create a vicious cycle of poverty (ILO, 2002). Poor people cannot stay unemployed and have to work to make a living. Many people who work in the informal sector have turned to this sector due to the lack of job opportunities in the formal sector (Renani et al., 2009).

Numerous empirical and experimental studies have been conducted in the present research field. These studies can be divided into two broad categories: The first category comprises the studies investigating the effects of minimum wage on informal and formal employment in various countries. In this regard, we can refer to the Suryhadi et al. (2003) study, which examines minimum wage policy and its effects on the urban informal sector employment in Indonesian provinces between 1988 and 2000, applying the panel data method. The study results revealed that the imposition of the minimum wage has a significant and negative effect on the formal urban sector and a considerable impact on women, youths, and low-literate laborers. Also, raising the minimum wage would increase informal employment. Carneiro (2004), in his paper, studied the impact of minimum wage on informal and formal employment in Brazil between 1982 and 2002, applying time-series data analysis. The results illustrated that the minimum wage has a negative effect on the formal employment rate and a positive effect on informal employment in a long period. Muravyev and Oshchepkov (2016) studied doubling the minimum wage on employment in 2007 for 85 regions in Russia. The findings demonstrated that an increase in the minimum wage led to a decrease in employment, an increase in youths unemployment, and a growth in informal employment. Sirger (2020) examined the effects of minimum wage on employment and unemployment in Indonesia between 2001 and 2015 using the province panel data method. The results revealed that the increase of minimum wage led to a decrease in formal sector employment and an increase in the informal sector employment. Moreover, women aged 15-24 are the most affected group by the minimum wage increase.

While most of the studies conducted in different countries have reported the negative effects of minimum wage on employment, in some cases, empirical evidence has shown the opposite. For instance, Ni et al. (2011) examined different areas in China from 2000 to 2005 using the panel data method and declared that

minimum wage had no significant and negative effect on employment. In eastern regions of China, the negative effect of minimum wage on employment was significant, but minimum wage had a positive effect on employment in central and western regions. Additionally, Campos et al. (2017) investigated the impact of minimum wage on income and employment by applying econometric analysis of cross-sectional and panel data in Mexico. Cross-sectional data analysis showed that minimum wage had no effect on employment but examining panel data demonstrated an increase in informal employment caused by the minimum wage increase.

The studies that explored the effect of minimum wage and other variables on informal employment in Iran are classified in the second category. Regarding this category, Renani et al. (2009), in their research, examined the structure of informal sector employment in Kohgiluye & Boyer –Ahmad Province of Iran. The results revealed that one-third of the laborers of this province are informal ones. Also, women, villagers, and laborers with lower than diploma degrees are more intended to work as informal laborers. Bakhtiari and Khoobkhahi (2011), in a study using multiple indicators- multiple causes (MIMIC) with a "partial least squares" approach, estimated the share of the informal labor market in Iran. Estimation shows that in sum, the share of informal labor market employees during the time from 1972 to 2006 has grown up and the most share (related to 1990-2006) was more than 21%. The estimation results show that tax burden, inflation, and minimum wages are the main factors of mentioned process direction, and distribution of income and consuming energy is intensely affected by these variables. Karimi (2013), in his research, investigated minimum wage law and informal employment in Iran between 2005 and 2008. The finding proved that although the average literacy was higher in women, the ratio of female laborers in informal employment was higher than male ones. Additionally, the ratio of male laborers had a sharp increase. In 2008, one-fourth of male laborers and one-third of female laborers worked for wages lower than the formal salary. In their study, Karimi and Jahan Tigh (2014) explored the employment status of young women aged 15-25 and effective factors on informal employment applying the household's income-expenditure plan by using the logit model in 2011. In this study, the minimum wage was applied to estimate informal employment in Iran. The results showed that female laborers' share in informal employment is higher than their male counterparts.

