

DEFINING AND MEASURING INFORMALITY: THE CASE OF TURKISH LABOR MARKET

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Abstract

In this study, we consider how informality can be defined and measured in the Turkish labor market. The empirical analysis consists of developing three alternative definitions of labor informality, and exploring the relevance and implications of each for the Turkish labor market using descriptive statistics and multivariate probit analysis of the likelihood of informality under each definition. We find that social security registration criterion is a better measure of informality in the Turkish labor market given its ability to capture key relationships between several individual and employment characteristics and the likelihood of informality.

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1. INTRODUCTION

Informal employment has always been at the center of theory and policy debate in terms of its importance, determinants and policy implications. Considering its high levels of prevalence and persistence, informality is expected to influence developing country labor markets in many ways and for many years to come, therefore it requires special attention and proactive approach. In order to effectively address its nature and dynamics, however, one first needs a profound understanding of the concept and its dimensions. Data limitations and its intrinsic heterogeneity have rendered measuring informal employment a challenge. There exist numerous attempts in the literature to identify informality. The resulting vast array of methodologies should not be seen only as an obstacle but at the same time as a tool to comprehend its many different facets. Along these lines, this study aims to propose a definitive framework that can be used as a well-grounded initial step to detailed analysis of informal employment in the Turkish labor market.

Given its economic and demographic dynamics, Turkey indeed provides rich evidence for a growing and multifaceted informal labor market (Tansel, 1997, 1999, 2001; Bulutay, 2000; Bulutay and Taştı, 2004; Özdemir et al., 2004; SPO, 2009; Kenar, 2009; Reis et al., 2009; Aydın et al., 2010; OECD, 2010; World Bank, 2010; Ercan, 2011). However, existing evidence is mixed and scant. Data limitations and conceptual obscurity have impeded generalizable and comparable analyses. This study aims to elucidate the informalization in the Turkish labor market in terms of its definition, measurement and salient characteristics.

A better understanding of the definition and measurement of labor informality is of utmost importance in such a developing country context. Firstly, as Perry et al. (2007) argue: “The term

informality means different things to different people, but almost always bad things: unprotected workers, excessive regulation, low productivity, unfair competition, evasion of the rule of law...”. Moreover, particular vulnerable groups such as young, women and migrants are often disproportionately represented in informal employment. Therefore, diagnosing the extent of informal employment is crucial for identifying the risks and sources of socioeconomic inequality, especially for the vulnerable. Second, informality is a multifaceted phenomenon which in practice refers to several types of workers and activities, ranging from informal employees of informal or formal enterprises to unpaid family workers, and from marginal own-account workers to prosperous employers. The famous *informal sector elephant* metaphor proposed by Hernando de Soto is based on this aspect. Thus, as Jütting et al. (2008) state, defining and comparing informal employment in multiple ways enable comprehending different dimensions of the phenomenon.

The empirical analysis consists of developing three alternative definitions of labor informality, gauging the extent of their association, and exploring the relevance and implications of each for the Turkish labor market using a number of individual and employment characteristics. First, is an enterprise-based definition which describes informality with *employment in the informal sector*, where informal sector refers to small firms and self-employment. Then this definition is modified in a way to comprise *informal employment* in both formal and informal sector, by incorporating the social protection aspect of employment. In particular, those workers who work in formal sector but have no social security are re-classified as informal, and those who work in informal sector but have social protection are re-categorized as formal. The third one is defined exclusively on social protection coverage independent of the nature of the sector one is employed. Then, informality based on these definitions are comparatively analyzed in multiple dimensions including age, gender, education, household size, geographical region, economic sector, establishment size and employment status. The first part of the analysis is descriptive in nature and meant to determine the degree of congruence between alternative definitions and decompose

the structure of labor informality in Turkey. Next, we conduct a multivariate analysis in order to explore the likelihood of informality under each definition using various personal and job attributes as explanatory variables.

To the best of our knowledge, this analysis is the first empirical attempt to compare alternative definitions and measures of informal employment in Turkey using 2006-2009 Income and Living Conditions Survey (SILC). Moreover, the analysis is linked to the evolution of theory of formal and informal labor markets, hence provides a synthesis of empirical and theoretical literature in the context of Turkey. Moreover, thanks to the novel nature of SILC data set, time span of this study allows exploring the existence and extent of any effect of global economic crisis in the Turkish labor market along the formal/informal divide. Along these lines, ultimate objective is to improve the understanding of informality concept, thereby stimulate vigorous analyses of the labor markets and policy.

The paper is organized as follows. The next section reviews the literature on the definition and measurement of informal employment. In particular, Section 2.a presents existing theoretical and empirical literature, and Section 2.b addresses previous Turkish evidence. Section 3 describes the data, definition of main variables and empirical methodology used in the study. Section 4 presents a comprehensive descriptive analysis of different definitions of informality. In Section 5, results of the multivariate analysis are discussed. Section 6 concludes.

2. LITERATURE SURVEY

(a) Conceptualizing labor informality - Theory, definition and measurement

The initial formal versus informal divide of economic activities and employment can be traced back to the dual economy theory, introduced by Lewis (1954), Kuznets (1955) and Harris and Todaro (1970), which explained economic development by the emergence and growth of the *modern* manufacturing sector through absorbing labor from the *traditional* agriculture sector (Bromley, 1978). Hart (1973) extended the dualist terminology by decomposing the economy into *formal* and *informal* sectors analogous to modern and traditional sectors, respectively. In this way, he first coined the term informal sector to describe self-employment and small enterprises activities of *the reserve army of urban unemployed and underemployed* to generate income.

The first internationally agreed definition was adopted in the 15th International Conference of Labor Statisticians (ICLS) in 1993. Informal employment was defined as comprising of “all jobs in informal sector enterprises, or all persons who, during a given reference period, were employed in at least one informal sector enterprise” (Husmanns, 2005). Under this definition, informality is identified based on the characteristics of the production units in which the activities took place, rather than in terms of the characteristics of the worker or the job. Hence, it is named *enterprise definition* of informality. This approach is the longest established in the existing theoretical and empirical literature. It dates back to the earliest analyses, which described informal sector with self-employment and micro-scale enterprises. The unit of observation is enterprises and main measurement criterion is the number of workers in an enterprise.

The enterprise definition was later criticized for that it might fail to capture those marginal micro-scale informal activities which are often unreported by individuals, and that it cannot fully capture the increasing variety of informal employment forms (Husmanns, 2004). Along these lines, a broader informality specification relating the enterprise-based concept of *employment in the informal sector* to a job-based concept of *informal employment* was adopted in 17th ICLS in

2003 (Husmanns, 2004). In a nutshell, Chen (2007) recapitulates the new labor informality concept as comprising self-employed in informal enterprises and wage employment in informal jobs. Informal jobs refer to jobs that are not subject to legal or social protection, or more clearly “if their employment is not subject to national labor legislation, income taxation, social protection or entitlement to certain employment benefits”. The new approach, combining both enterprise and job-type characteristics, is named the *productive definition* of informality.

More recently, a third strand emerged in parallel to the need for a more comprehensive definition and advances in data sources. The idea was to expand the definition of informal employment to encompass the increasing variety of informal activities and workers. This was done by transiting from an enterprise-based approach to a worker/employment-based approach. The main idea was that informality should be defined and measured in terms of legal status of employment, rather than firm or job characteristics (Henley et al., 2009). In official ILO terms, an employment relationship is considered to be informal if it is not subject to labor legislation, social protection, taxes or employment benefits (Husmanns, 2005). In practice, the definition translated into several measurement criteria such as having a signed contract, belonging to a union, being entitled to benefits such as health insurance or pension, working at the public sector, or paying taxes (Saavedra and Chong, 1999). It is referred to as *legalistic, contract-based* or *social protection* definition of informality.

(b) Overview of labor informality in Turkey

In Turkey, the informal sector concept was officially articulated for the first time by the Turkish Statistical Institute (TurkStat) in 1988 Household Labor Force Survey (HLFS). Size, legal and residency status of the firm were used to describe the concept (Toksöz and Özşuca, 2003). Later, TurkStat identified the official criteria of informal employment in HLFS as being employed

without registration with social security system. That is, informal or unregistered employment comprises “persons who are not registered to any social security institution due to main job worked in reference week” (TurkStat, 2011). The most recent rate of informal employment using this definition is reported as 38.4 percent as of January 2012 (TurkStat, 2012). Moreover, TurkStat reports that the rate of informality is 82.8 percent in agricultural employment and 25.8 percent for non-agricultural employment. Evidently, these figures beg a more nuanced discussion on the nature and underlying dynamics of informal employment.

