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**RETHINKING SOCIAL INSURANCE IN EGYPT:  
AN EMPIRICAL STUDY**

**Irène Selwaness**

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## Abstract

The focus of this paper is to empirically analyze the social insurance system (SIS) in Egypt. A first aspect is to estimate the determinants of the coverage among wage workers and non-wage workers. The second is to analyze the risk of underreporting insurable wages to the social security administration. To treat the selection bias but also the endogeneity problem of the employment states, i.e. the choice between wage work or non-wage work, a bivariate probit model and a switching probit model are used to jointly estimate the social insurance (SI) coverage probability for wage workers and non-wage workers, separately, with the selection into each of these employment statuses. Results show that older, married, educated workers have more likelihood to be covered, as known in international findings concerning SI or formality. It shows that employment status is indeed correlated with social security coverage. Likewise, we found that acquiring SI coverage is a dynamic process over time for wage workers while time is not as important for non-wage workers. Underreporting insurable wages is negatively correlated with higher education levels and also with the closer the worker gets to retirement.

**JEL Classification:** H55, C34

**Keywords:** Social Security, Social Insurance, Social Protection, Switching Model

## ملخص

محور هذه الورقة هو التحليل التجريبي لنظام التأمين الاجتماعي في مصر. الجانب الأول من الورقة هو تقدير العوامل المحددة للتغطية التأمينية على الأجر بين العاملين بأجر و بدون أجر. والثاني هو تحليل المشاكل الناجمة عن عدم إبلاغ الأجر لإدارة الضمان الاجتماعي. ولعلاج الانحياز في الاختيار وأيضا مشكلة الجوانب الداخلية لحالة العمل، أي الاختيار بين العمل بأجر او العمل بدون أجر، نستخدم في هذه الورقة نموذج bivariate probit ونموذج switching probit لقياس احتمال وجود تغطية تأمينية للعاملين بأجر و بغير أجر، بشكل منفصل. وتظهر النتائج أن العاملين كبار السن والمتزوجين يكون على الأرجح لديهم تغطية تأمينية، كما هو معروف في النتائج الدولية المتعلقة بالتأمين الاجتماعي. و هذا يؤكد ارتباط نظام العمل بتغطية الضمان الاجتماعي. وبالمثل، فقد وجدنا أن الحصول على التأمين الاجتماعي هي عملية ديناميكية مع مرور الوقت للعامل ذوي الأجر بينما يكون الوقت بغير أهمية بالنسبة للعامل الذين يعملون بدون اجر. عدم إبلاغ الأجر لإدارة الضمان الاجتماعي يرتبط سلبا مع مستويات التعليم العالي، وكذلك مع قرب حصول العامل على التقاعد.

## 1. Introduction

The pension schemes and social insurance systems (SISs) have important implications on individual choices and preferences in the labor market. Since wage workers and non-wage workers in the Egyptian labor market face different social insurance schemes and designs, this paper aims to know who gets SI among these two employment statuses and the extent to which the main determinants of SI could play differently for each of them. Moreover, the paper attempts to analyze how the system can influence the choice between wage employment and non-wage employment. Further, to the extent that regulations and laws can shape the behaviors, one is interested in studying the phenomenon of underreporting deductible earnings to the social security administration, i.e. when workers are covered by the social security system while their insurable wages reported for the social security deduction are lower than their true wages.

Thereby, in order to estimate the probability of SI coverage, taking into account the employment status, a bivariate probit model is estimated to correct for any selection bias that could occur at the entry level to the employment status. In addition, in a quest to understand if being a wage worker or non-wage worker could be decided endogenously or simultaneously with the social security coverage decision, i.e. if the system influences the employment status choice, a switching probit model is estimated. This model allows the estimation of a SI coverage probability for each of the employment states (wage worker and non-wage worker), simultaneously with the probability of being in one of these employment states, which is the switch equation. Moreover, the probability of fully reporting the basic wage to the social security is estimated through a simple probit model. For this analysis, the Egyptian Labor Market Panel Survey ELMPS 2006 is used.

Social insurance is one of the three main components of Social Protection<sup>1</sup> according to its traditional definition, besides social assistance or social safety nets and employment strategies or labor market interventions (Holzmann and Jorgensen 2000).<sup>2</sup> It is a tool where workers participate to secure their future, which it is partially or fully funded from the contributions of workers and employees. On the other hand, social assistance programs are based on a non-contributory basis and mainly considered as coping strategies against risk.