Furthermore, living in urban areas, higher education degrees, and marital status reduced the likelihood of informal employment. In their study, Karimi et al. (2018) calculated the amount of informal employment, and they investigated the component of informal employment for each gender separately for variables like age, educational degree, marital status, and the type of activity during 2001, 2008, 2014 using raw data of households' income-expenditure plan in Kurdistan province. The criteria for informal employment were to benefit from lawful minimum wage and social security insurance. The results show that in the years from 2001 to 2014, the informal employment ratio in this province increased from

67.1 % to 73.8 %. Moreover, the effect of each characteristic of employees on classifying them as informal laborers on the chance of informal employment using the Logit model showed that higher age, higher educational degrees, and marital status reduce informal employment probability. The industry and social service sectors comprise the most informal employees, respectively. An analysis of studies conducted in different countries to examine the impact of the minimum wage on employment shows that the minimum wage has a negative effect on formal employment and a positive effect on informal employment. The present study specifically seeks to investigate the effect of real minimum wage on informal employment and other macro variables affecting informal employment during the period 2005-2018 in Iran. The investigation is also conducted separately for urban and rural areas.

3. Econometric Model

The present study aimed to investigate the effects of real minimum wage on informal employment in urban and rural areas in Iran. To this aim, the employment was categorized into formal and informal. The amount of informal employment was estimated in each providence in 2005- 2018 using the microdata of income-expenditure plans for urban and rural households. In order to explain the effect of the real minimum wage and other variables on informal employment, the research models are presented in the form of two regression equations.

3.1 First Model

The main purpose of the first model was to scrutinize the effects of real minimum wage on informal employment in urban and rural areas. In this regard, according to the review of literature, the tax burden and Gini coefficient were used as control variables. Based on this idea, the specification of the first model is as equation (1):

$$LnIFEMP_{it}^{j} = \alpha_i + \beta_1 LnRMW_{it}^{j} + \beta_2 LnTaxBar_{it}^{j} + \beta_3 LnGini_{it}^{j} + \varepsilon_{it}^{j} ,$$
$$j = 1 \,\& \, 2 \tag{1}$$

Where IFEMP is the ratio of informal employment to total employment, RMW is the real minimum wage obtained by dividing nominal minimum wage into Consumer Price Index (CPI). Tax Bar is the tax burden achieved by dividing the total tax income into Gross Domestic Product (GDP). Gini is the Gini coefficient. "i" and "t" are the individuals (30 provinces[2]) and time (2005 to 2018) dimensions. Also, j with two codes (1 and 2) is the indicator of urban and rural areas, respectively. Applying collected microdata of the income-expenditure plan of urban and rural households is sourced from the Statistical Center of Iran[3] to distinguishing formal and informal employment, and the criteria of benefitting

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[2] In the present study, sections include 30 provinces of Iran. Alborz province has been recognized as an independent province since 2011 in the divisions of the country. Since the information of this province for the years before 2011 has been included in the information of Tehran province, for the years 2011 to 2018, the information of this province is also included in Tehran province.

[3] amar.org.ir

from minimum wage law were used. According to this benchmark, the employees whose annual wage is less than the minimum wage determined by labor law are considered informal employees; otherwise, they are considered formal employees. Additionally, family workers are assigned to the informal employment category and receive no wage. The data of nominal minimum wage and consumer price index (CPI) were sourced from the Ministry of Cooperatives Labor and Social welfare[4], economic reports, and Central Bank's Balance Sheet, respectively[5]. According to the theoretical framework, it is expected that increasing the real minimum wage may raise informal employment. The Tax and Gross Domestic Product (GDP) data were sourced from the tax statistical yearbook[6] of Tax Organization and statistical yearbook of Statistical Center of Iran, respectively. It is expected that increasing tax burden causes growing informal employment. The Gini coefficient data is sourced from the income-expenditure plan of urban and rural households of the statistical center of Iran.

3.2 The Second Model

The primary aim of presentation of the second model is to respond to this question:

Does the amount of impact of informal employment from real minimum wage in the provinces where the unemployment rate is higher than the national average differ from the provinces that the unemployment rate is lower than the national average? Based on this, the specification of the second model is as equation (2):

$$LnIEMP_{it}^j = \alpha_i + \beta_1 LnRMW_{it}^j + \beta_2 dumUER * LnRMW_{it}^j + \beta_3 LnTaxBar_{it}^j + \beta_4 LnGini_{it}^j + \varepsilon_{it}^j \quad , \quad j = 1 \& 2 \quad\quad (2)$$

Where $dumUER * LnRMW$ is the interactive effect of real minimum wage on the level of the unemployment rate? In this equation $dumUER$ is a dummy variable, so that the code "1" was assigned to the provinces with a higher unemployment rate than the national average, and the code "0" was assigned to the provinces with a lower unemployment rate than the national one. In the next section, using the panel data method, Equations (1) and (2) will be estimated separately for urban and rural areas.