3. DATA AND METHODOLOGY

Given the importance of understanding the nature of labor informality, this study endeavors to provide an extensive snapshot of the incidence in the Turkish labor market. We analyze various dimensions, transformation over time, relevance and implications of different specifications of informality. For this particular purpose, survey based, individual level micro data is the most appropriate. The data set used is drawn from the “Income and Living Conditions Survey (SILC)”, which has been conducted by the Turkish Statistical Institute (TurkStat) since 2006. Subsuming a rich set of information on household expenditure, income and assets, employment and living conditions, SILC enables defining informality in multiple ways, thereby comparing the relevance and implications of different specifications. Of particular importance for this study are the employment status, social security registration, occupation and firm size variables. Furthermore, the data set includes several other variables of personal, household and job characteristics such as age, gender, education, household head status, household type, marital status, work experience, sector of economic activity, and others which are typically thought to constitute underlying dynamics of being informal or formal. The survey results have only recently been released in micro data sets, thus to our knowledge have not yet been used in any other studies of informality. The analysis below focuses mainly on the cross-sectional data for the years 2006, 2007, 2008 and

2009, since the micro data set for the following years are not yet released. The original cross-sectional samples consist of 30,186 individuals for 2006; 30,263 individuals for 2007; 31,121 individuals for 2008 and 32,539 individuals for 2009. For the specific aim and methodology of our study, the cross-sectional samples are modified in a way to comprise only those individuals who are between 15-64 years of age and are currently employed, and for whom information on employment status and social security registration status are available. This selection leaves 13,016 individuals for 2006; 13,458 individuals for 2007; 13,956 individuals for 2008; and 14,375 individuals for 2009.²

In the following analysis, we identify three different definitions of labor informality which are adopted to be consistent with the international guidelines provided by ILO, comparable with other countries' studies and inclusive for a comprehensive analysis. Specifically, informal employment under each definition comprises of:

Definition A: The sum of employers and employees in small firms (which in the SILC data set corresponds to firms with less than 10 workers), and self-employment in the forms of either own-account workers (excluding administrative, professional and technical workers) or unpaid family workers.

Definition B: The first definition is modified to incorporate informal employment in the formal sector by removing those workers who are not registered at the social security institute, from the formal sector defined according to Definition A and putting them into the informal sector.

Definition C: Those workers who are not registered at the social security institute regardless of whether they work in the formal or informal sector.

² For analyses on non-agricultural employment, the sample further reduces to 8,412 individuals for 2006; 8,774 individuals for 2007; 9,575 individuals for 2008; and 9,771 individuals for 2009.

Along these lines, Definition A basically corresponds to *enterprise* or *productive* definitions which describes informality with *employment in the informal sector*, where informal sector refers to small firms and self-employment. In similar vein, formality is ascribed to employment in large firms. In this method, informality is identified based on the characteristics of the enterprise rather than the worker. Informality measure is constructed using the employment category and firm size questions in the SILC questionnaire. Then, in conformity with ILO's new definition of employment that comprises both *employment in the informal sector* and *informal employment*, Definition B extends the first definition by incorporating social security aspect of employment. This is done by re-classifying those workers who work in formal sector (based on the first definition) but do not have social security as informal, and those who work in informal sector but have social protection as formal. Finally, Definition C is built so as to represent the *legalistic* or *social security* approach. In particular, individual informality is determined at the level of social security protection, in other words whether or not registered at the social security institute. In the SILC survey, this corresponds to the question whether the respondent is registered to the social security or not for his main job.

The empirical analysis consists of two parts. First, we analyze and compare these three definitions using a number of individual and employment characteristics. The analysis is descriptive in nature, with an aim to determine the degree of congruence between alternative definitions and decompose the structure of labor informality in Turkey. Moreover, a large time span is adopted to trace the transformation dynamics over time, and detect any likely effect of the recent global economic crisis in the late 2008 on the structure of Turkish labor market.

The descriptive analysis provides an extensive preliminary vision of how certain individual and employment characteristics are correlated with the likelihood of being an informal worker based on three different definitions of informality, the degree of coincidence or discrepancy across these three definitions along key dimensions of employment. However, this practice falls short of

explaining any conditional association, namely the marginal effects of potential factors on the likelihood of informality. In order to address this issue, we rely on multivariate analysis and estimate probit regressions of the probability of being informal on a set of individual and job attributes that are well established in the literature as potential determinants of informality.

A simple probit model specifies the probability of observing an individual i being in state 1 as:

$$\Pr (y_i = 1) = \Phi (x_i' \beta) \quad (1)$$

where Φ is the standard normal cumulative distribution function, β is the coefficients vector to be estimated, and x_i are the case-specific regressors of individual i . The dependent variable y_i in each regression is assigned a value of “1” if the individual is classified as informal according to the definition in question; and “0” otherwise. The explanatory variables x_i include demographic characteristics of the individual (gender, age, education level), household type (marital status, household head status, existence of children in the household), employment characteristics (occupation, sector of economic activity, experience) and a dummy indicating whether individual resides in an urban or rural area.³ A comprehensive table of variable definitions is provided in Appendix (Table A.1).

The vector of coefficients β is straightforward to estimate by the maximum likelihood estimation (MLE) method using the following log-likelihood function:

$$\ln L (\beta) = \sum_{i=0}^N y_i \ln \Phi(x_i' \beta) + (1 - y_i) \ln \Phi(1 - x_i' \beta) \quad (2)$$

³ Urban areas are those settlements that have populations equal to or above 20001, and rural areas are settlements that have population equal to or below 20000 (TurkStat, 2011).

However, for probit models, β coefficients are seldom used for inference, instead marginal effects of the covariates are used. The marginal effect of a change in one of the independent variable k on the probability of being in state 1 is formulated as:

$$\frac{\partial \Pr (y_i = 1)}{\partial x_k} = \frac{\partial \Phi(x_i' \beta)}{\partial x_k} = \beta_k \Phi(x_i' \beta) \quad (3)$$

The probit analysis is conducted separately for each of the three definitions in order to detect any possible variation or overlap in the results. For presentational brevity purposes, however, we will mainly discuss the probit results for definition A based on job characteristics and definition C based on social security status, since definition B is somewhat a combination of these two edge measures. First, we present and elaborate on the estimation results of the probit model based on definition A, then consider the definition C based probit regression.⁴ Our motivation is twofold: characterizing labor informality in Turkey along multiple dimensions in a profound way and pinpointing the differences between these measures of informality that are found notable and indicative.

4. DESCRIPTIVE ANALYSIS OF LABOR INFORMALITY

In this section, we present a preliminary characterization of the Turkish labor market over the four-year period 2006-2009, with a particular focus on informal employment based on the three definitions of informality described in the previous section. More specifically, we first assess the extent of which informality prevails and varies across different definitions and time, and then

⁴ Since Definition B is somewhat a combination of Definition A and C, we prefer not to discuss its probit results in detail for presentational brevity purposes. Nevertheless, the probit regression results pertaining to Definition B are reported in Table 9. A quick glance shows that probit estimation results for definition B reveal patterns of relationships highly similar to that of definition C. Namely, propensity of being informal according to definition B displays a statistically significant and positive relationship with being female, young, illiterate and/or having no degree, working in agriculture, construction and/or transportation, being a service worker, technician, skilled agricultural worker, craftsmen, plant operator and/or elementary operations worker and working in small size firms. Hence, discussion of the estimation results for definition C can be taken as also applying to definition B to a large extent.

examine its nature using individual socio-demographic, household and employment attributes.

Table 1 reports the sample proportions of workers classified as informal under each definition over the four years. Note that all following analyses are conducted for total and non-agricultural employments separately in order to detach the likely effects of highly informal agriculture sector on the dynamics of labor informality. One first notes that share of informal employment in total employment is highest when defined according to definition B and lowest when defined according to definition C. Specifically, informality rate is approximately 65 percent for definition B, 57 percent for definition A and between 45 to 52 percent for definition C. Regarding the variation in time, informal employment rates based on definitions A and B remain more or less the same over the period in question, whereas social security based informality rate exhibits a readily discernible decreasing trend over time. For the non-agricultural sample, the most noticeable finding is the 10-15 percent fall in the informality rates based on all three definitions. This result clearly confirms that agriculture is a highly informal sector by its nature, hence exacerbates the overall informality figures to a considerable extent.

<Insert Table 1 here>

When data is subdivided by gender, similar results seem to apply except for the fact that female workers demonstrate a remarkably higher level of informality regardless of the definition used. Results are reported in Tables 2 and 3 for male and female subsamples, respectively.