Social insurance coverage in developing countries was the main focus of several studies, especially in Latin American countries, both indirectly and directly. Indirectly, social security coverage was tackled in all studies that deal with the informality in the labor market, where informality is defined as the lack of social security (Henley et al. 2006; Pages and Madrigal 2008; Bosch and Maloney 2010; Bosch et al. 2007). Henley, Arabsheibano and Carneiro (2006) to estimate the determinants of being informal using three different definitions for informality. The other studies focused on whether informality is a preference and a free choice, or is it imposed by labor market rules. Pages and Madrigal (2008) found that low-skilled workers value the jobs without social security contributions and self-employment jobs more than the formal ones since it they do not imply paying to social security. This could be due to several reasons such as the non-affordability of deferring present consumption to the future for the low-skilled workers who are mostly poor; or that these workers can have shorter life expectancy along with more reliance on family safety nets, mainly children and intergenerational transfers; or that these benefits could be non-cost-effective for them. Bosch and Maloney 2010 and Bosch et al. (2007) have shown that informality could be a preferred choice for the self-employed while for informal salaried workers it could be a last resort for

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<sup>1</sup>According to the ILO, the “social protection” is interchangeably used with “social security” (ILO2009)

<sup>2</sup>The World Bank has newly proposed a definition of social protection in the context of social risk management: “*SP as public interventions to (i) assist individuals, households, and communities better manage risk, and (ii) provide support to the critically poor.*” (Holzmann and Jorgensen 2000, p. 3).

those who cannot afford unemployment until they get a job in the formal sector, i.e. informal salaried workers queue for formal jobs.

Directly, one of the first empirical studies on SI tried to explain the low participation rates of wage workers in the social security system, by comparing between the determinants of coverage between wage workers whose participation is mandatory and non-wage workers whose participation is voluntary. The study found that the weak law enforcement combined with the low willingness of workers to participate in the system are reasons of the low coverage rates. However, low coverage is not only driven by demand factors (workers demand on the insurance), but it is also determined by the firm's or employer's choices to insure their workers or not. Thus, non-participation for wage workers could be partly a choice by those who are not willing to pay for the SI, but at the same time it could be a choice by employers who evade the system in the presence of weak enforcement (Auerbach et al.2007). Other studies attempted to evaluate the labor market distortions that could be developed by the social protection system, including its two components: SI and social assistance programs. Cuesta and Olivera (2010) found that the presence of non-contributive systems that are free for poor informal workers could create incentives for workers to be informal (i.e. not contributing to the SI). In the same spirit, Cuesta and Bohorquez (2011) analyzed labor market transitions during 2008-2009 in Columbia and its relation with social security coverage, where they found that workers evaluate similarly the non-contributive and the contributive schemes, so that the presence of both schemes together could encourage workers to opt for informality, provided that they will have the non-contributive benefits ensured. The study also stated that individuals do not relate the use of social security systems to insure against potential risks.

In MENA countries, with the increasing trend of informality witnessed in the late 1990s and after the implementation of the Economic Reform and Structural Adjustment Programs, the lack of social security coverage phenomenon became more widespread and concerned certain groups in the labor market. Tansel (1999) studied the wage differentials between the covered and the uncovered wage workers of social security coverage in Turkey taking into account four employment statuses: not working; covered wage worker; uncovered wage worker; and other employment. Angel-Urdinola and Tanabe (2012) empirically estimated the determinants of labor informality in the MENA region, mainly defined as lack of SI coverage. In Egypt, empirical studies have mainly tackled the phenomenon of informality where it is mainly defined as the lack of both legal contract and social security coverage (Wahba 2009; Wahba and Mokhtar 2002). However, to the best of our knowledge, there are no studies that directly discuss the SI coverage among workers in Egypt and its relationship to the employment status.

In this paper, the design of the SIS implies several challenges for the labor market. The first is the non-coverage of a substantial share of the working population. Thus, being covered will be firstly analyzed in this paper. Moreover, since wage workers in Egypt have different SISs than non-wage workers, with regards to contributions, maximum bound for insurable wage and benefits, we will therefore analyze the SI coverage differently for each of these two employment statuses. This is to correct for the selection bias into the employment status and also for the potential endogeneity of the employment status, i.e. when coverage or non-coverage by social security could affect the choice of employment status between wage worker and non-wage worker. The second challenge is the underreporting of insurable wages to the social security administration, which will also be the aim of study of this paper.