4. Data Analysis
4.1 Informal Employment

According to the International Labor Organization (ILO) definition, informal employment is defined as the lack of labor market laws. Regarding previous studies conducted in Iran, the indicator of informal employment rate is the deprivation of receiving minimum wage determined by the labor law of Iran for wage earners. Additionally, unpaid family workers are also considered informal

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[4] rkj.mcls.gov.ir
[5] https://www.cbi.ir/category/EconomicReport_fa.aspx
[6] https://taxresearch.ir/page.php?slct_pg_id=32&sid=1&slc_lang=fa

workers. Table 1 shows the average values of informal employment rate in urban and rural areas between 2005 and 2018 for each province, separately.

Table 1. Informal Employment Rate in Urban and Rural Areas of Iran (2005-2018) (percentage)

Provinces	Urban	Rural	Provinces	Urban	Rural
Ardabil	43.9	75.5	Kurdistan	35.5	75.8
Bushehr	22.5	31.1	Lorestan	33.2	62.7
Chaharmahal and Bakhtiari	28.3	53.4	Markazi	28.2	62.2
East Azerbaijan	31.5	58.9	Mazandaran	25.8	45.6
Fars	32.3	60.4	North Khorasan	39.3	81.6
Gilan	33.6	67.5	Qazvin	27.2	49.1
Golestan	43.9	78.8	Qom	27.1	37.7
Hamedan	40.2	72.1	Razavi Khorasan	39.7	76.9
Hormozgan	23.8	57.4	Semnan	22.2	48.5
Ilam	27	53.5	Sistan and Baluchestan	47.7	80.2
Isfahan	29.7	48.8	South Khorasan	27.5	57.2
Kerman	38.2	70.9	Tehran	13.8	22/1
Kermanshah	42.9	79.3	West Azerbaijan	42.9	72.2
Khuzestan	19.9	38.9	Yazd	14.8	33.3
Kohgiluyeh and Boyer-Ahmad	18.2	48.9	Zanjan	29.5	64.6

Source*: Author's Computation, 2021.*

According to Table 1, the maximum value of informal employment rate belongs to Sistan and Baluchestan province with 47.7%. In this province, some factors, such as informal economic growth, underground trade, and smuggled goods import from neighboring countries, have reduced manufacturing activities and paved the way for informal employment (Business development and sustainable employment plan of Sistan and Baluchestan, 2006). In rural areas, the maximum value of informal employment belongs to North Khorasan with 81.6 %. The most significant factors of growing informal business units are tax evasion, insurance evasion, fear of being observed, economic agents' misconception about formal employment, and reducing the costs of corporates (Business development and sustainable employment plan of North Khorasan, 2006). Tehran province has a lower value of informal employment in urban (13.8 %) and rural areas (22.1 %).

Figure 1 illustrates the informal employment rates for urban and rural areas between 2005 and 2018. Obviously, the amount of informal employment has been accompanied by an increase and a decrease in the 2005-2018 period, but in sum, it had an upward trend. In urban areas, the rate of informal employment proceeded from 27.2 % to 34.17 %. Moreover, in rural areas, this rate had an increase from 55.52 % to 60 %. It can be concluded from the figure that firstly, the amount of informal employment in rural areas was more than in urban areas. Secondly, more than half of the employees in rural areas and more than one-third of urban areas

employees work as informal laborers. The highest rate of informal employment was reported in the last two years of the 2000s. This finding can be attributed to the unemployment rate. In the years between 2005 and 2018, the unemployment rate increased and reached 13.5 %, which was the maximum value through this period.
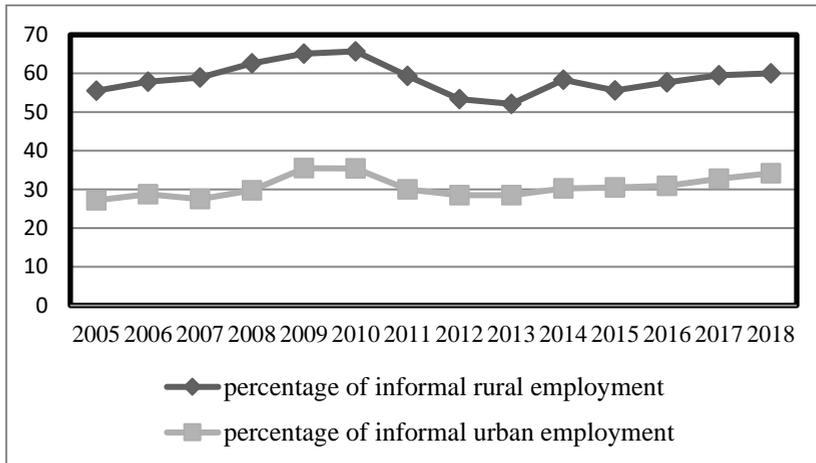
Figure 1. Informal Employment in Urban and Rural Areas of Iran (percentage)
Source: Author's Plot, 2021.