< Insert Table 2 here>

< Insert Table 3 here>

Turning first to the male workers, definition B continues to yield the largest informality rate at

between 60 to 64 percent, and definition C the lowest at between 37 to 45 percent. For the male sample, not only definition C but also definition B exhibit a time pattern which decreases from 2006 to 2008, then reverses upwards in 2009. This finding may be interpreted as reflection of the impact of the 2008-2009 global economic crisis on the Turkish labor market.⁵ When agriculture is excluded from the sample, male informality exhibits a fall at around 7-8 percent, but its overall pattern does not change at all. As for female workers, the picture somewhat alters in a way that the variation in female informality across different definitions is significantly lower compared to that of male. Furthermore, informality rate under each definition is notably larger for female workers compared to that of both overall and male samples, reaching levels over 70 percent. Moreover, the decline in informality is steepest for female workers when agriculture is excluded, amounting to approximately 20 percentage points. Also interesting is the finding that, the degree of congruence between definitions A and C is highest for the female subsample, except for the last year. Put differently, enterprise and social security measures overlap to a remarkable extent when female workers are considered.

A breakdown of informality by age is given in Table 4. The first thing to notice is the somewhat U-shaped relationship between informality and age. That is, share of those who are informally employed is higher for the elderly and the young compared to the middle-aged workers. For the 15-24 age group, definition B provides the highest informality rate at between 69 to 76 percent. Whereas, in contrast to the overall picture, for this groups of workers informality is lowest when defined according to definition A. This finding well conforms to the conventional wisdom which postulates that young workers are often initially employed without social security registration and gradually become covered by social protection as they gain experience. Workers in 25-34 and 35-44 age groups are observed to exhibit quite similar informality patterns under all definitions and years. In particular, the proportion of workers defined as informal is highest under definition B

⁵ For a comprehensive analysis of the impact of global crisis on Turkish employment, see Ercan (2010).

and lowest under C.

< Insert Table 4 here >

An interesting finding is that these two groups appear to experience only minor falls or no change in informality rate for 2009. That result may be interpreted as middle age workers being the least affected from the economic crisis. Also note that the discrepancy between definition C based informality rate and others is largest for these workers. This finding is a mere reflection of the fact that social security registration reaches its highest level for middle age workers, thereby confirming the mainstream literature. Moving forward to workers of age 45-54, informality rate records a more than 10 percentage points rise under all three definitions, else being almost identical with prior evidence. Informality rate is estimated at around 80-90 percent for the oldest group of workers. They are significantly more likely to work in informal enterprises (i.e. firms with less than 10 workers, own-account or unpaid family work) when considering definition A, and also more prone to working as unregistered at the social security institute when definition C is applied. Overall, the results imply three main points for further investigation. First, young workers are found as significantly more informal under the social security definition compared to enterprise definition in contrast to all other age groups. Second, middle age workers exhibit the highest level of social protection coverage and lowest level of variation in informality over time. Also interesting is the result that workers of age group 55-64 suffer a severe level of informality regardless of the definition applied. This finding is most likely the result of generous pension schemes causing an epidemic of early retirement, after which elder individuals often move into informal types of employment.⁶ Regarding the non-agricultural sample, almost identical patterns

⁶ Until 1992, Turkish pension system stipulated a minimum retirement age threshold of 60 for males and 55 for females, and a minimum premium payment equivalent to 5000 days of work. Law No.3774, which was passed in February 1992, pledged a minimum period of social security system attachment for 25 years for males and 20 for females (World Bank, 2006). In 1999, the minimum age thresholds were reinstated at 60 for male and 58 for female, and minimum premium payment requirement was increased to 7000 days of work. With the latest reforms which came into force in October 2008, benefit entitlements and incentives for early retirement were reduced to a large extent. In particular, retirement age is increased from 60 and 58 for men and women, respectively, to 65 for both, and the number of minimum contribution days are increased from 7000 to 7200 (OECD, 2009). However, these stipulations will be phased in gradually and become effective for age cohorts born after 1980.

can be observed, the only difference being a 10-20 percent fall in the proportion of informal employment for all definitions and years in question.

In Table 5, one first notes that informality is strongly associated with education level regardless of the measurement criteria used. Starting from as high as over 90 percent for the illiterates, informality rate falls progressively by each increased level of educational attainment. Illiterates are almost exclusively informal and all definitions coincide to a significant extent.

< Insert Table 5 here >

When agriculture is excluded, the steepest fall in illiterate informality rate is that of definition A at approximately 30 percent, which reflects the weightiness of the illiterate workers working as unpaid family workers in agriculture sector. In conformity with their low level of human capital, this group of workers seem to suffer significantly from informality. For the secondary school graduates, informal employment rates and their variation across different definitions are qualitatively similar, but only quantitatively lower. Turning to workers with high school or above level of education, informal employment is found to fall sharply under each definition. This trend is most pronounced for definition C. Regarding high-skilled workers in non-agricultural employment, we find a larger coincidence of informality figures under all definitions, that are mostly visible for university graduates. Also noteworthy is the finding that there is only a minor variation in informality rate over time, when workers with high school or above education are considered. This evidence is consistent with the basic premise which views informality as mostly a low-skill phenomenon. Given that the impact of economic crisis on informal employment is most detectable under definition C, one can easily observe from definition C based informality figures that proportion of informal employment among primary and secondary school graduates

increase by around 4 percent in 2009, whereas it stays put for high school or above graduates.

Table 6 details the proportions of workers classified as informal under each definition broken down into employment status. Regular employees are by far the least informal under each definition compared to all others. Also interesting is to see that the ratio of informally employed according to definition C in the sample of regular employees decreases significantly from 2006 to 2008, reaching a level of as low as 17 percent. When comparing the enterprise and social security definitions of informality, namely definitions A and C, one sees a substantial overlap for the regular employees. The results are almost identical for the non-agricultural sample both qualitatively and quantitatively, implying that regular employees are only rarely or never employed in agriculture. However, the picture almost completely changes when casual employees are considered. Definition C based informality is now significantly higher than definition A based informality, and noticeably closer to definition B based rate. This finding reveals that casual employees are on average working in informal enterprises, i.e. small firms, but their most differential characteristics is being employed without social security. Casual employees display significant increases in the share of informality for the year 2009 regardless of whichever definition is applied, which implies these workers being severely affected from the crisis.

< Insert Table 6 here >

When agriculture is excluded, figures remain more or less the same, indicating that casual employees constitute only a marginal fraction of agricultural employment. Turning to employers, one first notes that they are almost exclusively informal at around 90 percent according to definitions A and B, but only between 25 to 38 percent informal under definition C of social security coverage. This can be explained by the genesis of the definition criteria used in the analysis. That is, employers are classified as informal if working in a firm with less 10 workers

under definitions A and B. Thus, the evidence suggests that most employers are associated with small-scale operations in the Turkish economy. Definition C based informality, however, reveals a different reality of the Turkish labor market which points to high levels of self-registration of the employers at the social security institute. Moreover, time variation of informality based on definition C is quite remarkable, decreasing from as high as 38 percent in 2006 to 25 percent in 2008. This finding may be either a reflection of state's planned and insistent fight against informality that was put into action starting with the EU accession negotiations or overall well performance of the Turkish economy during the years in question.⁷ Non-agricultural rates of informal employment are almost identical to that of entire sample, suggesting that employers exist mostly in sectors outside agriculture. As for the most noticeable difference between total and non-agricultural samples, own-account workers display the highest rise at approximately 10 percent under all definitions. In regards to other patterns observed for own-account workers, one finds that proportion of informal workers in own-account status is lowest when defined according to social security registration. Moreover, the level of definition C based informality records a steep fall from 2006 to 2008, and re-rises by four points in 2009. Regarding the unpaid family workers, our analysis confirms the basic premise that these workers are almost exclusively employed as informal and in agriculture sector. In addition, one can also note that the degree of coincidence between three measures is substantially high, indicating that regardless of whichever definition is used, unpaid family work is an informal phenomenon.