The remainder of the paper is as follows; The Egyptian SIS is explained in section 2 in addition to the implications of such a system on the labor market. Section 3 presents the data

sources and the stylized facts. The methodology and the estimation strategy are explained in section 4 as well as the empirical results. We conclude by section 5.

## **2. The Egyptian Social Insurance System: A Conceptual Framework**

Social insurance schemes in the Middle East and North Africa region were drawn in the early 1950s and are mainly managed nowadays as defined-benefits (DB), pay-as-you-go (PAYG) (ILO 2009; World Bank 2010). Under DB-PAYG schemes, the contributions of current active members are used to pay the pensions of those who are currently retired, and the benefits are determined as a defined percentage of the average monthly wage earned in the last few years before retirement. These schemes usually cover workers in the public and the private sector, including the military in Arab countries, where contributions are paid jointly by workers, employers and the government.

Since the 1952 revolution, Egypt has implemented a new widely stratified SIS operated as a fully funded scheme where employees pay their contributions that should be invested and then repaid to them afterwards as pensions. The system has gradually shifted to be partially funded on a PAYG with a defined benefits scheme. The SIS provides old-age, disability, survivors, sickness, maternity, work injury and unemployment benefits for workers and their dependents. The system is mainly regulated by four laws, which are law 79 for 1975 for wage workers, law 108 for 1976 for employers and self-employed, law 50 for 1978 for Egyptians working abroad, and law 112 for 1980 for workers who are not included in any of the previous schemes.

### ***2.1 Wage workers Legislation: the General scheme (Law 79/1975)***

Law 79 for 1975 draws the general scheme for the system, insuring all government, public sector and private sector employees (who are subject to the law provisions and aged 18 years old and above, or—in case of government employees—aged 16 years old and above) for old-age, disability, survivorship, work injuries and occupational diseases, sickness, maternity and unemployment. Contributions are deducted from two types of monthly wage earnings—the basic and the variable monthly wages.<sup>3</sup> The basic monthly earnings had a maximum bound of LE650 (Helmy 2008; Social Security Administration (SSA) 2005), of LE775 in 2008 (SSA 2009), and was raised to LE875 in 2011 (SAA 2011) as per the post-revolution reform measures that were applied by the ministry of finance. The variable monthly earnings can reach up to LE500 (Helmy 2008; SSA 2009), and was could also be up to LE1,050. Therefore, monthly earnings for social security deduction have maximum bounds/ceilings, which amounted to LE1,200 in 2006 (SSA 2007) and to LE1,925 in 2011. Moreover, contributions are a fixed percentage of the pensionable wage or the wage reported to the Social Insurance Authority. The total contribution amounts to an average of around 41% of basic wages and 25% of variable wages, paid by employees, employers and the government. Employees contribute by 14% and 10% of their base and variable earnings, respectively, while employers pay 26% and 15% of their base and variable earnings respectively. The government contributes by 1% of earnings in addition to the cost of any deficit (Helmy 2008). Therefore, these benefits are mainly financed by the employers-employees contributions in addition to a symbolic contribution by the government.

Old age, invalidity and survivor pensions could be claimed for insured persons who meet the eligibility conditions: being 60 years old with 120 months of contributions or 50 years old with 240 months of contributions. Early retirement is possible under certain conditions. As mentioned above, the pensions are calculated on a defined benefit basis and are calculated for the basic wage and the variable wage. Old-age base pensions usually represent a certain amount of the average monthly base earnings during the last two years for public sector

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<sup>3</sup> The variable wage earning is any earning beyond the basic wage, including incentives, bonuses...etc.

employees and civil servants multiplied by the years of contribution, up to 36 years. For private sector employees, the earnings upon which the base pension is calculated is the average monthly base earnings for the last two years or for the five years before the last two years multiplied by 1.4, whichever is lower—up to the base earning ceiling for this year (e.g. LE875 in 2009)—then also multiplied by the years of contributions, up to 36 years. Variables pensions are calculated upon the reference variable earning which is the average monthly earning computed for the whole duration of contribution increased by 2%, with a maximum of LE1,050 (the variable earning maximum bound for the year of concern). The total pension has a maximum bound and should not exceed 80% of the reference monthly total earnings (SSA 2011).

