# Pay Gaps and Mobility for Lower and Upper Tier Informal Sector Employees: an investigation of the Turkish labor market

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## Abstract

Many empirical studies found wage gaps between formal and informal sector workers even after controlling for a number of individual and firm level characteristics. While there is limited amount of research considering the same question in the Turkish labor market, wage gap between formal and informal employees generally do not take unobserved characteristics into account. In our paper, we carry this analysis for Turkey and estimate the wage gap between formal and informal sector workers utilizing panel data from Survey of Income and Living Conditions (SILC) for the period of 2014 and 2017. Mincer wage equations across quantiles are estimated considering observable and unobservable characteristics with a fixed effect model, and for sensitivity tests we regard the possibility of nonlinearity in covariate effects and estimate a variant of matching models. Our results show that informal wage penalty is persistent even after unobserved heterogeneity is taken into account, however, the penalty is not statistically significant at the upper end of the wage distribution. Moreover, we show that there are important differences between informal workers who have permanent contracts versus informal workers that have relatively more irregular work arrangements. Not only the latter is subject to earnings reductions, but they also have slightly lower probability of moving out of informal employment. We also demonstrate that the mobility of lower and upper tier informal workers is affected by different variables.

## 1. Introduction

The theoretical models of informality are generally based on two approaches; exclusion and exit. According to the former, lack of enough jobs in the formal sector pushes individuals to seek employment in the subsistence economy. Once, the country develops and formal sector is able to provide jobs to everyone, informality is assumed to be disappearing (Perry et al., 2007). In this view, people unwillingly work in the informal sector given the poor labor conditions and greater insecurity. The exit approach, on the other hand, stresses the voluntary nature of informality and affirms that owners of micro-entrepreneurs choose the sector in order to function outside of the regulatory framework (de Soto, 1989). These two models have distinct expectations about the socio-economic consequences of informality. While exclusion view argues that wages and working conditions in the formal sector is superior, exit view suggests that informal sector can offer higher earnings and benefits to its participants. In more recent studies, heterogeneity of informal jobs is commonly acknowledged where the lower tier employees have only constrained choice and the upper tier employees voluntarily select into these positions (Fields, 1990). Both the existence and consequences of diversity in the informal work have been documented, yet, there is no agreement on the degree of wage gap across sectors and criteria to distinguish the informal segments (Chen, 2012; De Vreyer and Roubaud, 2013; Kanbur, 2017).

Similar to the theoretical debates, the empirical research is also not clear if there is a positive wage gap between formal and informal employees. In El Salvador and Peru, sizable wage premiums are found for the formal sector workers, but the opposite result has been obtained for Mexico (Marcouiller et al., 1997). Various other studies also documented conflicting findings where formal-informal wage difference changes across countries and estimation methodology. For example, in Colombia, the average pay gap is measured to be between 30% and 60% while in Tajikistan, informal workers have higher earnings (Daza and Gamboa, 2013; Staneva and Arabshaibani, 2014). Moreover, it has been shown that the wage differences are not equal across the distribution indicating heterogeneity. In Russia, workers in the lower quantiles are penalized for informal employment whereas the wages are comparable at the upper quantiles across sectors (Lehmann and Zaiceva, 2013). The evidence from Madagascar, also points out the heterogeneity of informal sector given the earnings are higher for self-employed and workers at the upper quantiles (Nordman et al., 2016). Moreover, in recent studies it has been shown that either wage penalty disappears or gets much smaller once unobservable worker characteristics are controlled for with FE estimations (Bargain and

Kwenda, 2014). Hence, the empirical analysis of formal-informal wage gap is still inconclusive, and the findings change depending on the sample used and econometric methodology. But it is clear that informal sector is not homogenous and there are significant differences between types of unregistered work.

The main goal of the paper is to examine the impact of informality on earnings both for workers and self-employed after considering the unobserved characteristics and matching techniques. To this purpose, we utilize individual-level panel data set, collected by Turkish Statistical Institute, and compare the earnings differences between formal and informal sector wage workers as well as self-employed. Additionally, we analyze if there is heterogeneity within the informal sector and to what extent this is related to earnings and mobility. We identify two groups of informal sector workers; those with permanent contracts and those who have irregular work arrangements representing the upper and lower tiers, respectively. The final goal of the paper is to examine several factors that are correlated with transition from lower tier and upper tier informal employment to formal employment.

Our findings support the existence of a wage penalty for informal sector workers in Turkey even after controlling time-invariant unobservable features and using matching models to account for possibility of nonlinearity in covariate effects. In all cases, we find a persistent informal wage penalty which is robust to several sensitivity checks with the exception of top three quantiles. While the size of penalty gets smaller when fixed effects and matching techniques are utilized, still workers with comparable observable and unobservable characteristics earn less if they belong to the informal sector. We also find no wage penalty for the lower tier informal workers but a sizable one for the upper tier, which could be due to firm level investments into training and skills in the formal sector for individuals with regular contracts. For self-employed, earnings difference vanishes if fixed effects and matching models are applied, thus, it can be said that in Turkey, self-employees do not suffer from informality. In terms of mobility, our results show that informal sector workers, both from lower and upper tiers, have limited possibility of moving to the formal sector. For irregular employees, having a non-agricultural job has a positive impact on transition probability whereas education increases the likelihood of moving to formal employment. On the other hand, gender decreases the transition probability of the upper tier informal workers to the formal sector.

The rest of the paper is organized as follows. In the next section, existing studies and definition of informality are briefly reviewed. A short background of the evolution of informal employment in Turkey and description of tiers are also summarized in this section. The Section 3 presents the data utilized for the empirical analysis and the econometric methods including

unconditional quantile regressions and matching techniques. In section 4, the results are discussed in more detail. The fifth section provides few concluding remarks and policy implications.

## 2. Review of Informal Employment and Its Evolution in Turkey

The definition and measurement of informal employment is an open question and there is no agreement in the existing studies about which features represent informality. Precise descriptions are vital to understand the risks and opportunities informal sector workers experience, and to develop suitable policies to increase wages and productivity of these jobs. The two most widely utilized conceptualizations of informality are either based on the attributes of enterprises or on the legal status of employees. According to the enterprise definition, anyone who works in firm that operates in the informal sector regardless of the employee or job characteristics. Later, this kind of portrayal is revised to involve informal jobs that are not subject to national labor legislation and regulations (Chen, 2007). The legal or social security-based approach puts the employees at the center, and regards informality to contain individuals without a contract, who are not subject to labor legislation and who are not covered by social protection (Hussmanns, 2005). Originally, informality was defined by the size, legal and residency status of the companies in Turkey but legalistic definition has been adopted later. Currently, informal employment is recognized as employment without social security in the main job during the reference week by the Turkish Statistical Institute (Turkstat).

In our paper, the legalistic or social security approach is used, and the share of informal employment is measured by considering the wage earners who are not covered by social security. It has been argued that social security criterion better captures informality in Turkey than enterprise criterion, and it is able to explain the relationship between the likelihood of informal sector employment, individual and job characteristics (Acar and Tansel, 2016). Like many other developing countries, informality is a noticeable character of Turkish labor market. In 2017, almost 34% of non-agricultural employment was in the informal sector, while the ratio was estimated to be over 83% in agriculture (Turkstat, nd). Figure 1 presents the share of informal employment over the years in Turkey. As can be seen, there is considerable decline since the beginning of 2000s. The peak was reached in 2001 with 53.1% and over time it was diminished to the 33.6% in 2015. Since then the share of informal employment in Turkey is quite stagnant and remained to be 34% for the last couple of years. While this ratio is above the developed country averages, it is lower than a number of developing economies such as

Egypt and Mexico with 45% and 43% of informality, respectively, using the social security definition (Tansel et al., 2019).