A further breakdown of informality by sector of economic activity elucidates several noteworthy patterns. As Table 7 depicts, agricultural employment based on definitions A and/or B turns out

⁷ The government of Turkey has been pursuing a combat against informality since the opening of accession negotiations with European Union in October 2005. In particular, a comprehensive action plan "The Struggle Against Informal Employment" (KADİM) has been launched under the aegis of Ministry of Labour and Social Security. The project was initially focused on informal employment of illegal foreign employees (Ben Salem et al., 2011). More recently, the Government has incorporated fight against informality strategy as a separate section into its Annual Programs. A broader programme, namely "Struggle Against the Informal Economy Action Plan", was out into action under the leadership of Revenue Administration among various other institutions in 2009. The comprehensive and resolute Plan identifies three main targets (i) promoting formal activities; (ii) strengthening audit capacity and increasing the deterrence of sanctions; (iii) establishing and strengthening institutional and societal consensus (World Bank, 2010).

to be entirely informal, whereas definition C implies that 10 percent of these workers are indeed covered by social security, hence classified as formal. On the other hand, the share of informal work is considerably low in mining, utilities, finances, public administration, education and health sectors. Moreover, estimates of the size of informality under three definitions are more or less similar for these sectors. This finding, in particular, articulates the intrinsic formal nature of these sectors. Indeed, these sectors have been mostly operated by the state and have only recently been privatized, though not fully. Since SILC data set does not cover any information whether a work/worker is either public or private, we are not able to distinguish the informality proneness along this divide. However, as results clearly point out, sectoral differences indeed reveal to a significant extent the concomitant dynamics of informality along public/private employment dimension. These sectors are both associated with large-scale formal enterprises and membership to social security. Likewise, manufacturing workers display a lower rate than the average level of informality, though with a size larger than above mentioned sectors. The rate of social security coverage appears to be quite high in manufacturing sector, as depicted by definition C. Moreover, informality rate based on social security status decreases gradually by 10 percent from 2006 to 2009, which points to fastened formalization in the sector over the recent years. None of the three definitions displays any notable change in the informality rate for 2009 compared to the previous years, thereby one might argue that manufacturing was not affected from the crisis at all. Turning to the construction sector, informality appears to be highest at between 75 to 83 percent according to definition B. Social security based informal employment rate, though initially higher than that provided by definition A, decreases gradually over time and reaches a level of 56 percent in 2009. This figure is 8 percent lower than the estimate of definition A. Given the continuously changing dynamic nature of informality, one may prefer definition C to measure informal employment for construction workers, as enterprise measure appears to be quite non-responsive to time variation.

< Insert Table 7 here >

Regarding the relationship between economic crisis and informal employment, common assumption postulates that during an economic crisis, informal employment would expand as those workers who lose jobs in the formal sector are often displaced in informal sector (Ercan, 2010). However, as Ercan has shown, this was not the case in the recent global crisis since “it was primarily the informal economy workers who lost their jobs”. The sectoral breakdown of informality rates based on social security definition in Table 7 confirms this argument to some extent. In manufacturing sector, one sees that the share of informal employment increased but only slightly by one percentage point from 2008 to 2009. Relatively larger increases can be observed for mining from 18 to 24 percent, transportation from 38 to 43 percent, others from 56 to 62 percent. For construction sector, which is mostly informal by its nature, we see a fall in informal employment from 2008 to 2009 indicating that informal job losses were disproportionately higher. Finally, the rise in agricultural informality proves that those who lost jobs during the crisis moved back to agricultural sector which helped recovery in overall employment situation (Ercan, 2010).

5. MULTIVARIATE ANALYSIS OF LABOR INFORMALITY

The probit regression results for definition A, as reported in Table 8, provide some valuable insight into observed patterns of informal employment. For this particular case, coefficient estimates represent the impact of explanatory variables on the probability of being informal based on definition A. In this framework, gender turns out to have almost no statistically significant explanatory power, though displaying a positive sign throughout the period in question. This evidence points to a weakness of definition A, namely being unable to capture such a well-established association between gender and informality status. The marginal effect of being female is only slightly significant for 2009, that is women are significantly more likely than men

to be informal. This finding may be an implication of the economic crisis. As Ercan (2010) reports women's informal self-employment considerably increased during the crisis, most probably because they had to step in the labor market in order to substitute for their husbands who lost jobs, which is called as the "added worker effect" in the literature.

< Insert Table 8 here >

Regarding age, the evidence suggests that workers aged 25-44 and 45-64 are both significantly less likely to be informal according to definition A, compared to the reference category of aged 15-24. Moreover, the negative relationship becomes more pronounced for the eldest workers, reaching a level of almost 50 percentage points. This evidence confirms the well-known stylized fact that young and less experienced workers are more prone to working informally as they often suffer from barriers to entry into formal employment opportunities. The picture somewhat changes when we consider the year 2009. Namely, the sign of the middle age dummy reverses and turns out as significantly positive, whereas older age dummy ceases to be statistically significant. This finding can be interpreted as middle age workers being affected disproportionately higher than the young during the crisis. The possible reasons are twofold. First, job losses in formal sector could be higher for middle age workers. Moreover, they might be more eager for and successful in finding re-employment in informal sector in case of a lay-off, whereas young workers may not be so and either become unemployed or move out of labor force.

Turning to education, we find that the coefficient estimates contradict the basic premises of the established theory on the association between schooling and being informal. More specifically, the reference category of primary school graduates are found to have significantly lower probability of being informal under definition A compared to workers with any higher level of educational attainment. Furthermore, the coefficient for illiterates or no degree turn out negative,

albeit being only slightly significant. This evidence pinpoints to another drawback of definition A, namely eliding to identify one of the most prominent stylized facts related to informality.

Household demographic structure seems to play almost no role in explaining definition A based informal employment. Specifically, marginal effects of being married and/or being a household head are found as positive but not statistically significant. The only exception is the statistically significant *married* dummy for 2009, which implies that those married individuals became more likely to be informal in the aftermath of the crisis. Whereas having children in the household exhibits a negative relationship with being informal based on definition A, albeit being only marginally significant in 2008. Along these lines, one can confidently tell that definition A also fails to notice any potential influence of household characteristics on the likelihood of being informal.

Sector of economic activity plays somewhat a fair role in explaining the probability of being informal, though seems to overlook some of the well-established premises. Compared to the base category of manufacturing workers, workers in trade, hotels and restaurants, finances, health and other services sectors are found to display a significantly lower probability of being informal based on definition A. These patterns are persistent throughout the period in question, though the magnitudes and significance of coefficients, hence their explanatory power decrease to a notable extent for the year 2009. On the other hand, definition A fails to capture the prominent relationships of informality with agriculture and construction activities.

Occupation emerges as virtually the most significant and powerful determinant of the probability of being informal according to definition A. In particular, workers in all occupations other than legislators and technicians display a significantly higher probability of being informal when compared to the reference group of professional workers. Moreover, these coefficients are not only statistically significant but also remarkably high in magnitude. However, we prefer to

approach these evidence with skepticism, since definition A by its construction employs occupational criteria when classifying workers as formal and/or informal. In particular, it peculiarly excludes self-employment in the forms administrative, professional and technical work from informal employment. Therefore, results should rather be viewed as only a statistical outcome, without adhering a strong qualitative meaning. Similar findings and interpretations may also apply to the firm size variable, which is also used as an explicit criterion in definition A to identify informal workers. Regarding firm size, probit regression coefficient estimates yield ambiguous results, which is due to firm size being used as the measurement criteria in Definition A. Thus, we prefer not to treat them as meaningful for this particular case. Overall, definition A falls short of explaining the well-established association between informality and factors such as occupation and firm size, since that it rather uses these relationships as measurement criteria in its very definition.

For urban/rural divide, definition A reveals a statistically significant pattern. In particular, workers residing in urban areas are found as significantly more likely to be informal between 2006 and 2008 than rural residents. Whereas, the coefficient of urban dummy ceases to be significant in 2009, which is most probably attributable to the impact of the economic crisis. As Ercan (2010) well articulates one of the most important factors that helped recovery in employment was the increase in agriculture as “job losers have gone back to their villages to weather the crisis”. Ercan states that urban informal job holders are the ones who were affected most during the crisis. When head of the household lost jobs, families returned to their villages in the rural, and started to work as unpaid family workers there. This argument clearly explains the coefficient of urban dummy ceasing to be statistically significantly positive any more in 2009, as rural informality have indeed expanded considerably in the aftermath of the economic crisis.

Turning to the probit estimation results for definition C, reported in Table 10, one first notes gender now emerging as a powerful and robust predictor of the likelihood of being informal. In particular, women are approximately 40-50 percentage points more likely than men to work informally, *ceteris paribus*. The highly significant and positive coefficient is well consistent with the renowned stylized fact that female workers are typically disproportionately represented in formal employment than their male counterparts, even given equal qualifications. This may be due to involuntary or voluntary factors. First, women often face higher entry barriers into formal work opportunities, thereby have no choice but become informal. Whereas, they might also voluntarily opt out of formal employment which is often subject to stricter working conditions and regulations, given their reproductive role and traditional gender division of labor in the Turkish family structure. To this extent, one can confidently argue that definition C based on social security status is superior compared to definition A based on job characteristics, since it can properly capture the gender dimension of labor informality.