Besides pensions, eligible insured workers receive other benefits, such as a special supplement for additional contribution years beyond 36, increments and other indemnities. The scheme also provides insured workers, who are not eligible for old-age, invalidity or survivor pensions and whose employment is terminated for one reason or another, with other kinds of settlements if they are in one of the following categories: aged 60 but do not meet the qualifying conditions for an old age pension; emigrating employee unconditional of age, imprisoned employee of 10 years or more; ineligible but insured women aged 51 or older in any marital status (married, widowed or divorced).<sup>4</sup>

The general scheme law 79/1975 allows for two important exceptions to the above described general rules in regards to the calculation method of pensions. First, a minimum pension exists and amounts to 50% of the total average monthly wage in the last two years for at least 20 contributions. Second, when the average wage amounts to LE70 or less per month, the maximum pension is raised to 100% of it. Such exceptions were designed in order to assist low-income workers. Further, according to the general scheme, inheritance of pensions is allowed. Beneficiaries are then treated in the same manner as eligible survivors in the survivorship insurance plan, i.e. dependent spouses, parents, single daughters, sons/brothers younger than 21 (age 26 if student or no limit if disabled), lastly divorced spouses with no income revenues, and previously being married to the deceased for at least 20 years.

Furthermore, and as mentioned above, the general scheme provides—for insured and eligible workers—sickness and maternity benefits paid out for eligible workers, compensatory benefits for work injuries that cause permanent or temporary disability, and unemployment benefits for insured persons that lose their jobs not resulting from their voluntary leaving, or their misconduct, or by their refusal of a “suitable” job offer or a training opportunity.<sup>5</sup>

## **2.2 Employers & self-employed scheme (Law 108/1976)**

The Law 108/1976 provides voluntary old-age, invalidity and death insurance to the non-wage workers and the self-employed who are between 21 & 60 years of age.<sup>6</sup> The contribution rates are set lower than those of the general scheme law 79/1975, reaching 15% of the covered monthly payroll. Moreover, non-wage workers can choose the level of their

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<sup>4</sup>These settlements are a certain amount of the total reference monthly earnings multiplied by 12 and by the number of years of contributions. These workers have also the right for lump-sum compensation/benefit amounting to one month of base earnings multiplied by the years of contributions. The reference base earnings are calculated as mentioned above with respect to public and private sector employees.

<sup>5</sup>To read more, please refer to SSA (2011) or the law 79/1975.

<sup>6</sup>Covered categories are: own-account workers in the domain of commercial, industrial or agricultural activities; partners in partnerships and limited liabilities companies; board and managing directors in private stock companies; managers of commercial, and medical syndicates, and the syndicate for agricultural professions; members of production cooperatives who are working on their account; farmers owning 10 feddans or more; owners of real estate yielding at least LE250 yearly; owners of transportation means; officials authorized to contract civil marriages, delegated notaries other than priests, and priests; mayors and village chiefs; tourist guides; commercial agents; professionals of house industries employing one or more workers; owners of fishing boats and river transportation boats if employing one or more persons; self-employed if employing one or more workers, who have to be registered in the commercial register.



insurable monthly earnings within the range of LE50 to LE900. Contributions represent 15% of such monthly declared income. The insured person has the right to change his earnings level under some conditions stated in the law. Workers aged 65 years whose contributions were paid for 120 months (10 years) are eligible to retire. Likewise, early retirement is possible under certain conditions. The pensions are calculated as a share of the declared monthly income or as a share of its average in case of changes in income brackets, multiplied by the number of years of contribution, given that the pension does not exceed 80% of average monthly income and does not reach lower than LE35.

The system also covers Egyptians working abroad (law 50/1978) on a voluntary basis. Moreover, it has two non-contributory schemes regulated by law 112/1980, which are the comprehensive Social Insurance Scheme (CSIS) and the Sadat Pension Plan, to insure those who are not covered by any of the previously mentioned laws. These schemes aim at providing financial support and insurance for the working poor who have not been included in or covered by any of the previous schemes—like casual workers—against old age, death and disability risks. Sadat pension also covers individuals aged 65 or above who have no pensions and are considered as inheritors for deceased persons before 1980.