**Figure 1.** Share of Informal Sector Employment
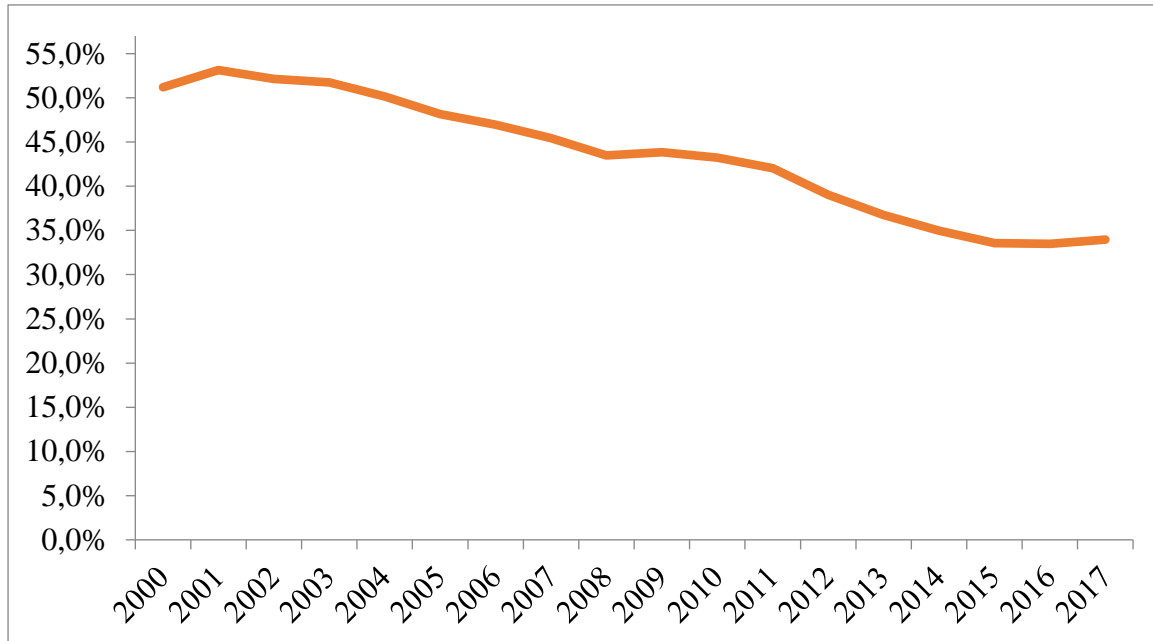


Source: Turkstat (nd)

Traditionally, the source of wage gaps between formal and informal employment are explained by either segmentation or competition theories, which emphasize productivity differentials, institutional variation, and non-pecuniary benefits (Roy, 1951; Maloney, 2004; Tokman, 1982). More recently, studies also highlight the diversity of informal sector jobs and argue that competition and segmentation coexist. Informal employment is described as heterogeneous where an upper tier of those who are voluntarily informal and a lower tier of those who cannot afford to be unemployed but are rationed out of a formal job can be both seen (Fields, 1990). In such a setting, it is commonly accepted that the upper tier corresponds to self-employment with a competitive structure, whereas the lower tier consists of wage workers with a segmented structure. On the one hand, there are people excluded from modern economy and publicly provided benefits, who have to maintain their livelihoods engaging in informal work. On the other hand, certain firms and individuals decide to exit from the formal institutions according to the evaluations of private costs and benefits (Hirschman, 1970; Perry et al., 2007). While it is easier to theoretically distinguish these groups, it is harder to identify the exact reasons for people exiting the formal arrangements. Similarly, the factors that generate exclusion of particular individuals or groups from the more lucrative economic

opportunities and social protection are challenging to pin down empirically. Even though there is no agreement on how to categorize the voluntary and involuntary employees in the informal sector, for a number of countries, and researchers provide evidence for two-tier structure (Cunningham and Maloney, 2001; Botelho and Ponczek, 2011; Gunther and Launov, 2012).

In addition to the difficulties of identifying tiers withing the informal sector, selection biases and unobserved characteristics generate problems to accurately measure the earning gaps between formal and informal employees. Recent availability of panel data in many developing countries enabled researchers to deal with the sector selection and other estimation issues using alternative methodologies. With panel data, wage variations are observed as the same individual switches between formal and informal sectors over time. Given that the FE estimation is, at least partially, able to control for self-selection and unobservable characteristics, we are able to reach to more consistent estimates assuming that unobserved characteristics are time-invariant. Furthermore, several studies use various versions of propensity score matching (PSM) or propensity score weighting (PSW) techniques to ensure a comparison of wages for formal and informal workers only with comparable observable and time-invariant unobservable characteristics (Smith and Todd 2005). Such techniques also address the issue of misspecifications that may occur due to linearity assumption on the covariates. As a result, most of the recent literature uses these techniques and finds that informal sector penalty either gets smaller or disappears when unobservable worker characteristics are controlled for in various labor markets (Botelho and Ponczek, 2011; Tansel and Kan, 2016; Nguyen et al., 2013; Bargain and Kwenda, 2014; Nordman et al., 2016).

The research focusing on Turkish informal labor market is limited, and most of them only consider wage differences at the mean. Informality is argued to reduce the earnings significantly on average even after controlling for self-selection and a series of individual, firm and occupational variables. Human capital endowment, location and gender are explanatory for being employed in the informal sector (Tansel, 2002; Baskaya and Hulagu 2011). In the later studies that utilize non-parametric techniques and quantile regression methods, it has been revealed that the effect of informality in wages is not uniform along the distribution. Besides, informality is found to raise the wages at the upper end suggesting that the sector is diverse (Tansel and Acar, 2016). Yet, some of the features that are used to define lower and upper ties of informal work, such as self-employment, do not capture the heterogeneity accurately in the Turkish context. For example, informal self-employment doesn't have a statistically significant impact on wages along the distribution and a very significant majority of informal employees both salaried and self-employed would be better paid if they are in the formal sector (Tansel

and Acar, 2016; Ben Salem and Bensidoun, 2012). Besides, in Turkey, transition rates are quite low and employees are stuck with precarious jobs throughout their career without any prospects of moving to well-paid and secure jobs (Tansel and Acar 2017).

Our paper extends this literature by utilizing unconditional quantile fixed-effects and matching techniques to account for unobserved characteristics than can influence earnings. Figure 2 presents that share of informal wage workers across quantiles, and it can be seen that the decline is not secular and for the bottom segments of the distribution, there is even an increase in informality over time in Turkey. This implies that looking at the mean would not be sufficient to understand the wage gaps across sectors. Moreover, we define lower and upper tier informal sector workers not only by self-employment but also by the irregularity of contracts. Temporary, casual workers and workers with no contracts might be subject to double penalty in the informal sector as their wages are expected to be lower than permanent contract holders even in formal employment (Duman, 2019). Irregular workers also have much lower chances of obtaining a formal sector job especially if they are unskilled, which is clearly the case in Turkey. Nearly 78% of the irregular workers have less than high school education while the ratio is slightly over 41% for the permanent contract holders.