4.2 Real Minimum Wage

Table 2 presents the monthly real minimum wage and its growth rate from 2005 to 2017. According to Table 2, the highest value in the real minimum wage growth rate was recorded with 8.36 % in 2009, which according to figure 1, is associated with the highest value of informal employment and its growth in urban areas. In addition, the lowest value in the growth rate of real minimum wage was reported in 2011 with -10.28 %, which was associated with the lowest growth rate of informal employment in urban areas. Accordingly, it can be concluded that changes in informal employment are consistent with changes in the real minimum wage.

Table 2. Monthly Real Minimum Wage and Its Growth Rate

Year	Monthly Real Minimum Wage (Hezar toman)	Growth Rate (Percentage)	Year	Monthly Real Minimum Wage (Hezar toman)	Growth Rate (Percentage)
2005	318.21	7.64	2012	298.62	-9.59
2006	336.78	5.84	2013	276.94	-7.26
2007	347.12	3.07	2014	299.66	8.2
2008	332.22	-4.29	2015	313.16	4.51
2009	360.00	8.36	2016	327.37	4.54
2010	368.17	2.27	2017	342.0	4.47
2011	330.30	-10.28			

Source: *Author's Computation, 2021.*

5. Empirical Results
5.1 Pesaran Cross-Sectional Dependence (CD) and Unit Root Tests

In general, it is assumed that there is cross-sectional independence for the variables in the panel data method. This assumption may not have been valid. Consequently, at the first stage, it is necessary to test the cross-sectional independence of the variables. To this end, numerous tests such as Friedman (1937), Breusch and Pagan (1980), and Pesaran cross-sectional dependence test (2004) can be applied. Pesaran (2004) has presented a test to distinguish the cross-sectional dependence or independence for balanced and unbalanced panel data whose null hypotheses are defined as equation 3:

$$\begin{cases} H_0: \rho_{ij} = \rho_{ji} = E(u_{it}v_{it}) = 0 & for\ all\ i \neq j \\ H_1: \rho_{ij} = \rho_{ji} = E(u_{it}v_{it}) \neq 0 & for\ some\ i \neq j \end{cases} \tag{3}$$

For balanced panel data, the CD statistics are presented as equation 4:

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \tag{4}$$

Where $\hat{\rho}_{ij}$ is the Pearson pair correlation coefficient of the residual? If the CD statistics at a certain level of significance is greater than the critical value of the standard normal distribution, the null hypothesis is rejected, which means there is a cross-sectional dependence. The results of this test for variables are reported in Table 3. According to table 3, the CD statistics for all research variables is more than the critical values in all significant levels of 95%. Consequently, the null hypothesis is rejected for all variables, and as a result, cross-sectional dependence is confirmed.

Table 3. The Results of Pesaran CD Test

	Urban Areas		Rural Areas	
	Pesaran CD test	P-value	Pesaran CD test	P-value
Informal Employment Ratio (IFEMP)	14.7	0.000	13.3	0.000
Real Minimum Wage (RMW)	71.3	0.000	71.2	0.000
Tax Burden (Tax Bar)	32.9	0.000	33.0	0.000
Gini Coefficient (Gini)	43.5	0.000	42.4	0.000

Source*: Author's Computation, 2021.*

Due to the existence of cross-sectional dependence, the Im, Pesaran, and Shin test (CIPS) was used to investigate the existence of a unit root in the variables. The results of the test are shown in Table 4. The results indicate that all variables are stationary.