< Insert Table 10 here >

Regarding age, there are some pronounced differences when one uses definition C to identify informal workers rather than definition A. First, workers aged 25-44 exhibit a significantly lower likelihood of being informal than the reference group of aged 15-24 workers. This evidence is robust over time and identified for both definitions A and C, and indeed conforms to the mainstream literature which associates informality with young and inexperienced workers. However, workers of age between 45-64 appear no less likely to be informal than those between 15-24. Its coefficient ceases to be statistically significant when definition C based informality is considered. This finding contradicts that of definition A of informality, which exhibits a statistically significant negative coefficient for 45-64 dummy, though only significant at the 5 percent confidence level for 2006 and 2008.

As for the education level and in line with the conventional wisdom, definition C based probit results reveal a strong schooling pattern. In particular, compared to the base category of primary school graduates those with higher schooling exhibit a significantly lower probability of being informal, whereas those who are illiterate or have no degree have approximately 50 percentage points higher probability of working informally. Moreover, one can also note that the magnitude of difference in the probability of being informal rises incrementally for each additional level of educational attainment. Another noteworthy pattern is that the evidence applies to all years under study. This finding is of great importance since it pinpoints an important disparity between the two main definitions. Education variable when used for explaining any relationship with informality based on definition A, appears to yield ambiguous results which contradict the established theory, whereas it confirms all expected patterns when described by definition C.

A similar picture emerges for the household characteristics variables, which are now statistically significantly related to definition C based informality. More specifically, marginal effect of marriage on probability of being informal is strongly significantly negative for all years in question. That is, married workers are approximately 20 percentage points less likely to be informal compared to those who are not married. This might reflect that married individuals are less willing to take risks associated with informal employment, and prefer safer employment in formal sector. Due to similar reasons, being a household head statistically significantly reduces the likelihood of informal employment, around 20 percentage points. Turning to children variable, one notes statistically significant but this time positive coefficients, though there exist some variation in its size and significance level over time. The evidence suggests that individuals in households with children posit a higher likelihood of informality. This finding may be interpreted as increased household financial burden making individuals more likely to consent with informal jobs since formal sector jobs are often limited and have higher entry barriers. The

evidence on household variables, overall, demonstrate the traditional family influences such as increased family responsibility and increased dependence on safe employment on individual employment decisions. Therefore, one would typically expect a proper definition of informality to identify such household effects in an accurate fashion. In this regard, definition C appears to be superior over definition A once again, as the latter fails to detect these associations.

Informal status defined on the basis of social security registration displays an almost completely different relationship with sector of economic activity, compared to that of based on definition A. Agriculture now emerges as a strong predictor of being informal, namely agricultural workers display statistically positive association with being informal which remain so until the end of the period in question. Whereas definition A based informality fails to identify this prominent stylized fact on sectoral informality. Indeed starting with the mainstream literature, informality has been viewed as mostly a rural agricultural phenomenon which is also a salient feature of Turkish labor markets. Another notable result pertains to the construction workers who are now 70-80 percentage points more likely to be informal compared to their counterparts in manufacturing for all years. This finding, albeit was unidentified by definition A of informality, strictly conforms to a stylized fact of the labor markets in Turkey, where construction workers are mostly those casual day-laborers and account for a major fraction of informal employment.

Regarding the firm size, those workers who are not registered at the social security are significantly more likely to be employed in small firms with less than 10 workers. More specifically, workers in firms with 11 to 49 employees are associated with an approximately 70-80 percentage points lower likelihood of being informal. When firm size is even larger, the magnitude of the coefficient increases and reaches a level of almost 150 percentage points.

When compared to the same coefficient in the analysis for definition A of informality, the evidence on rural/urban variable also appears to be entirely different. More specifically, definition C specifies a negative relationship between probability of being informal and urban, which is statistically significant for only 2008 and 2009. Whereas, definition A reveals a positive relationship between informality and urban residence, which turns out as statistically significant for all years except for 2009.

6. CONCLUDING REMARKS

In this paper, we consider how informality can be defined and measured in the Turkish labor market given that there is no single universally accepted definition, but a multiple number of methods in the literature, tailored specifically to different time and space contexts. In this endeavor, we construct three alternative definitions following theoretical and empirical literature. Definition A mostly corresponds to employment in the informal sector, hence the *enterprise definition* which associates informality with activities of small-scale enterprises and self-employed; definition C represents the *legalistic view* which identifies informality with lack of social security, and definition B is constructed so as to combine both employment in the informal sector and lack of social security. The first part is descriptive in nature and meant to determine the degree of congruence between alternative definitions and decompose the structure of labor informality in Turkey. Next, a multivariate analysis is conducted to explain the likelihood of informality using various personal and job attributes as explanatory variables.

Overall, informal employment accounts for approximately 65, 57 and between 45 to 52 percent of the sample when defined based on definitions B, A and C, respectively. For the non-agricultural sample, all figures fall by around 10 percentage points, else being identical. Regarding variation over time, social security based informality displays a more discernible pattern from 2006 to 2009, whereas others remain more or less the same over time. Females are found as significantly

more informal under all definitions, and overlap between different definitions is higher for female workers. Moreover, we observe a U-shaped relationship between informality and age which is commonly postulated in the mainstream literature. Furthermore, in conformity with the conventional wisdom, informality is found as significantly negatively associated with educational attainment level regardless of the measurement criteria used. A breakdown of informality by sector of economic activity and occupation also marks several evident patterns.

The probit analysis provides a more profound characterization of informal employment in the Turkish labor market both along different definitions and over time. The results, overall, point towards social security based informality definition being superior over productive definition in capturing the association between key individual and job characteristics and informality. More specifically, gender, age, education, household demographics, sector and firm size variables are all found as confirming the well-established stylized facts when informality is identified based on definition C. Whereas, productive measure of informal employment appears to fall short of properly detecting renowned basic premises in the theory, even in some cases not detecting them at all.

To conclude, this study provides a comprehensive and detailed diagnosis of the Turkish labor market. We find that social security registration criterion is a better measure of informality than enterprise or productive definitions in the Turkish labor market given its ability to capture key relationships between several individual and employment characteristics and the likelihood of informality. Moreover, social security definition appears as the most responsive measure with regards to time and impacts of crisis. Along these lines, we recommend researchers and policy-makers prefer the social security to define labor informality, for more accurate analyses of the Turkish labor markets.

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Table 1: Informality Rates for each definition (Total)

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Definition A	0.58	0.57	0.57	0.57	0.45	0.44	0.43	0.44
Definition B	0.67	0.65	0.64	0.64	0.56	0.54	0.52	0.52
Definition C	0.52	0.48	0.45	0.46	0.39	0.35	0.31	0.32

Source : Author's own calculations based on SILC 2006-2009.

Notes : Definition A is the enterprise definition, Definition B is the extended enterprise definition, Definition C is the social security definition.

Table 2: Informality Rates for each definition (Male only)

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Definition A	0.54	0.53	0.53	0.54	0.46	0.45	0.45	0.44
Definition B	0.64	0.62	0.60	0.61	0.57	0.55	0.53	0.53
Definition C	0.45	0.42	0.37	0.40	0.38	0.35	0.30	0.32

Source : Author's own calculations based on SILC 2006-2009.

Notes : Definition A is the enterprise definition, Definition B is the extended enterprise definition, Definition C is the social security definition.

Table 3: Informality Rates for each definition (Female only)

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Definition A	0.68	0.66	0.65	0.66	0.42	0.39	0.39	0.40
Definition B	0.76	0.73	0.72	0.71	0.53	0.50	0.47	0.48

Definition C	0.69	0.65	0.63	0.62	0.43	0.36	0.33	0.32
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Source : Author's own calculations based on SILC 2006-2009.

Notes : Definition A is the enterprise definition, Definition B is the extended enterprise definition, Definition C is the social security definition.

Table 4: Informality Rates for each definition by Age

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Age 15-24								
Definition A	0.60	0.59	0.59	0.61	0.50	0.48	0.48	0.49
Definition B	0.76	0.72	0.69	0.73	0.68	0.63	0.60	0.63
Definition C	0.67	0.61	0.55	0.60	0.57	0.50	0.42	0.46
Age 25-34								
Definition A	0.51	0.50	0.49	0.50	0.42	0.41	0.40	0.41
Definition B	0.58	0.56	0.54	0.55	0.49	0.47	0.45	0.46
Definition C	0.41	0.36	0.33	0.34	0.31	0.26	0.22	0.23
Age 35-44								
Definition A	0.56	0.54	0.54	0.53	0.44	0.42	0.42	0.42
Definition B	0.63	0.60	0.59	0.58	0.52	0.50	0.48	0.47
Definition C	0.43	0.40	0.37	0.37	0.31	0.28	0.25	0.25
Age 45-54								
Definition A	0.65	0.65	0.64	0.63	0.47	0.47	0.46	0.44
Definition B	0.74	0.74	0.73	0.72	0.60	0.59	0.58	0.57
Definition C	0.59	0.57	0.55	0.57	0.45	0.42	0.39	0.41
Age 55-64								
Definition A	0.82	0.80	0.81	0.82	0.59	0.56	0.60	0.56
Definition B	0.93	0.92	0.90	0.90	0.83	0.81	0.79	0.77
Definition C	0.85	0.82	0.80	0.81	0.73	0.71	0.67	0.65

Source : Author's own calculations based on SILC 2006-2009.