**Figure 2.** Share of Informal Sector Employment by Wage Quantiles
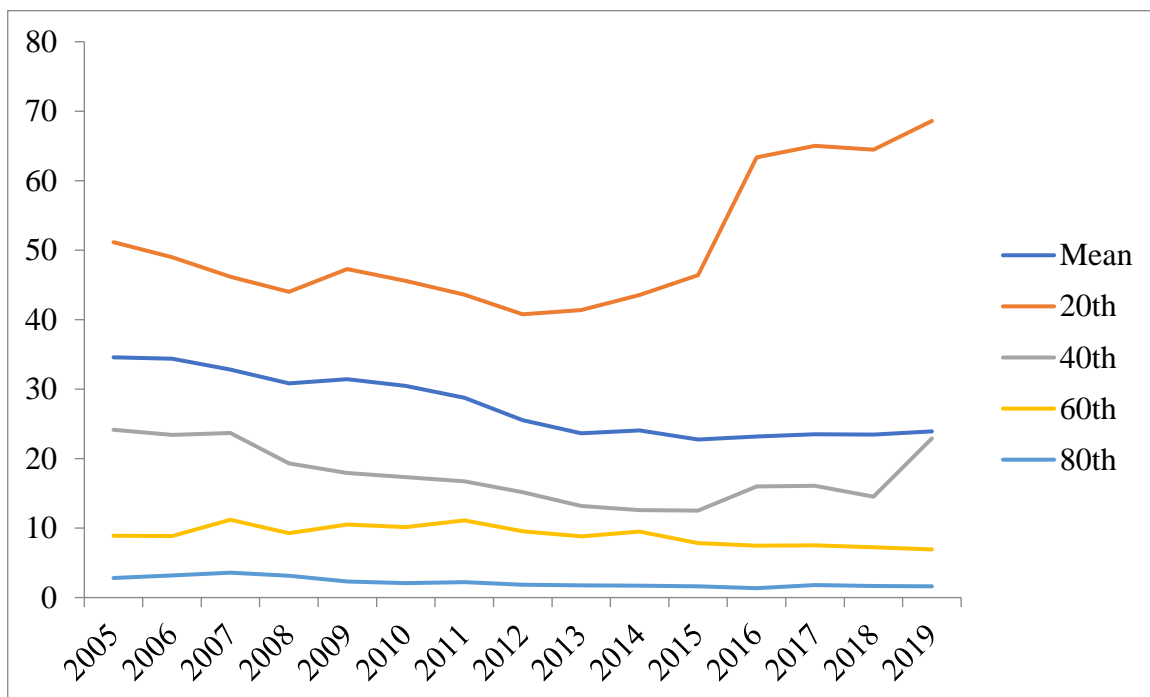


Source: Author's calculations based on Turkstat data.

## 3. Data and Empirical Methodology

### 3.1 Data Description

Our primary source of data is the last wave (2014-2017) of Income and Living Conditions Survey (SILC), which is a nationally representative and rich dataset collected by Turkish Statistical Institute (TurkStat) since 2006. It provides detailed information on the employment status, social security coverage, working hours, labor and other income, demographic characteristics, living conditions, job characteristics, and socioeconomic conditions of the subjects. The survey results are published annually in both cross-section and panel data formats, and panel data is rotating where sample of households and corresponding individuals are traced annually for four consecutive years. For the specific aim and methodology of our study, we use the panel samples which are modified in a way to comprise only the labor force between 15-64 years of age who are present in at least two consecutive years of the survey. This selection leaves an unbalanced panel of 58,610 individuals who are present for two years; 39,973 individuals for three years; and 19,960 individuals for four years. We calculate hourly real earnings by dividing the reported earnings that are net of taxes according to the months and hours worked in respective year and adjusting by CPI. Demographic variables (age, gender, marital status), education, experience, firm level characteristics (number of employees, part-time status), occupational and industrial dummies are based on questions from SILC.

As mentioned before, we adopt legalistic definition of informality and individuals are classified into four mutually exclusive groups, formal-salaried, formal self-employed, informal-salaried and informal self-employed. In this regard, the SILC questionnaire explicitly asks individuals whether they have social security registration for their main job. Accordingly, employees working for a wage/salary are defined as formal-salaried if they are registered at the for their current job, and informal-salaried if they are not. Own-account workers form the self-employed category, which is further divided into formal self-employed if they have social security registration and informal self-employed if not. Unpaid family workers whose earnings are difficult to measure are excluded from the analysis. By disaggregating the labor force into multiple subcategories, we can inspect the earnings gap across multiple dimensions. We further divide informal workers according to their contractual status and denote employees with casual work or no contracts as lower tier. Individuals who report that they have permanent or fixed term contracts are regarded as upper tier. Table 1 presents the distribution of key variables for

formal wage workers and tiers within the informal sector. In Figure A1, density plots of wages for each group is shown.

From the table below, it can be observed that there are crucial differences among employees with respect to the sectors they belong and irregularity of work. For example, younger workers have a higher share in the informal sector. Other major variations emerge in education and firm size where the formal sector workers have longer years of schooling and work in larger companies. Among the informal sector, lower tier employees have less education than upper tier and the share of large firms is extremely restricted. When we look at experience, it is visible that lower tier informal employees have slightly longer years of work but the ratio of medium-term tenure (1-10 years) is well below their formal and upper tier counterparts. While majority of lower tier employees are concentrated in elementary occupations, for upper tier, service and sales form the big chunk, more than 50%. Lastly, upper tier informal workers are mostly employed in construction and education whereas individuals from the lower tier have jobs in agriculture and water, waste and sewage related activities. Manufacturing and public administration have the largest shares in formal sector employment with 22% and 12%, respectively. Overall, these figures suggest that neither formality nor irregularity of jobs are randomly distributed across worker groups. Therefore, empirical investigations need to take sample selection bias into account and consider time-invariant unobservable effects in addition to observable effects.

**Table 1.** Description of Key Variables

| | Formal | Lower Tier | Upper Tier |
|---|---|---|---|
| **Age** | | | |
| 15-24 years old | 12.91 | 22.11 | 22.18 |
| 25-55 years old | 84.19 | 67 | 62.84 |
| More than 55 years old | 2.91 | 10.89 | 14.98 |
| **Gender** | | | |
| Male | 72.66 | 75.79 | 60.16 |
| Female | 27.34 | 24.21 | 39.84 |
| **Marriage Status** | | | |
| Not married | 27.19 | 31.55 | 33.47 |
| Married | 72.81 | 68.45 | 66.53 |
| **Education** | | | |
| No schooling | 2.34 | 17.03 | 16.87 |
| Primary | 20.98 | 45.49 | 38.66 |
| Secondary | 16.71 | 24.14 | 26.38 |
| High | 24.72 | 10.37 | 13.46 |
| University | 35.26 | 2.98 | 4.63 |
| **Experience** | | | |
| Less than 1 year | 2 | 3.58 | 4.09 |
| 1-10 years | 41.04 | 37.94 | 43.71 |
| More than 10 years | 56.96 | 58.48 | 52.2 |
| **Firm size** | | | |
| Less than 10 employees | 24.75 | 78.99 | 76.5 |
| 10-50 employees | 29.35 | 18.13 | 18.09 |
| More than 50 employees | 45.9 | 2.88 | 5.42 |
| **Work Status** | | | |
| Full time | 98.31 | 79.92 | 94.55 |
| Part time | 1.69 | 20.08 | 5.45 |
| **Occupation** | | | |
| Managers | 5.19 | 0.48 | 2.79 |
| Professional | 18.77 | 1.2 | 1.55 |
| Technicians and associate professionals | 8.82 | 1.53 | 2.45 |
| Clerical support workers | 9.47 | 0.78 | 2.48 |
| Service and sales workers | 18.73 | 16.07 | 51.38 |
| Skilled agricultural, forestry and fishery workers | 0.69 | 8.49 | 1.72 |
| Craft and related trades workers | 13.57 | 24.76 | 14.98 |
| Plant and machine operators, and assemblers | 12.65 | 7.46 | 10.89 |
| Elementary occupations | 12.12 | 39.23 | 11.74 |
| **Industry** | | | |
| Agriculture, Forestry and Fishing | 0.93 | 22.46 | 3.16 |
| Mining and Quarrying | 0.99 | 0.38 | 0.2 |
| Manufacturing | 22.26 | 9.96 | 16.9 |
| Electricity, Gas, Steam and Air Conditioning Supply | 1.43 | 0.35 | 0.28 |

| | | | |
|---|---|---|---|
| Water Supply; Sewerage, Waste Management and Remediation Activities | 8.02 | 26.87 | 5.39 |
| Construction | 11.62 | 8.26 | 13.94 |
| Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles | 4.55 | 6.74 | 6.8 |
| Transportation and Storage | 5.09 | 8.14 | 7.84 |
| Accommodation and Food Service Activities | 0.9 | 0.33 | 0.17 |
| Information and Communication | 1.92 | 0.08 | 0.17 |
| Financial and Insurance Activities | 0.9 | 0.45 | 1.55 |
| Real Estate Activities | 2.53 | 0.7 | 1.5 |
| Professional, Scientific and Technical Activities | 6.55 | 4.78 | 2.06 |
| Administrative and Support Service Activities | 11.46 | 0.33 | 4.63 |
| Public Administration and Defence; Compulsory Social Security | 12.02 | 0.88 | 0.93 |
| Education | 6.26 | 1.23 | 23.7 |
| Human Health and Social Work Activities | 0.44 | 0.98 | 0.51 |
| Arts, Entertainment and Recreation | 2.13 | 7.11 | 10.27 |