Table 4. CIPS Unit Root Test

	Urban Areas		Rural Areas	
	CIPS Statistics	P-value	CIPS Statistics	P-value
Informal Employment Ratio (IFEMP)	-2.86	0.002	-3.57	0.000
Real Minimum Wage (RMW)	-3.77	0.000	-3.76	0.000
Tax Burden (Tax Bar)	-4.49	0.000	-4.49	0.000
Gini Coefficient (Gini)	-1.81	0.036	-1.85	0.032

Source*: Author's Computation, 2021.*

5.2 Diagnostic Tests

In this section, the estimation results are presented. At the beginning and before estimating the model, to select between the pooled least-squares methods, fixed effects, and random effects, three tests (Chow (F-Leamer), Hausman, Breusch-Pagan) were conducted.

Table 5. The Results of Chow (Leamer), Hausman and Breusch-Pagan TestS

Areas	Model	test	Stat.	P-value	Result of Test
Urban	First	Leamer	23.7	0.000	Accept the method of fixed effects
		Hausman	0.22	0.974	Accept the method of random effects
		Breusch-Pagan	711.2	0.000	Accept the method of random effects
	Second	Leamer	23.3	0.000	Accept the method of fixed effects
		Hausman	4.13	0.389	Accept the method of fixed effects
		Breusch-Pagan	704.6	0.000	Accept the method of random effects
Rural	First	Leamer	31.8	0.000	Accept the method of fixed effects
		Hausman	11.6	0.009	Accept the method of fixed effects
	Second	Leamer	31.8	0.000	Accept the method of fixed effects
		Hausman	15.9	0.003	Accept the method of fixed effects

Source: *Author's Computation, 2021.*

According to Table 5, the Chow test shows that the null hypothesis (pooling data) is not accepted. Therefore, to select the estimation method between the fixed effects and random effects methods, the Hausman test was performed. According to the Hausman test in both models (Equation 1 and 2) for rural areas, the null hypothesis based on the method of random effects is rejected. Therefore, the method of fixed effects is preferred for estimation. Another explanation is that after selecting the method of fixed effects for rural areas, the modified Wald test for heteroskedasticity and the Wooldridge test for autocorrelation were performed. The results showed that the null hypothesis was not accepted in both tests. As a result, the existence of heteroskedasticity and autocorrelation have been confirmed. Based on this, the estimation for rural areas is based on the fixed effects method and feasible generalized least squares (FGLS) estimator. According to the Hausman test in both models (Equation 1 and 2) for urban areas, the null hypothesis based on the method of random effects is not rejected. Hence, the method of random effects is preferred for estimation. Furthermore, conducting the Breusch-Pagan test in both models shows that the estimation with the method of random effects is preferred to the pooling data method.

5.3 Results for Urban Areas

The results of estimation for urban areas are reported in Table 6. As can be observed, according to the estimation elicited from the first model, the minimum wage is associated with a positive effect on informal employment. The estimated coefficient in urban areas illustrates that, with a 10% increase in the real minimum wage, the share of informal employment in total employment increased by 6.2%. The positive effect of real minimum wage on informal employment due to increased real minimum wage leads to losing job opportunities in the formal labor market. As a result, unemployed laborers who are disappointed to find a job in the

formal sector inevitably shift to the informal labor market and cause developing informal employment. According to the literature, the tax burden has a positive effect on informal employment, too. In urban areas, a one percent increase in the tax burden leads to a 0.089 percent increase in informal employment. This positive effect of the tax burden on informal employment is due in part to the rational decision of the workforce. If they notice much difference between working costs and post-tax income, they would have greater motivation to ignore their earning from formal employment and intend to shift to the informal sector. On the other hand, the rational decision of employers on the prevention of reducing profits by tax evasion provides the necessary incentive to leave the formal sector and enter the informal sector. The estimated coefficient for the Gini coefficient is not significant. Accordingly, in urban areas, inequality in income distribution does not affect the ratio of informal employment. The results of estimation in the second model are significantly similar to the first model. As mentioned earlier, the difference between the two models is due to the interactive effect of the real minimum wage concerning the unemployment rate. The estimated coefficient of this factor is significant. It shows that in urban areas, the size of coefficient for real minimum wage in provinces whose unemployment average is higher than the national average is different from provinces whose unemployment rate is lower than the national average. The positive coefficient reveals that in urban areas, the effect size in provinces whose unemployment rate is higher than the national average is more than the others. In the first category (provinces with an unemployment rate higher than the national average) and the second category (provinces with an employment rate less than the national average), the coefficient size equals 0.62 and 0.60, respectively. Based on these findings, a 10% increase in the real minimum wage can grow the share of informal employment by 6.2% (in the first category) and 6% (in the second category), respectively. This finding shows that an increase in the unemployment rate in urban areas leads to an increase in the size of a positive effect of the real minimum wage on informal employment.