### ***2.3 Implications of the SIS on the Labor Market***

In the MENA region in general and in Egypt in particular, such social insurance schemes face many challenges, such as the low coverage rates for particular categories of workers, system evasion, wages underreporting, and the differing schemes by workers categories. For instance, as explained above, the wage workers and the non-wage workers have different schemes that imply different contributions rates, different maximum pensionable wage earnings and different pension benefits when retired. Such differences in schemes either between public and private sector workers or between wage workers and non-wage workers could be translated into more restricted labor mobility across sectors or employment statuses (Robalino et al. 2005). In the same sense, World Bank (2010) suggests that this may cause the loss of large economies of scale.

Moreover, SI coverage in most MENA countries is deemed to be limited reaching only a third of the total labor force. However the coverage rate depends and is positively associated with the size of the public sector in each country (World Bank 2010; Robalino et al. 2005). In effect, according to Assaad (2009), the public sector employment size is the most important in overall employment (39% in 1998 and 30% in 2006). This is why coverage in Egypt (55.5% of overall employment)<sup>7</sup> is higher than other countries where agriculture employment is widespread and public sector employment is limited (Gatti et al. 2011). Yet, in the time period from 2000 to 2007, there is some 44.5% of overall employment that do not contribute in Egypt (Gatti et al. 2011) and 30% of private sector employers who do not contribute for their employees (UNDP2005). High contribution rates in Egypt could be responsible for such problems of non-participation to such a mandatory system, which is supported by weak law enforcement. According to Helmy (2008) Egypt is considered as having one of the high contribution rates in the region, as compared to other countries like Algeria, Libya or Morocco. As explained above, the employer and the employee jointly contribute by 41% of the basic wage and 25% of the variable wage.

Holzman and Jorgensen (2000) also argue that the low coverage in developing countries is mainly due to the fact that the insurance programs are closely linked to formal employment in these countries whereas an important share of labor market is employed informally. More specifically, MENA region schemes mainly cover the public and formal private sectors, i.e. regular job workers, whereas some categories of workers are not covered such as temporary

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<sup>7</sup>Gatti et al. 2011

or casual workers, agricultural, domestic or migrant workers (ILO 2009). Further, the self-employed have low coverage patterns where about 50% or below in all countries are covered. Moreover, having legal contracts or SI coverage, i.e. being formal, remains problematic to the youth and new entrants to the labor market in Egypt (Wahba and Mokhtar 2002; Wahba 2009). Women in some countries like Syria (Kattaa and Al Cheikh Hussein 2010) represent another particular concern because of their low coverage, which could be due to their low levels of participation in formal employment. This implies the need to establish wider and universal social protection systems alongside increasing the enforcement level to ensure better coverage. Therefore, countries in the region face the challenge of securing some categories of workers and their families, mainly youth, women, self-employed and informal or irregular workers.

Due to the presence of a ceiling on pensionable wage, the SIS acts as a regressive tax (Helmy 2008). This suggests that the low-wage workers pay the contributions on their full earnings (since their earnings may be lower or equal to the ceiling of pensionable earnings) while the high-wage workers whose earnings exceed the ceiling of the pensionable wage defined by the law, pay contributions on only a part of their wage. Therefore, low-wage workers may have incentives to underreport their wages, to evade the high contributions they are paying. On the other hand, by putting a maximum bound for the pensionable wage, the system loses a large part of the contributions that could have been collected from the high-income workers if there was no maximum ceiling on insurable earnings.

Further, the calculation method of the pension which takes into account the average monthly earnings during the last two years in service raises another shortcoming. Robalino et al. 2005 confirms that basing pension entitlements on the average salary of final years of service rather than on the lifetime average salary leaves space to abuse and to get around the system so as to pay the lowest contributions possible. First, according to this method, the pension would be higher for workers who have experienced an increase in wage in their last years of work. Second, it may encourage workers to underreport their pensionable wage during their first years of service to minimize their contributions payments. Then at the end of their service, they tend to fully report their wages and thus to pay much higher contributions to get high pensions. This could happen in agreement with employers who prefer to pay lower contributions. Therefore, the way the pension is determined sometimes pushes the workers to get around the system. Occasionally, employers who seek to minimize the required social security contributions that they have to pay on behalf of their employees might also oblige their employees to underreport their pensionable wages in order to pay lower contributions, thus reducing their costs. According to Maait et al. (2000) the average pensionable wage for government employees is significantly much higher than its level for what the author calls the "business sector", i.e. the private sector, and the former increases even more rapidly than the latter. This suggests that the tendency of underreporting is more common in the "business" sector than in the public sector. Therefore, mainly because of high contributions combined with the presence of maximum bounds of pensionable earnings, basing benefits on the wage for the last years of service, and weak law enforcement levels, employers and employees tend to contribute by amounts that are lower than their actual wage. Latest reports of the UNDP show that around 40% of the private sector employers and employees underreport their earnings to the social security administration (UNDP 2005).