Source: Author's calculations based on SILC data

### 3.2 Empirical Methodology

Several studies in the literature examined the informal sector wage penalty/premium by using a standard Mincerian framework where the wage is determined by a number of covariates such as human capital and firm characteristics. However, as discussed earlier, the impact of informal employment on wages are not uniform across the distribution. Therefore, we employ unconditional quantile regression technique, which allows us to see how unconditional expectation of the dependent variable changes when unconditional distribution of the explanatory variable changes (Firpo et al., 2009). Since we are interested in how informal employment affects wages, it is more useful to assume no conditionality on the distribution. UQR is based on extending the concept of influence function (IF), which is commonly employed as tool for robust estimation that can easily be computed for each quantile of interest. Firpo et al. (2009) add $v(F_Y)$ to IF in order to reach the recentered influence function (RIF), and show that RIF has the same properties with IF. The estimation of RIF regressions under the linearity assumption enables us to interpret the coefficients similar to OLS, as the effect of a change in the mean of an explanatory variable in respective quantiles. We compute the unconditional quantile partial effects based on RIF, and analyze the impact of non-standard jobs on wages along the unconditional wage distribution by specifying the following linear UQR for selected quantiles of the unconditional distribution of real hourly wages ($q_\pi$):

$$\text{RIF}(\ln(w_i), q_\pi) = q_\pi + \text{IF}(\ln(w_i), q_\pi) = q_\pi + \frac{\pi - I(lnw_i) \leq q_\pi}{f \ln(w)^{q_\pi}} \tag{1}$$

By replacing the unknown components with their sample estimators in Equation (1) gives us the estimated RIF:

$$\overline{RIF} (\ln(w_i), \overline{q_\pi}) = \overline{q_\pi}) + \overline{IF}(\ln(w_i), \overline{q_\pi}) = \overline{q_\pi} + \frac{\pi - I(lnw_i) \leq \overline{q_\pi}}{\bar{f} \ln(w)^{\overline{q_\pi}}} \tag{2}$$

$$E\lfloor \overline{RIF}(\ln(w_i), \overline{q_\pi}) | X_i, Inf_i \rfloor = \bar{\sigma}_\pi + \overline{\beta'_\pi} X_i + \sum \overline{\delta_{j\pi}} I(Inf_{i=j}) \; j = 1 \dots \text{J-1} \tag{3}$$

where $X_i$ is the vector of covariates and $Inf_i$ is informal employment.

In order to control for the unobserved features that can affect earnings, we extend the standard UQR method to incorporate panel data and estimate the FEUQR model. Estimating the UQR models is especially important since the earnings differentials across different quantiles could be due to unobserved heterogeneity. For the FE estimator to be valid the number of transitions across sectors must be large. Table 2 presents the transition probabilities and it can be seen that there is substantial mobility from informal to formal sector although the mobility in the reverse direction is quite limited. Lastly, quantile estimations assume linearity of the covariate effects. However, the distribution of covariates between formal and informal sectors can be different, which needs to be corrected. We try to overcome this issue by combining matching techniques with UQR and include propensity score weighting in the regressions. The combination provides consistent estimates even if the relationship between the dependent variable and the covariates are nonlinear (Fortin et al., 2011). We follow the same steps that are utilized in Botelho and Ponczek (2011) and Bargain and Kwenda (2014). The propensity to be in the informal sector is estimated by a logistics model using the set of variables that can potentially influence participation in the informal sector and the wage rate. Figure A2 exhibits the distribution of the propensity scores, which are p and (1-p) for informal and formal sector workers, respectively.

**Table 2.** Transition probabilities (%) between sectors (Pij)

| | Formal | Lower tier informal | Upper tier informal | Formal SE | Informal SE | Unemployed | Non-employed |
|---|---|---|---|---|---|---|---|
| **Formal** | 85.11 | 0.76 | 0.93 | 0.88 | 0.87 | 4.27 | 7.18 |
| **Lower tier informal** | 9.62 | 50.04 | 1.69 | 0.57 | 6.09 | 10.61 | 21.38 |
| **Upper tier informal** | 10.5 | 2.79 | 58.99 | 0.84 | 3.14 | 5.67 | 18.07 |
| **Formal SE** | 4.05 | 0.44 | 0.54 | 82.46 | 7.06 | 1.45 | 3.99 |
| **Informal SE** | 2.37 | 1.33 | 1.12 | 2.2 | 78.1 | 1.29 | 13.59 |
| **Unemployed** | 26.72 | 8.72 | 2.88 | 1.69 | 4.39 | 31.55 | 24.05 |
| **Non-employed** | 1.73 | 0.74 | 0.64 | 0.12 | 1.35 | 1.36 | 94.06 |
| **Total** | 18.02 | 2.19 | 1.97 | 3.27 | 7.37 | 3.09 | 64.08 |

## 4. Findings

In Figure 3, we demonstrate the earnings differences between formal and informal wage workers. It can be seen that there are substantial penalties to informality if we don't consider unobserved factors. For wage workers, the earnings are reduced by nearly 1 log points at the 10th quantile and 0.3 points at the mean, whereas at 90th quantile, there is statistically insignificant but positive, 0.02, premium. After fixed effects model is run, penalty gets smaller, around 0.33 for the bottom 10th and 0.16 for the 50th quantiles. However, informal workers continue to earn less than their formal counterparts for the large part of the wage distribution. These findings indicate that the very large unconditional wage gap is explained not only by better observed characteristics in the formal sector but also by better unobserved skills. Moreover, the results suggest that informal wage penalties are significant in the lower part of the conditional distribution, while they tend to disappear at the top. In other words, those who do badly conditional on their observed characteristics do especially poorly in informal wage work. The results are robust to IPW estimations, and formal-to-informal and informal-to-formal switches.

Figure 4 repeats the same exercise for self-employed, and once again we reach to sizable decreases in earnings if unobserved characteristics are excluded. For the bottom 10th and 50th

quantiles, informal self-employees receive incomes that are 0.54 log points lower than formal sector self-employed. Nonetheless, the negative effect of informal sector disappears entirely for the self-employed at all quantiles after fixed effects and matching techniques are utilized. In fact, the bottom of the distribution experience insignificant and positive returns to informality while the middle and upper quantiles have negative and insignificant returns. Given that there is no difference between the earnings of formal and informal self-employed in Turkey, it can be argued that there is sufficient amount of competition and earnings are equalized across sectors. Nonetheless, from Table 2, it is also clear that the transition from informal self-employment to formal self-employment is rather limited. Mobility in the reverse direction is slightly higher, which means that formal sector self-employees are more likely to become informal entrepreneurs in Turkish labor market.