Notes : Definition A is the enterprise definition, Definition B is the extended enterprise definition, Definition C is the social security definition.

Table 5: Informality Rates for each definition by Education

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Illiterate								
Definition A	0.91	0.89	0.91	0.91	0.65	0.62	0.69	0.65
Definition B	0.98	0.96	0.97	0.98	0.90	0.81	0.86	0.90
Definition C	0.95	0.92	0.94	0.95	0.83	0.73	0.81	0.83
No Grade								
Definition A	0.76	0.77	0.76	0.76	0.53	0.57	0.54	0.53
Definition B	0.91	0.93	0.91	0.91	0.81	0.86	0.82	0.81
Definition C	0.85	0.86	0.84	0.85	0.72	0.77	0.72	0.72
Primary								
Definition A	0.70	0.68	0.68	0.70	0.55	0.53	0.54	0.55
Definition B	0.77	0.77	0.75	0.77	0.65	0.65	0.63	0.65
Definition C	0.58	0.59	0.54	0.58	0.44	0.45	0.40	0.44
Secondary								
Definition A	0.62	0.58	0.58	0.62	0.53	0.49	0.49	0.53
Definition B	0.71	0.68	0.68	0.71	0.64	0.61	0.61	0.64
Definition C	0.53	0.52	0.48	0.53	0.43	0.44	0.39	0.43
High								
Definition A	0.44	0.45	0.46	0.44	0.40	0.41	0.41	0.40
Definition B	0.52	0.53	0.52	0.52	0.48	0.49	0.47	0.48
Definition C	0.28	0.31	0.27	0.28	0.23	0.27	0.22	0.23
Vocational								
Definition A	0.39	0.41	0.38	0.39	0.35	0.37	0.34	0.35
Definition B	0.43	0.45	0.41	0.43	0.39	0.42	0.38	0.39
Definition C	0.23	0.24	0.20	0.23	0.18	0.21	0.17	0.18
University								
Definition A	0.22	0.24	0.21	0.22	0.21	0.23	0.20	0.21
Definition B	0.26	0.29	0.24	0.26	0.25	0.28	0.23	0.25
Definition C	0.09	0.11	0.08	0.09	0.07	0.10	0.07	0.07

Source : Author's own calculations based on SILC 2006-2009.

Notes : Definition A is the enterprise definition, Definition B is the extended enterprise definition, Definition C is the social security definition.

Table 6: Informality Rates for each definition by Employment Status

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Regular employee								
Definition A	0.32	0.32	0.30	0.31	0.31	0.31	0.30	0.31
Definition B	0.41	0.39	0.36	0.37	0.41	0.38	0.36	0.37
Definition C	0.26	0.22	0.17	0.18	0.26	0.21	0.17	0.18
Casual employee								
Definition A	0.80	0.75	0.75	0.78	0.82	0.76	0.77	0.80
Definition B	0.97	0.96	0.94	0.96	0.96	0.95	0.93	0.95
Definition C	0.94	0.92	0.85	0.91	0.93	0.90	0.83	0.89
Employer								
Definition A	0.88	0.87	0.88	0.87	0.88	0.87	0.88	0.87
Definition B	0.92	0.90	0.90	0.90	0.92	0.89	0.89	0.89
Definition C	0.38	0.30	0.25	0.27	0.35	0.26	0.22	0.23
Own-account worker								
Definition A	0.79	0.77	0.78	0.78	0.56	0.54	0.56	0.57
Definition B	0.90	0.89	0.89	0.88	0.79	0.77	0.77	0.78
Definition C	0.72	0.68	0.64	0.68	0.62	0.57	0.53	0.58
Unpaid family worker								
Definition A	0.99	0.99	0.99	0.99	0.91	0.94	0.95	0.95
Definition B	1.00	1.00	1.00	1.00	0.97	0.98	0.98	0.98
Definition C	0.94	0.93	0.93	0.95	0.81	0.79	0.77	0.82

Source : Author's own calculations based on SILC 2006-2009.

Notes : Definition A is the enterprise definition, Definition B is the extended enterprise definition, Definition C is the social security definition.

Table 7: Informality Rates for each definition by Sector

	ALL SAMPLE					ALL SAMPLE			
	2006	2007	2008	2009		2006	2007	2008	2009
Agriculture					Transportation				
Definition A	0.97	0.97	0.96	0.97	Definition A	0.59	0.56	0.55	0.56
Definition B	0.99	0.99	0.99	0.99	Definition B	0.70	0.65	0.62	0.64
Definition C	0.90	0.89	0.87	0.89	Definition C	0.49	0.43	0.38	0.43
Mining					Finances				
Definition A	0.16	0.20	0.19	0.21	Definition A	0.22	0.21	0.22	0.20
Definition B	0.20	0.29	0.26	0.31	Definition B	0.26	0.22	0.24	0.24
Definition C	0.14	0.23	0.18	0.24	Definition C	0.09	0.06	0.09	0.09
Manufacturing					Business services				
Definition A	0.33	0.32	0.33	0.33	Definition A	0.37	0.37	0.37	0.35
Definition B	0.47	0.43	0.42	0.42	Definition B	0.50	0.47	0.43	0.42
Definition C	0.35	0.29	0.25	0.26	Definition C	0.28	0.25	0.19	0.20
Utilities					Public Administration				
Definition A	0.03	0.04	0.07	0.06	Definition A	0.08	0.11	0.10	0.11
Definition B	0.04	0.05	0.09	0.10	Definition B	0.11	0.15	0.14	0.15
Definition C	0.01	0.01	0.02	0.04	Definition C	0.05	0.08	0.08	0.08
Construction					Education				
Definition A	0.66	0.65	0.65	0.64	Definition A	0.07	0.09	0.07	0.10
Definition B	0.83	0.80	0.76	0.75	Definition B	0.13	0.16	0.11	0.15
Definition C	0.72	0.67	0.58	0.56	Definition C	0.07	0.08	0.06	0.07
Trade					Health				
Definition A	0.64	0.63	0.61	0.61	Definition A	0.15	0.15	0.12	0.12
Definition B	0.76	0.74	0.71	0.71	Definition B	0.21	0.20	0.14	0.15
Definition C	0.47	0.43	0.35	0.37	Definition C	0.10	0.09	0.05	0.07
Hotels&Restaurants					Others				
Definition A	0.59	0.54	0.55	0.55	Definition A	0.78	0.74	0.74	0.78

Definition B	0.70	0.67	0.67	0.68	Definition B	0.87	0.82	0.83	0.85
Definition C	0.48	0.45	0.44	0.45	Definition C	0.64	0.55	0.56	0.62

Source : Author's own calculations based on SILC 2006-2009.

Notes : Definition A is the enterprise definition, Definition B is the extended enterprise definition, Definition C is the social security definition.