Table 6. The Results of Estimation in Urban Areas

	First Model		Second Model	
	Coef.	P-value	Coef.	P-value
Real Minimum Wage (RMW)	0.62	0.000	0.60	0.000
Tax Burden (Tax Bar)	0.089	0.056	0.115	0.017
Gini Coefficient (Gini)	0.031	0.810	0.057	0.656
Interactive Effect of Real Minimum Wage with Unemployment Rate (dum UER*Ln RMW)	-	-	0.02	0.043
Estimation Method (Estimator)	RE (GLS)		RE (GLS)	

Source: Author's Computation, 2021.

5.4 Results for Rural Areas

The results of estimation for rural areas are reported in Table 7. According to Table 7, the real minimum wage directly affects informal employment. The estimated coefficient illustrates that in rural areas, with a 10% increase in the real minimum wage, the share of informal employment will increase by about 6.4%. Like urban areas, the tax burden in rural areas is accompanied by an increase in informal employment. It means that in rural areas, a 1% growth in tax burden may increase the share of informal employment by 0.126%. Unlike urban areas, the estimated coefficient of Gini coefficient has a considerable impact on rural areas. In rural areas, inequality in income distribution has a positive effect on the share of informal employment. The size of the estimated coefficient shows that in rural areas, a 1% increase in income inequality may increase the share of informal employment by 0.34%. The greater inequality in income distribution leads to strengthening the expectation. The lack of enough job opportunities in the formal sector can force impoverished people to shift to the informal sector to meet their basic needs and develop informal employment. In rural areas, like urban areas, the estimation results for equation 2 are considerably similar to equation 1 and are almost similar in terms of the effect size. Considering the differences between the two models regarding the interactive effect of the real minimum wage concerning the unemployment rate and the estimated coefficient of this factor show that in rural areas, the estimated coefficient of the real minimum wage on informal employment in provinces whose unemployment rate is higher than the national average differs with the provinces whose unemployment rate is lower than the national average. However, unlike urban areas, in rural areas, the amount of interactive effect is negative. It means that in rural areas of provinces whose unemployment rate is higher than the national rate, the effect size is lower than in other provinces. The estimated coefficient in the first category of provinces (with an unemployment rate higher than the national average) and the second category (unemployment rate less than the national average) equals 0.42 and 0.79, respectively. Based on this finding, a 10% increase in the real minimum wage may increase the share of informal employment by 4.2% (in the first category) and 7.9% (in the second category). These results show that growth in the unemployment rate reduces the size of the positive effect of the real minimum wage on informal employment in rural areas.

Table 7. The Results of Estimation in Rural Areas

	Equation 1		Equation 2	
	Coef.	P-value	Coef.	P-value
Real Minimum Wage (RMW)	0.64	0.000	0.79	0.000
Tax Burden (Tax Bar)	0.126	0.005	0.142	0.002
Gini coefficient (Gini)	0.34	0.001	0.36	0.001
Interactive Effect of Real Minimum Wage with Unemployment Rate (dum UER*Ln RMW)	-	-	-0.37	0.073
Estimation Model (Estimator)	FE (FGLS)		FE (FGLS)	

Source: *Author's Computation, 2021.*

5.5 Comparing Estimation Coefficient in Urban and Rural Areas

　　This section aims to answer the question: "Is there any significant difference in estimated coefficients of similar variables in urban and rural areas?" In other words, is the effect size for informal employment in urban areas different from rural areas statistically? For this purpose, the difference test between means has been applied. The basis of comparison is also the result of estimation in the first model in each area. It should be noted that this test is not conducted for the Gini coefficient variable because the estimated coefficient of this factor is significant in rural areas only. Thus, in terms of the effectiveness of this factor, in rural areas, the estimated coefficient is significantly different from urban areas. In order to compare coefficients of other variables, t-statistic was calculated and reported in Table 8.

Table 8. Comparing Estimated Coefficients of the First Model in Urban and Rural Areas

	Urban area		Rural area		Urban coefficient difference from rural	t-stat.
	Coef.	S. D.	Coef.	S. D.		
Real Minimum Wage (RMW)	0.62	0.152	0.64	0.117	-0.02	-1.01
Tax Burden (Tax Bar)	0.089	0.047	0.126	0.044	-0.037	-7.66**

Source: *Author's Computation, 2021.*
Note: *** significant at 1%.*

　　According to Table 8, estimated coefficients of the real minimum wage for urban areas do not show a significant difference compared with rural areas. The size of the positive effect of real minimum wage in urban areas is different from rural areas. Moreover, in rural areas, the estimated coefficient of the tax burden on informal employment is 0.037% more than similar cases for urban areas.