**Figure 3.** Informal Sector Earnings Penalty for Wage and Salaried Workers
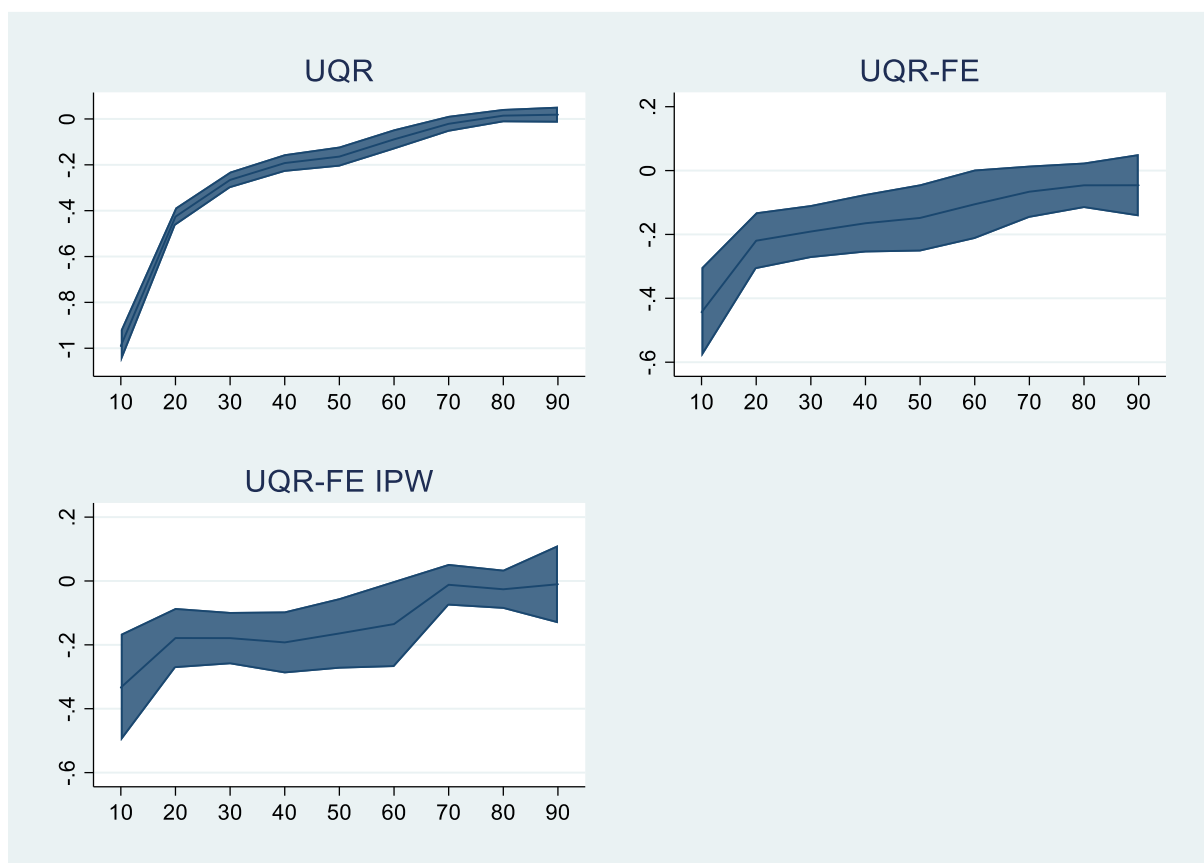


Notes: Author's estimations using SILC data for the period of 2014-2017. Upper part of the graph shows informal versus formal wage penalty using UQR and UQR-FE, and the bottom part shows UQR-FE-IPW. Table A1 presents the full models for selected quantiles for UQR, UQR-FE and UQR-FE-IPW. The shaded areas show the bootstrapped 95% confidence intervals.

**Figure 4.** Informal Sector Earnings Penalty for Self-Employed
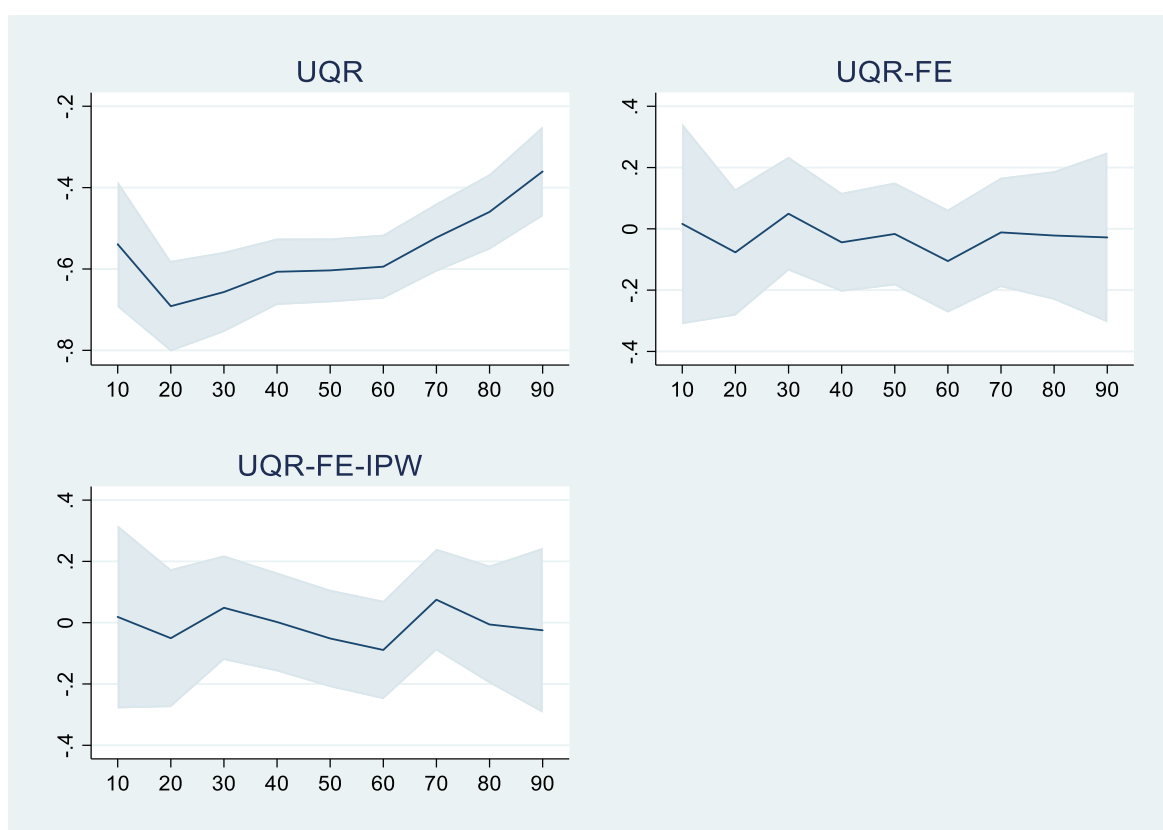


Notes: Author's estimations using SILC data for the period of 2014-2017. Upper part of the graph shows informal versus formal wage penalty using UQR and UQR-FE, and the bottom part shows UQR-FE-IPW. Table A2 presents the full models for selected quantiles for UQR, UQR-FE and UQR-FE-IPW. The light shaded areas show the bootstrapped 95% confidence intervals.

In the next part, we examine the influence of heterogeneity within informal sector on wages and run fixed effect regressions for upper and lower tiers as well as with matching techniques. Table 3 shows the results for informal sector and other variables after considering the unobservable heterogeneity and matching. As can be understood from the table below, informality decreases the earnings for lower tier workers by 0.22 log points. For upper tier workers, although the coefficient is negative, the relationship between informality and wages is statistically insignificant. The findings are robust to the inclusion of propensity score weights that are obtained from the logistics regression. In terms of other factors, being in prime age or older increase earnings for employees with permanent contracts. Similarly, having more than 10 years of experience is positively related to wages for the upper tier but not for the lower tier workers. High school and university education have statistically insignificant coefficients, suggesting that the returns to education is partially captured by the type of contracts individuals receive. Lastly, firm size also does not matter for earnings if the employees are divided into

lower and upper tiers, which can again be due to the greater share of permanent contracts in bigger firms and disproportionately high ratio of irregular workers in small enterprises.