Table 8: Probit estimation results (Definition A)

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Gender								
female	0.207	0.189	0.169	0.224*	0.168	0.189	-0.169	-0.224*
Age								
age25to44	-0.334*	-0.139	-0.315*	0.251*	-0.381*	-0.139	0.315*	-0.251*
age45to64	-0.520*	-0.365	-0.523*	0.27	-0.542*	-0.365	0.523*	-0.27
Schooling								
illiterate	-0.342	-0.742	-0.131	-0.366*	-0.871	-0.742	0.131	0.366*
noschool	-0.5	-0.252	-0.565*	-0.177	-0.523	-0.252	0.565*	0.177
secondary	0.505***	0.328**	0.0722	0.14	0.540***	0.328**	-0.0722	-0.14
high	0.457***	0.414***	0.282*	0.290**	0.492***	0.414***	-0.282*	-0.290**
vocational	0.671***	0.727***	0.380**	0.256*	0.689***	0.727***	-0.380**	-0.256*
university	0.771***	0.919***	0.427**	0.450***	0.792***	0.919***	-0.427**	-0.450***
Household type								
married	0.0905	5.967	0.135	1.905***	0.0845	5.967	-0.135	-1.905***
hhead	0.093	0.107	0.117	0.125	0.162	0.107	-0.117	-0.125
child	-0.0131	0.00327	-0.201*	0.0456	-0.0123	0.00327	0.201*	-0.0456
Experience								
exper	0.0192	0.000137	-0.0225	-0.0842	0.0125	0.000137	0.0225	0.0842
expersq	-0.000316	-0.0035	0.000457	-0.0187	-0.000177	-0.0035	-0.000457	0.0187
Sector								
Agriculture	0.57	0.000137	0.369	0.000395		0.000137	-0.369	-0.000395
Mining	-3.464	0.466	-0.253	0.737**	-3.5	0.466	0.253	-0.737**
Energy	-0.653	0.49	0.336	-0.793	-0.239	0.49	-0.336	0.793
Construction	-0.513	0.475	0.0546	0.661*	-0.507	0.475	-0.0546	-0.661*
Trade	-1.406***	0.0109	-0.980***	-0.0769	-1.393***	0.0109	0.980***	0.0769
Hotels	-0.704**	-1.080***	-0.469**	-0.348**	-0.660**	-1.080***	0.469**	0.348**
Transportation	0.161	-0.217	-0.18	-0.129	0.174	-0.217	0.18	0.129
Finances	-1.690***	-0.473*	-1.242***	-0.229	-1.702***	-0.473*	1.242***	0.229
PublicAdministrat	0.341	-1.282***	1.142***	-0.477**	0.600**	-1.282***	-1.142***	0.477**
Education	0.111	1.023***	-0.375	0.488*	0.0961	1.023***	0.375	-0.488*
Health	-1.166***	-0.0368	-1.087***	-0.041	-1.139**	-0.0368	1.087***	0.041
OtherServices	-0.881***	-1.013**	-0.774***	-0.578*	-0.848***	-1.013**	0.774***	0.578*
Occupation								
Legislators	-0.647***	-0.654**	-0.858***	0.179	-0.668***	-0.654**	0.858***	-0.179
Technicians	0.346*	-0.538***	-0.0291	-0.579***	0.345	-0.538***	0.0291	0.579***
Clerks	11.60***	0.396*	11.78***	0.171	12.62***	0.396*	-11.78***	-0.171
ServiceWorkers	6.932	11.81***	6.936***	1.726**	7.581	11.81***	-6.936***	-1.726**
SkilledAgricultur	13.72***	7.183***	14.26	1.736***	6.574	7.183***	-14.26	-1.736***
Craftsmen	11.54***	14.69	12.25***	3.625***	12.54***	14.69	-12.25***	-3.625***
PlantOperators	11.43***	12.17***	11.90***	1.967***	12.43	12.17***	-11.90***	-1.967***
ElementaryOpera	11.56***	12.44***	11.75***	1.825***	12.84***	12.44***	-11.75***	-1.825***
Firm size								
medium	-15.66***	12.42***	-16.20***	1.423***	-16.64***	12.42***	16.20***	-1.423***
large	-16.66	-16.17***		-4.900***		-16.17***		4.900***
Region								
urban	0.353***	0.327***	0.376***	0.0983	0.423***	0.327***	-0.376***	-0.0983
N	13016	11008	11338	11752	6128	11008	11338	11752

Source : Author's own calculations based on SILC 2006-2009.

Notes : ¹For variable definitions, see Appendix Table A.1. ²The results are marginal effects for the Probit Model. ³Dependent variable base category: Formal based on definition A. ⁴Independent variable base category: Male, age 15-24, primary school graduate, single, not household head, does not have children, manufacturing sector, professional occupation, small size firms, rural. ⁵The coefficients imply the marginal effects for the probit model.

Legend: * for p<.05, ** for p<.01, and *** for p<.001

Table 9: Probit estimation results (Definition B)

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Gender								
female	0.222**	0.302***	0.320***	0.316***	0.202**	0.302***	0.320***	0.316***
Age								
age25to44	-0.497***	-0.355***	-0.268***	-0.172*	-0.490***	-0.355***	-0.268***	-0.172*
age45to64	-0.187	-0.0899	0.0696	0.183	-0.185	-0.0899	0.0696	0.183
Schooling								
illiterate	0.481*	0.734***	0.631***	0.906***	0.387	0.734***	0.631***	0.906***
noschool	0.540**	0.764***	0.689***	0.776***	0.593***	0.764***	0.689***	0.776***
secondary	-0.0479	0.0864	0.0341	0.0733	-0.0494	0.0864	0.0341	0.0733
high	-0.191*	-0.0983	-0.149*	-0.0771	-0.163*	-0.0983	-0.149*	-0.0771
vocational	-0.278***	-0.199**	-0.302***	-0.217**	-0.273***	-0.199**	-0.302***	-0.217**
university	-0.0299	0.214*	0.025	-0.0391	-0.0205	0.214*	0.025	-0.0391
Household type								
married	-0.183*	-0.142*	-0.176*	-0.160*	-0.193*	-0.142*	-0.176*	-0.160*
hhead	-0.0153	-0.074	0.0844	0.0105	-0.00683	-0.074	0.0844	0.0105
child	0.101	0.235***	0.191***	0.168**	0.0933	0.235***	0.191***	0.168**
Experience								
exper	-0.0211*	-0.0113	-0.0368***	-0.0353***	-0.0211*	-0.0113	-0.0368***	-0.0353***
expersq	0.000768**	0.000712**	0.00116***	0.00117***	0.000803**	0.000712**	0.00116***	0.00117***
Sector								
Agriculture	1.319***	1.590***	1.519***	1.402***		1.590***	1.519***	1.402***
Mining	-0.558	0.0468	-0.0756	0.127	-0.555	0.0468	-0.0756	0.127
Energy	-0.799**	-0.534	-0.696*	-0.32	-0.814**	-0.534	-0.696*	-0.32
Construction	0.587**	0.761***	0.661***	0.552***	0.589***	0.761***	0.661***	0.552***
Trade	-0.404***	-0.154*	-0.354***	-0.0766	-0.398***	-0.154*	-0.354***	-0.0766
Hotels	-0.208	0.186	0.0285	0.158	-0.191	0.186	0.0285	0.158
Transportation	0.431***	0.360***	0.397***	0.261*	0.421***	0.360***	0.397***	0.261*
Finances	-0.529***	-0.272**	-0.579***	-0.167	-0.524***	-0.272**	-0.579***	-0.167
PublicAdministr	-0.518***	-0.104	-0.0843	-0.0942	-0.514***	-0.104	-0.0843	-0.0942
Education	-0.279	0.114	-0.113	-0.0737	-0.269	0.114	-0.113	-0.0737
Health	-0.549***	-0.239	-0.526**	-0.446**	-0.537***	-0.239	-0.526**	-0.446**
OtherServices	0.105	0.333**	0.427**	0.749***	0.119	0.333**	0.427**	0.749***
Occupation								
Legislators	-0.582***	-0.201	-0.546***	-0.305**	-0.587***	-0.201	-0.546***	-0.305**
Technicians	0.284*	0.589***	0.488**	0.461***	0.283*	0.589***	0.488**	0.461***
Clerks	0.431**	0.736***	0.548***	0.694***	0.435**	0.736***	0.548***	0.694***
ServiceWorkers	0.896***	1.485***	1.339***	1.223***	0.899***	1.485***	1.339***	1.223***
SkilledAgricultu	0.776**	1.240***	0.639*	0.899***	0.613	1.240***	0.639*	0.899***
Craftsmen	0.952***	1.532***	1.259***	1.301***	0.961***	1.532***	1.259***	1.301***
PlantOperators	0.846***	1.261***	1.009***	1.101***	0.867***	1.261***	1.009***	1.101***
ElementaryOper	0.871***	1.346***	1.230***	1.079***	0.859***	1.346***	1.230***	1.079***
Firm size								
medium	-2.965***	-2.890***	-3.294***	-2.771***	-2.963***	-2.890***	-3.294***	-2.771***
large	-3.785***	-3.708***	-3.974***	-3.595***	-3.771***	-3.708***	-3.974***	-3.595***
Region								
urban	0.115*	0.0716	-0.101*	-0.138**	0.139**	0.0716	-0.101*	-0.138**
N	13016	13457	13950	14368	8412	13457	13950	14368

Source : Author's own calculations based on SILC 2006-2009.

Notes : ¹For variable definitions, see Appendix Table A.1. ²The results are marginal effects for the Probit Model. ³Dependent variable base category: Formal based on definition B. ⁴Independent variable base category: Male, age 15-24, primary school graduate, single, not household head, does not have children, manufacturing sector, professional occupation, small size firms, rural. ⁵The coefficients imply the marginal effects for the probit model.