6. Concluding Remarks

One of the salient characteristics of developing countries such as Iran is an informal labor market. Studies conducted in Iran show that a significant proportion of laborers work as informal ones. A factor that influences informal employment is the minimum wage. Although the aim of determining minimum wage is usually conflicting poverty and inequality for low-wage laborers, its effectiveness is doubtful if it reduces the labor demand in the formal sector and causes the shifting of unemployed persons to the informal labor market. Due to the importance of this issue, the present study investigated the effect of the real minimum wage on informal employment in urban and rural areas of Iran during 2005 and 2018. In the first stage, utilizing the microdata of households' income-expenditure plan during 2005-2018 according to the minimum wage index, informal employees were separated from formal ones, and the ratio of informal employment to total employment was calculated. In the second stage, the data were described, and finding of the study was presented below:

1. The highest and lowest average values of informal employment through 14 years in urban and rural areas belong to Sistan and Baluchestan and Tehran provinces, respectively. Besides, the highest and lowest informal employment rates in rural areas were reported in North Khorasan and Tehran provinces.

2. In 2005-2018, one-third of employees in urban areas and more than half of the employees in rural areas work as informal workers.

In the third stage, the estimation of the models (Based on equation 1 (first model) and equation 2 (second model)) using panel data method was conducted for urban and rural areas, separately. The results are presented below:

1. The estimation of the first model (equation 1) in urban areas by random effects method shows a positive effect of the real minimum wage on informal employment. In other words, with a 10% increase in the real minimum wage, the share of informal employment increases with 6.2%. Additionally, the tax burden has a positive effect on informal employment, and the Gini coefficient has no significant effect on informal employment.

2. The estimation of the second model (equation 2) in urban areas by random effects method is almost similar to the results of the first model in terms of significance and the effect size. The only difference is the interactive effect of the real minimum wage concerning the unemployed rate in equation 2. The estimated coefficient of this factor is significant. It demonstrates that the size of the effect of real minimum wage on informal employment in provinces whose unemployment rate is higher than the national average differs from those whose average unemployment rate is lower than the national average. The positive effect proves that for urban areas, the size of the effect in provinces whose unemployment rate is higher than average is more than other provinces. This finding shows that in urban areas increase in the unemployment rate leads to the growth of the positive effect of real minimum wage on informal employment.

3. The estimation of the first model (equation 1) in rural areas by the fixed effects method (and FGLS estimator) confirms the positive effect of the real

minimum wage on informal employment. Therefore, with a 10% increase in the real minimum wage the share of informal employment will increase by 6.4%. The tax burden and Gini coefficient also have a positive effect on informal employment.

4. The estimation of the second model (equation 2) in rural areas using the fixed effects method (and FGLS estimator) is almost similar to the results of equation 1 in terms of significance and size of effect. The negative interactive effect of real minimum wage shows that in rural areas, the size of effect in providences with higher unemployment rate is lower than other provinces. This finding revealed that the increase in unemployment rate in rural areas leads to a decrease in positive effect of real minimum wage on informal employment. Finally, the mean difference test results to compare the estimated coefficient in urban and rural areas in equation 1 indicate that in urban areas, the positive effect of real minimum wage on informal employment equals the size of the effect in rural areas. Also, in rural areas, the estimation coefficient of the tax burden on informal employment is greater than in urban areas.

Another explanation is that the results of the present study in terms of the positive effect of the real minimum wage on informal employment, similar to the studies of Bakhtiari and Khoobkhahi (2011), Muravyev and Oshchepkov (2016), Siregar (2020), Campos et al. (2017), Carneiro (2004). Also, the positive effect of the tax burden on informal employment is consistent with the results of Bakhtiari and Khoobkhahi (2011). According to the result of the study, it is suggested that for determining the minimum wage and inflation, and minimum livelihood, different aspects of the effects of this variable on macroeconomic variables such as employment should be considered. Moreover, tax rates and other tax laws should be enacted to reduce the employers' motivation for tax evasion and fear of being observed.

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