The last part of our investigation looks at the variables that can affect transition from informal sector, lower tier and upper tier to other labor market states. We estimate seven multinomial logit regressions for each labor market state of departure, namely formal-salaried, informal-salaried, informal lower tier, informal upper tier, formal self-employed, informal self-employed, unemployed, and inactive. For robustness check purposes, our analysis is repeated for all three samples; 2014-2015, 2015-2016 and 2016-2017 panels. Table A3 and A4 present the results for the first two samples, and Table 4 shows transitions for the latest years of the panel data. The dependent variable in each regression is defined as a categorical variable which takes the value 0 if the individual maintains his/her labor market state from t to t+1 and takes a value of i if the individual moves from the respective status to the rest of the six states. To make the presentation simpler, we only report the transitions from informal, lower tier informal and upper tier informal to formal employment in Table 4. As can be observed, there are important differences across groups of workers. While age, gender and sales and service jobs are negatively influence the transition for all and upper tier informal workers, they are not explanatory for the moves out of lower tier. In contrast, being employed in non-agricultural help the lower tier informal employees to become formal. As expectedly, education has a positive impact for all groups whereas gender and service sector jobs reduce the transition probability of upper tier informal workers. Neither the firm size nor experience has an effect on the mobility for each group. All in all, the findings indicate that there is considerable variation between lower and upper tiers in terms of their likelihood to move to formal sector. Education consistently increases the mobility out of informal sector while distinct occupational and industrial variables are helpful for lower and upper tier workers.

**Table 3.** Informal Sector Earnings Penalty for Lower and Upper Tiers

| | Lower Tier FE | Lower Tier FE-IPW | Upper Tier FE | Upper Tier FE-IPW |
|---|---|---|---|---|
| Informal | -0.22** | -0.22** | -0.1 | -0.09 |
| | 0.08 | 0.06 | 0.05 | 0.05 |
| Prime age | 0.15 | 0.11 | 0.11** | 0.12** |
| | 0.09 | 0.07 | 0.03 | 0.03 |
| Older | 0.05 | 0.09 | 0.17** | 0.20** |
| | 0.13 | 0.11 | 0.05 | 0.04 |
| Married | -0.26 | -0.04 | 0.13** | 0.14** |
| | 0.16 | 0.09 | 0.03 | 0.03 |
| Primary | -0.63 | -0.11 | -0.03 | -0.03 |
| | 0.4 | 0.21 | 0.09 | 0.09 |
| Secondary | -0.15 | -0.09 | -0.03 | -0.01 |
| | 0.18 | 0.21 | 0.13 | 0.13 |
| High | 0.53 | 0.39 | 0.14 | 0.2 |
| | 0.32 | 0.28 | 0.18 | 0.19 |
| University | 1.72 | 1.16 | 0.26 | 0.33 |
| | 1 | 0.78 | 0.18 | 0.19 |
| 1-10 years experience | -0.13 | -0.25* | 0.10* | 0.1 |
| | 0.11 | 0.11 | 0.05 | 0.06 |
| More than 10 years | -0.12 | -0.17 | 0.14** | 0.14* |
| | 0.14 | 0.13 | 0.05 | 0.06 |
| 10-50 emp | 0.18 | 0.16 | 0 | 0.02 |
| | 0.12 | 0.1 | 0.04 | 0.04 |
| More than 50 emp | 0.19 | 0.2 | 0.06 | 0.08 |
| | 0.17 | 0.15 | 0.04 | 0.06 |
| Part time | -0.26** | -0.17** | -0.10* | -0.05 |
| | 0.07 | 0.06 | 0.05 | 0.06 |
| Occupation | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes |
| R squared | 0.66 | 0.62 | 0.77 | 0.8 |
| # of Observations | 1859 | 1474 | 10753 | 10753 |

Notes: Fixed effect models are estimated with bootstrapped standard errors. ** and * denote statistical significance at the .01 and .05 levels, respectively.

**Table 4.** Selected MNL Results for Transitions to Formal Sector Employment (2016-2017)

| | Informal to Formal | Lower Tier Informal to Formal | Upper Tier Informal to Formal |
|---|---|---|---|
| Age | -0.00** | 0.00 | -0.00*** |
| | 0.00 | 0.00 | 0.00 |
| Gender | -0.02 | 0.01 | -0.04* |
| | 0.02 | 0.03 | 0.02 |
| Education | 0.02*** | 0.01** | 0.03*** |
| | 0.00 | 0.01 | 0.01 |
| Experience | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 |
| Firm Size | -0.01 | 0.00 | -0.01 |
| | 0.01 | 0.01 | 0.01 |
| Part time | -0.01 | -0.05** | 0.06* |
| | 0.02 | 0.02 | 0.03 |
| Sales and Service | -0.05*** | -0.03 | -0.04* |
| | 0.02 | 0.03 | 0.02 |
| Elementary | -0.02 | -0.05** | 0.03 |
| | 0.02 | 0.02 | 0.02 |
| Manufacturing | 0.09*** | 0.10*** | -0.07 |
| | 0.03 | 0.03 | 0.06 |
| Construction | 0.05** | 0.08*** | -0.08 |
| | 0.03 | 0.03 | 0.06 |
| Services | 0.04 | 0.05* | -0.11* |
| | 0.02 | 0.03 | 0.06 |

Notes: The results are the marginal effects for the MNL model. ***, ** and * denote statistical significance at the .01, .05 and 0.1 levels, respectively. MNL estimations for all labor market states can be asked from the author.

## 5. Conclusion

Informality is a pervasive aspect of Turkish labor market and even though its size over time declined, still a major part of employment is generated in this sector. Our paper examined the wage gap between formal and informal workers in Turkey along the distribution. The results showed that informal sector penalty exists for the bottom quantiles of the wage workers but not for self-employed when unobservable after taking unobservable characteristics into account. Moreover, we show that there are important differences between informal workers who have permanent contracts versus informal workers that have relatively more irregular work arrangements. Not only the latter is subject to earnings reductions, but they also have slightly lower probability of moving out of informal employment. We also demonstrate that the mobility of lower and upper tier informal workers is affected by different variables. While education raises the likelihood of obtaining a formal job for everyone in Turkey, non-

agricultural sectors are more helpful to the individuals at the lower tier. For upper tier workers, part-time work is the only other contributing factor to move out of informality besides education.

Understanding heterogeneity within the informal sector, earning differences across tiers and factors determining the discrepancies would help to design more proper policies. Investments into education and skill formation, facilitating school-to-work transitions and active labour market programs can contribute to the labour market prospects of workers in disadvantaged positions. But learning more about the factors that affect the labour market outcomes for the informal sector workers can be invaluable for targeting. The novel approach in our research to distinguish the tiers of informal work could be helpful in recognizing the specific disadvantages informality brings to each type of employees. For example, the determinants of being in the lower tier could be quite different than being employed in the upper tier, and hence policies that address each group should also be customized to achieve the most desirable results. Moreover, our research can be highly informative for tracing the wage differences and uncover the reasons for change; whether they can be explained by human capital endowments or sectoral composition. This can also contribute to the success of policy making and extending coverage of safety nets.