All the discussed challenges could contribute in creating labor market distortions (Cuesta and Olivera 2010). In this paper, the SIS in Egypt is studied from several dimensions. Definitely, the contribution to the social security system is the most obvious dimension. Controlling for the employment status (wage worker versus non-wage workers) is important since there are different regulations for each of these two employment statuses. Moreover, to the extent that the employment status could be endogenous or simultaneously decided with coverage, the

conditional probability of the coverage is estimated taking into account the selection of the employment status through a bivariate probit model technique. To allow for endogenous employment status, a switching probit model is estimated to allow for different equations of coverage for each employment status. We expect that low-income workers would be less likely covered. Also, it is expected that time spent in the labor market is another important factor for acquiring coverage. Reduced form equations of the probability of coverage will be estimated to determine the effects of education, experience, and age, i.e. human capital variables, as proxies for wages. The estimation strategy, whether bivariate or switching probit models, allows different determinants for these explanatory variables, so that one could compare with regards to the employment status how experience, education, age and other variables influence the coverage. Finally, the probability of underreporting is determined by probit estimations, controlling for experience, tenure and years remaining to retire to check to which extent the scheme, e.g. the benefit calculation or the pensionable wage influence the behavior of wage report to the social security.

### **3. Data Sources & Stylized Facts**

The descriptive analysis of this paper is based on data from the 1998 Egypt Labor Market Survey (ELMS 98), and the 2006 Egypt Labor Market Panel Survey (ELMPS 06). The ELMS 98 and ELMPS 06 were conducted by the Economic Research Forum (ERF) in cooperation with the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). The ELMS 98 was carried out on a nationally-representative sample of 4,816 households. The ELMPS 06 is a follow up survey to the ELMS 98, representing a periodic longitudinal survey that tracks the labor market and demographic characteristics of the households and individuals interviewed in 1998, and any new households that might have formed as a result of splits from the original households. The ELMPS 06 sample consists of a total of 8,349 households.<sup>8</sup> However, the empirical analysis will be based on the ELMPS 2006 since data on key variables for the SI are provided.

In this paper, we restricted our analysis to the sample of working men and women, in the age group between 15-64 years, based on the market definition of the labor force. The analysis mainly distinguishes between wage workers and non-wage workers. The sample of wage workers is 4,633 workers in ELMS 98, and about 7,456 workers in ELMPS 06. Meanwhile, the sample of non-wage workers is 1,183 workers in ELMS 98 and 2,632 workers in ELMPS 06.

#### ***3.1 Evolution of Access to Social Insurance Coverage, from 1998 to 2006***

Examining the trends of access to SI coverage between the two survey years (1998 and 2006) provides interesting patterns (Figure 1). The share of covered workers represented almost 51% of all workers in 1998 but only about 41.6% in 2006. Therefore, the share of non-covered workers increased from 49.1% to 58.5% from 1998 to 2006. As expected, wage workers are more likely to have SI compared to all non-wage workers (employer, self-employed and unpaid family workers). For instance, in 1998, about 62.2% of wage workers in 1998 were covered by SI, compared to only 34.7% of employers, 25.1% of self-employed and 4% of unpaid family workers. Moreover, SI coverage declined for all employment statuses in 2006, as compared to 1998. The decline in the proportion of covered workers is higher among employers and self-employed relative to wage workers. In 2006, the decline was 37.8% for employers, 28.9% for self-employed as compared to a decline of 8% wage workers. If studied against the expectation that formality would have increased after labor law No.12 for 2003, such a decline in coverage could be counterintuitive. However, it is important to notice that Law 2003 brought some flexibility in hiring and firing workers so that its effects might be more translated into an increase in the number of legal contracts,

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<sup>8</sup>See Assaad (2009) for more details on data description and attrition analysis of the Egypt Labor Market Surveys.

rather than into an increase of SI coverage. This is confirmed by Wahba (2009) who finds that informality, defined as the lack of both social security coverage and legal contract, has increased between 1998 and 2006 as a share of total employment. When measured only as a lack of legal contract, informality had declined in 2006 suggesting that more workers had acquired contracts in 2006 than 1998 (Wahba 2009).