Legend: * for p<.05, ** for p<.01, and *** for p<.001

Table 10: Probit estimation results (Definition C)

	ALL SAMPLE				NON-AGRICULTURAL SAMPLE			
	2006	2007	2008	2009	2006	2007	2008	2009
Gender								
female	0.452***	0.395***	0.529***	0.433***	0.187***	0.395***	0.529***	0.433***
Age								
age25to44	-0.408***	-0.389***	-0.299***	-0.332***	-0.361***	-0.389***	-0.299***	-0.332***
age45to64	-0.0365	-0.0737	0.0716	0.0941	0.0873	-0.0737	0.0716	0.0941
Schooling								
illiterate	0.620***	0.475***	0.640***	0.551***	0.525***	0.475***	0.640***	0.551***
noschool	0.496***	0.422***	0.476***	0.575***	0.482***	0.422***	0.476***	0.575***
secondary	-0.135**	-0.0865*	-0.0573	-0.0736	-0.162**	-0.0865*	-0.0573	-0.0736
high	-0.384***	-0.342***	-0.342***	-0.376***	-0.402***	-0.342***	-0.342***	-0.376***
vocational	-0.520***	-0.466***	-0.442***	-0.445***	-0.565***	-0.466***	-0.442***	-0.445***
university	-0.444***	-0.467***	-0.534***	-0.639***	-0.455***	-0.467***	-0.534***	-0.639***
Household type								
married	-0.212***	-0.194***	-0.271***	-0.248***	-0.224***	-0.194***	-0.271***	-0.248***
hhead	-0.194***	-0.195***	-0.160***	-0.194***	-0.0999	-0.195***	-0.160***	-0.194***
child	0.0842*	0.164***	0.188***	0.107**	0.0325	0.164***	0.188***	0.107**
Experience								
exper	-0.0204***	-0.00741	-0.0154**	-0.0166**	-0.0413***	-0.00741	-0.0154**	-0.0166**
expersq	0.000488***	0.000277*	0.000472***	0.000491***	0.00107***	0.000277*	0.000472***	0.000491***
Sector								
Agriculture	1.194***	1.341***	0.976***	1.254***		1.341***	0.976***	1.254***
Mining	-0.236	0.22	0.177	0.467**	-0.261	0.22	0.177	0.467**
Energy	-0.794*	-0.734	-0.775	-0.366	-0.889**	-0.734	-0.775	-0.366
Construction	0.753***	0.832***	0.727***	0.665***	0.706***	0.832***	0.727***	0.665***
Trade	-0.0168	0.119*	0.0619	0.077	-0.0513	0.119*	0.0619	0.077
Hotels	0.0839	0.310***	0.341***	0.418***	0.0495	0.310***	0.341***	0.418***
Transportation	0.338***	0.462***	0.500***	0.494***	0.270***	0.462***	0.500***	0.494***
Finances	-0.0903	0.0387	-0.0517	0.0394	-0.121	0.0387	-0.0517	0.0394
PublicAdmin.	-0.478***	-0.0123	0.0913	0.0583	-0.554***	-0.0123	0.0913	0.0583
Education	-0.366**	-0.107	-0.189	-0.247*	-0.326*	-0.107	-0.189	-0.247*
Health	-0.571***	-0.193	-0.537***	-0.402**	-0.485***	-0.193	-0.537***	-0.402**
OtherServices	0.286**	0.331***	0.448***	0.602***	0.258**	0.331***	0.448***	0.602***
Occupation								
Legislators	0.308**	0.462***	0.474***	0.510***	0.252*	0.462***	0.474***	0.510***
Technicians	0.218	0.275*	0.399***	0.349**	0.238*	0.275*	0.399***	0.349**
Clerks	0.0435	0.0734	-0.0183	0.151	0.149	0.0734	-0.0183	0.151
ServiceWork	0.601***	0.757***	0.651***	0.718***	0.627***	0.757***	0.651***	0.718***
SkilledAgricul.	0.0353	0.159	0.481***	0.293*	0.389	0.159	0.481***	0.293*
Craftsmen	0.687***	0.847***	0.768***	0.876***	0.673***	0.847***	0.768***	0.876***
PlantOperator	0.553***	0.597***	0.523***	0.676***	0.556***	0.597***	0.523***	0.676***
ElementaryOp	0.678***	0.832***	0.893***	0.874***	0.661***	0.832***	0.893***	0.874***
Firm size								
medium	-0.799***	-0.705***	-0.751***	-0.770***	-0.802***	-0.705***	-0.751***	-0.770***
large	-1.548***	-1.457***	-1.405***	-1.555***	-1.528***	-1.457***	-1.405***	-1.555***
Region								
urban	-0.0465	-0.0641	-0.110***	-0.157***	0.0142	-0.0641	-0.110***	-0.157***
N	13016	13457	13950	14368	8412	13457	13950	14368

Source : Author's own calculations based on SILC 2006-2009.

Notes : ¹For variable definitions, see Appendix Table A.1. ²The results are marginal effects for the Probit Model. ³Dependent variable base category: Formal based on definition C. ⁴Independent variable base category: Male, age 15-24, primary school graduate, single, not household head, does not have children, manufacturing sector, professional occupation, small size firms, rural. ⁵The coefficients imply the marginal effects for the probit model.

Legend: * for p<.05, ** for p<.01, and *** for p<.001

Table A.1: List of Definitions

<i>Variable Name</i>	<i>Definition</i>
Definition A	
Formal	1 if employee or employer in a firm with more than 10 workers or an administrative, professional or technician
Informal	1 if employee or employer in a firm with less than 10 workers or own account-worker (excluding administrative, professional and technicians) or unpaid family workers; 0 otherwise
Definition B	
Formal	1 if employee or employer in a firm with more than 10 workers or an administrative, professional or technician and who are registered to the social security institute; 0 otherwise
Informal	1 if employee or employer in a firm with less than 10 workers or own account-worker (excluding administrative, professional and technicians) or unpaid family workers and those who are categorized as formal in Definition A but is not registered to SSI; 0 otherwise
Definition C	
Formal	1 if registered to the social security institute for main job; 0 otherwise.
Informal	1 if not registered to the social security institute for main job; 0 otherwise.
Individual Characteristics	
male	1 if male; 0 otherwise
female	1 if female; 0 otherwise
age15to24	1 if in age range; 0 otherwise
age25to44	1 if in age range; 0 otherwise
age45to64	1 if in age range; 0 otherwise
illiterate	1 if illiterate; 0 otherwise
noschool	1 if did not attend school; 0 otherwise
primary	1 if completed primary school; 0 otherwise
secondary	1 if completed secondary school; 0 otherwise
high	1 if completed high school; 0 otherwise
vocational	1 if completed vocational school; 0 otherwise
university	1 if completed university; 0 otherwise
Household Characteristics	
single	1 if not married; 0 otherwise
married	1 if married; 0 otherwise
nochild	1 if the household do not have any children; 0 otherwise
child	1 if the household has children; 0 otherwise
hhead	1 if head of the household; 0 otherwise
Employment/Job Characteristics	
exper	total number of years the individual has worked for since he/she first started working
expersq	experince squared
Agriculture	1 if employed in agriculture; 0 otherwise
Mining	1 if employed in mining; 0 otherwise
Manufacturing	1 if employed in manufacturing; 0 otherwise
Energy	1 if employed in energy; 0 otherwise
Construction	1 if employed in construction; 0 otherwise
Trade	1 if employed in trade; 0 otherwise
Hotels	1 if employed in hotels; 0 otherwise
Transportation	1 if employed in transportation; 0 otherwise
Finances	1 if employed in finances; 0 otherwise
Public Administration	1 if employed in public administration; 0 otherwise
Education	1 if employed in education; 0 otherwise
Health	1 if employed in health; 0 otherwise
Other	1 if employed in other services; 0 otherwise
Legislators	1 if employed as a legislator; 0 otherwise
Professional	1 if employed as a professional; 0 otherwise
Technicals	1 if employed as a technician; 0 otherwise
Clerks	1 if employed as a clerk; 0 otherwise
Service workers	1 if employed as a service worker; 0 otherwise
Skilled agricultural worker	1 if employed as a skilled agricultural worker; 0 otherwise
Craftsmen	1 if employed as a craftsmen; 0 otherwise
Plant operators	1 if employed as a plant operator; 0 otherwise
Elementary operations	1 if employed as a elemenatry opr. worker; 0 otherwise
small	1 if firm size is between 1 to 10; 0 otherwise
medium	1 if firm size is between 11 to 49; 0 otherwise
large	1 if firm size is 50 or more; 0 otherwise
urban	1 if individual resides in an urban area; 0 otherwise
rural	1 if individual resides in an rural area; 0 otherwise