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**Appendix**

**Figure A1.** Wage Distribution across Sectors and Tiers
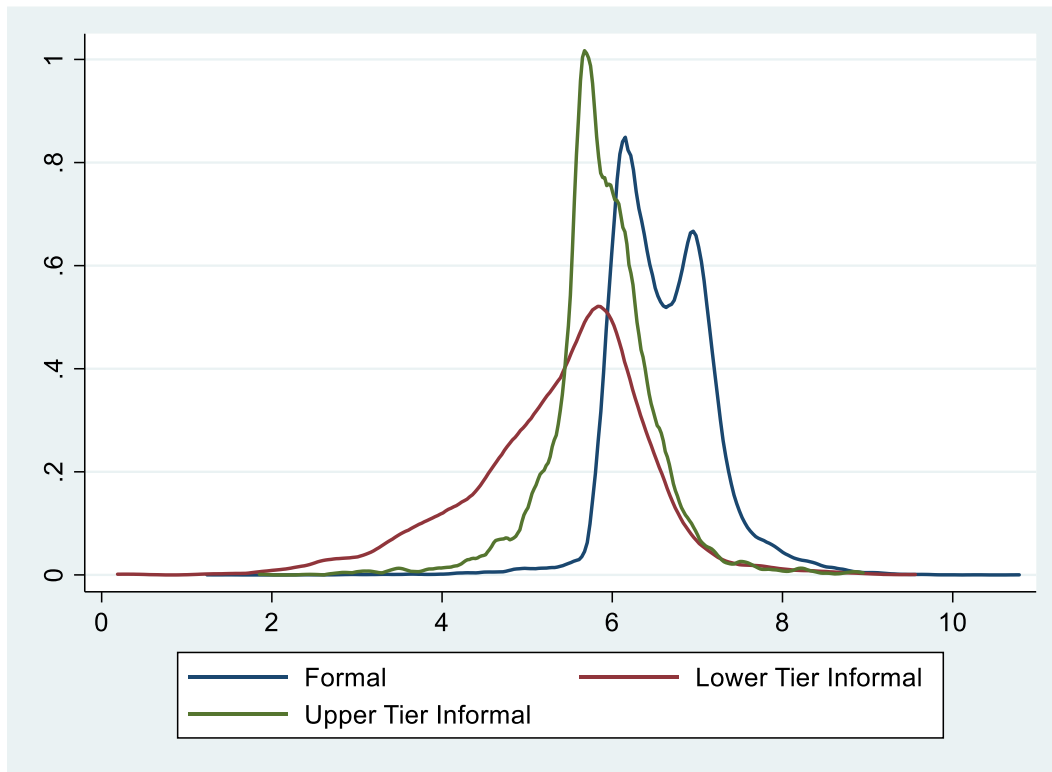
**Figure A2.** Propensity Score Matching

**Table A1.** Informal Sector Penalty for Wage Workers

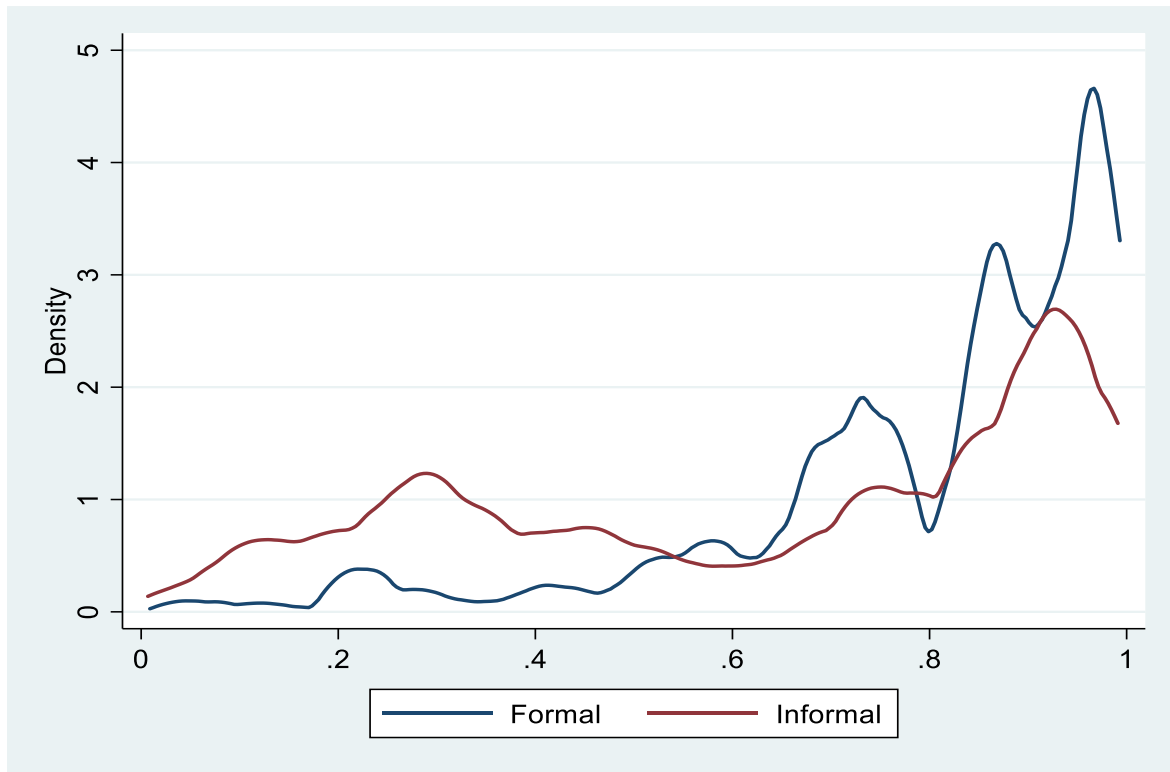| | 10th (UQR) | 10th (UQR-FE) | 10th (UQR-FE-IPW) | 50th (UQR) | 50th (UQR-FE) | 50th (UQR-FE-IPW) | 90th (UQR) | 90th (UQR-FE) | 90th (UQR-FE-IPW) |
|---|---|---|---|---|---|---|---|---|---|
| Informal | -0.99*** | -0.44*** | -0.33*** | -0.28*** | -0.19*** | -0.16*** | 0.02 | -0.05 | -0.01 |
| | 0.04 | 0.07 | 0.09 | 0.02 | 0.04 | 0.04 | 0.02 | 0.05 | 0.06 |
| Prime age | 0.04 | 0.10** | 0.16*** | 0.05*** | 0.13*** | 0.15*** | -0.02 | 0.07 | 0.10* |
| | 0.03 | 0.04 | 0.06 | 0.02 | 0.03 | 0.03 | 0.02 | 0.05 | 0.06 |
| Older | -0.14*** | 0.28*** | 0.19*** | -0.04 | 0.19*** | 0.23*** | -0.03 | 0.1 | 0.11* |
| | 0.05 | 0.1 | 0.07 | 0.03 | 0.05 | 0.04 | 0.04 | 0.09 | 0.06 |
| Female | -0.20*** | | | -0.18*** | | | -0.15*** | | |
| | 0.02 | | | 0.01 | | | 0.02 | | |
| Married | 0.04** | -0.01 | 0.09 | 0.09*** | 0.11*** | 0.09* | 0.07*** | 0.09* | 0.06 |
| | 0.02 | 0.03 | 0.07 | 0.01 | 0.03 | 0.05 | 0.02 | 0.05 | 0.09 |
| Primary | 0.19*** | -0.05 | -0.96 | 0 | -0.09 | -0.13 | -0.04** | 0.01 | 0 |
| | 0.05 | 0.07 | 0.82 | 0.02 | 0.13 | 0.14 | 0.02 | 0.04 | 0.05 |
| Secondary | 0.22*** | -0.06 | -0.74 | 0.10*** | -0.09 | -0.12 | 0.03 | 0 | -0.01 |
| | 0.05 | 0.08 | 0.62 | 0.02 | 0.14 | 0.15 | 0.02 | 0.04 | 0.05 |
| High | 0.33*** | 0.44** | 0.46 | 0.15*** | 0.23 | 0.26 | 0.01 | 0.14 | 0.1 |
| | 0.05 | 0.2 | 0.7 | 0.02 | 0.18 | 0.21 | 0.02 | 0.11 | 0.17 |
| University | 0.39*** | 0.60*** | 0.84 | 0.40*** | 0.48** | 0.55** | 0.30*** | 0.38** | 0.25 |
| | 0.05 | 0.23 | 0.73 | 0.03 | 0.21 | 0.23 | 0.03 | 0.17 | 0.23 |
| 1-10 years experience | 0.43*** | 0.24* | -0.1 | 0.25*** | 0.17** | 0.04 | 0.07 | -0.03 | 0.01 |
| | 0.11 | 0.14 | 0.53 | 0.05 | 0.07 | 0.09 | 0.05 | 0.06 | 0.03 |
| More than 10 years | 0.51*** | 0.23 | -0.18 | 0.36*** | 0.21*** | 0.08 | 0.13*** | -0.04 | 0.02 |
| | 0.11 | 0.15 | 0.53 | 0.05 | 0.07 | 0.09 | 0.05 | 0.07 | 0.05 |
| 10-50 emp | 0.13*** | 0.13*** | 0.14 | 0.10*** | 0.02 | 0.04 | 0.06*** | 0.01 | 0.02 |
| | 0.02 | 0.04 | 0.1 | 0.01 | 0.03 | 0.04 | 0.02 | 0.05 | 0.07 |

| More than 50 emp | 0.15*** | 0.13*** | 0.22* | 0.21*** | 0.08** | 0.09* | 0.21*** | 0 | 0.07 |
|---|---|---|---|---|---|---|---|---|---|
|  | 0.02 | 0.04 | 0.13 | 0.01 | 0.04 | 0.05 | 0.02 | 0.06 | 0.08 |
| Part time | -0.90*** | -0.34*** | -0.12 | -0.53*** | -0.23*** | -0.17*** | 0.01 | 0.07 | -0.02 |
|  | 0.06 | 0.08 | 0.16 | 0.03 | 0.04 | 0.05 | 0.03 | 0.05 | 0.06 |
| Temporary | -0.09*** | -0.32*** | -0.40*** | -0.10*** | -0.11** | -0.12* | -0.01 | -0.04 | -0.02 |
|  | 0.03 | 0.09 | 0.14 | 0.02 | 0.05 | 0.07 | 0.02 | 0.06 | 0.1 |
| Occupation | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R squared | 0.69 | 0.69 | 0.51 | 0.75 | 0.77 | 0.18 | 0.56 | 0.62 | 0.69 |
| # of Observations | 12495 | 12495 | 13466 | 12495 | 12495 | 13466 | 12495 | 12495 | 12495 |

Notes: UQR models are estimated with bootstrapped standard errors. ***, ** and * denote statistical significance at the .01, .05 and 0.1 levels, respectively.

**Table A2.** Informal Sector Penalty for Self Employed

| | 10th (UQR) | 10th (UQR-FE) | 10th (UQR-FE-IPW) | 50th (UQR) | 50th (UQR-FE) | 50th (UQR-FE-IPW) | 90th (UQR) | 90th (UQR-FE) | 90th (UQR-FE-IPW) |
|---|---|---|---|---|---|---|---|---|---|
| Informal | -0.54*** | 0.02 | 0.02 | -0.54*** | -0.04 | -0.02 | -0.36*** | -0.03 | -0.02 |
| | 01:55 | 0.17 | 0.15 | 0.03 | 0.06 | 0.06 | 0.06 | 0.14 | 0.14 |
| Age | -0.36*** | -0.26 | -0.38* | -0.15*** | 0.1 | 0.03 | 0 | 0.28** | 0.17 |
| | 0.1 | 0.26 | 0.2 | 0.04 | 0.08 | 0.13 | 0.05 | 0.13 | 0.14 |
| Female | -1.91*** | | | -0.79*** | | | -0.20*** | | |
| | 0.16 | | | 0.05 | | | 0.05 | | |
| Married | 0.34** | -0.07 | 0.1 | 0.28*** | 0.25** | 0.30*** | 0.27*** | 0.31 | 0.38* |
| | 0.16 | 0.17 | 0.18 | 0.05 | 0.1 | 0.09 | 0.06 | 0.24 | 0.23 |
| Education | 0.15*** | 0.05 | 0.06 | 0.21*** | 0.08 | 0.18 | 0.32*** | 0.39 | 0.37 |
| | 0.04 | 0.08 | 0.07 | 0.02 | 0.16 | 0.19 | 0.03 | 0.48 | 0.48 |
| Experience | 0.34** | 0.16 | 0.1 | 0.27*** | 0.08 | 0.07 | 0.25*** | -0.09 | -0.05 |
| | 0.14 | 0.26 | 0.22 | 0.05 | 0.1 | 0.1 | 0.08 | 0.19 | 0.18 |
| Firm size | -0.96*** | 0.03 | 0.37 | -0.49*** | -0.11 | -0.02 | 0.02 | -0.1 | -0.1 |
| | 0.13 | 0.36 | 0.41 | 0.05 | 0.14 | 0.14 | 0.07 | 0.23 | 0.31 |
| Occupation | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R squared | 0.11 | 0.47 | 0.43 | 0.25 | 0.72 | 0.74 | 0.08 | 0.49 | 0.47 |
| # of Observations | 5337 | 4824 | 4824 | 5337 | 4824 | 4824 | 5337 | 4824 | 4824 |

Notes: UQR models are estimated with bootstrapped standard errors. ***, ** and * denote statistical significance at the .01, .05 and 0.1 levels, respectively.

**Table A3.** MNL Results for Transitions to Formal Sector Employment (2014-2015)

| | Informal to Formal | Lower Tier Informal to Formal | Upper Tier Informal to Formal |
|---|---|---|---|
| Age | 0.00 | -0.00* | 0.00 |
| | 0.00 | 0.00 | 0.00 |
| Gender | -0.01 | 0.02 | -0.02 |
| | 0.02 | 0.03 | 0.04 |
| Education | 0.02** | 0.02** | 0.01 |
| | 0.01 | 0.01 | 0.01 |
| Experience | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 |
| Firm Size | 0.03 | 0.01 | 0.03 |
| | 0.01 | 0.02 | 0.02 |
| Part time | -0.06* | -0.03 | -0.06* |
| | 0.04 | 0.03 | 0.45 |
| Sales and Service | -0.08*** | -0.05 | -0.05* |
| | 0.03 | 0.04 | 0.05 |
| Elementary | 0.00 | -0.03 | 0.06 |
| | 0.02 | 0.03 | 0.05 |
| Manufacturing | 0.06* | 0.1** | 0.01 |
| | 0.09 | 0.08 | 0.5 |
| Construction | 0.18** | 0.15** | -0.05 |
| | 0.08 | 0.08 | 0.5 |
| Services | 0.06 | 0.05* | -0.1* |
| | 0.08 | 0.07 | 0.5 |

Notes: The results are the marginal effects for the MNL model. ***, ** and * denote statistical significance at the .01, .05 and 0.1 levels, respectively. MNL estimations for all labor market states can be asked from the author.

**Table A4.** MNL Results for Transitions to Formal Sector Employment (2015-2016)

| | Informal to Formal | Lower Tier Informal to Formal | Upper Tier Informal to Formal |
|---|---|---|---|
| Age | 0.00 | 0.00 | -0.00* |
| | 0.00 | 0.00 | 0.00 |
| Gender | -0.02 | -0.01 | -0.03 |
| | 0.02 | 0.03 | 0.03 |
| Education | 0.03*** | 0.02** | 0.04*** |
| | 0.01 | 0.01 | 0.01 |
| Experience | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.00 |
| Firm Size | 0.01 | 0.01 | 0.01 |
| | 0.01 | 0.01 | 0.01 |
| Part time | -0.01 | -0.02 | 0.04** |
| | 0.03 | 0.03 | 0.06 |
| Sales and Service | -0.08*** | -0.05 | 0.05* |
| | 0.02 | 0.03 | 0.04 |
| Elementary | 0.00 | -0.03* | -0.03 |
| | 0.02 | 0.02 | 0.04 |
| Manufacturing | 0.05* | 0.08** | 0.01 |
| | 0.03 | 0.04 | 0.08 |
| Construction | 0.06* | 0.07** | -0.09 |
| | 0.03 | 0.03 | 0.08 |
| Services | 0.04 | 0.04** | -0.09* |
| | 0.03 | 0.03 | 0.08 |

Notes: The results are the marginal effects for the MNL model. ***, ** and * denote statistical significance at the .01, .05 and 0.1 levels, respectively. MNL estimations for all labor market states can be asked from the author.