### ***3.2 The Dynamics of Social Insurance Coverage with the Year of Entry to the Labor Market***

The time dimension is another relevant factor for acquiring SI coverage. In this section, we use the individual level retrospective information provided in ELMPS06 to investigate this time dimension. Figure 2 shows the distribution of first job according to different employment statuses by year of entry to the labor market during the period 1960-2006. We differentiate here between 5 types of employment statuses: wage worker in public sector, wage worker in private sector with SI, wage worker in private sector without SI, non-wage worker, and unpaid family worker. As noticed, the share of private sector wage workers without SI of first jobs has been increasing since the late 1980s and the early 1990s, at the same time as a decline in the share of public sector wage work of first jobs. These years correspond to the implementation of the Economic Reform and Structural Adjustment Program, a period that was characterized by downsizing in the public sector and an expansion in the private sector. The figure also shows that the share of first jobs held as a wage worker in the private sector without SI has reached a peak of 51.67% in 1999. This presents evidence on the private sector in Egypt, that it has not only failed to absorb new entrants, who for a long time used to be hired by the public sector, but that also it could not also ensure formality or social security coverage to all its entrants.

Figure 3 describes the evolution of the share of the private sector's uncovered wage workers in total employment among first entrants, among those with 5 years of working experience and among those with 10 years. It shows that acquiring SI coverage in the private sector does not often come at first entry, but that it takes some time to gain such insurance. The above figure shows that the share of private sector wage workers with no SI is highest among labor market first entrants, followed by those having 5 years of experience and lowest among those with at least 10 years of working experience. Yet, the percentage of those with no SI has been increasing over time, for all three categories.

### ***3.3 Characteristics of Covered and Uncovered Workers***

In this section, we discuss the characteristics of covered and uncovered workers according to their employment status (wage workers and non-wage workers). A brief discussion about the main characteristics of wage workers and non-wage workers is first provided in Table 1. Men are slightly more likely to be non-wage workers than females (27.2% of men are non-wage workers versus 22.6% of females in 2006) whereas females are more likely to be waged employees than males (77.4% of females versus 72.8% of males in 2006). Moreover, from 1998 to 2006, there was a trend towards independent work and away from waged work for females where 22.6% in 2006 were independent versus 14.3% in 1998. Married individuals are more likely to be non-wage workers than those who are not married (single, divorced, and widowed). Age is positively correlated with non-wage work where the age group (50-64) is more likely to be non-wage workers than the prime age working group (30-49) and the youngest age group (15-29). This could reflect that with more experience in the labor market, individuals can shift to or opt for independent work. Individuals residing in rural areas are more likely to be non-wage workers than those in urban ones. The higher the educational level the more likely that an individual would be a wage worker while the opposite is observed for non-wage workers where the highly educated are less likely to be independent compared to those with lower educational levels. Non-wage workers have a higher number of

working hours weekly compared to wage workers. Those who work in the services sectors are more likely to work for wage, while those in the agriculture sector are more likely to be on their own. Between 1998 and 2006, the share of non-wage workers in the agriculture sector had increased from 49 to 60.9%. Likewise, the share of non-wage workers in the industry sector had slightly increased from 13.3 to 16.9%.

Table 2 describes the characteristics of covered workers in comparison to uncovered workers separately for the wage workers and the non-wage workers. It is observed that among wage workers, females are more likely to be covered than males (the share of covered among females is 71.9% compared to 53.7% among males). In contrast, among non-wage workers, females are less likely to be covered than males. Workers who are married, urban, household heads are more likely to be covered, whether wage workers or non-wage workers.

Among wage-workers, age is strongly associated with social security coverage where older workers are much more likely than their younger peers to be covered. In 2006, a third of those aged 15 to 29 years were covered versus 70.8% of the prime age group (30-49) and 82.5% of the older group (50-64). Likewise, for non-wage workers, being older is correlated with coverage but not as strongly as for wage workers, i.e. the difference in coverage rates between the age groups is small. Specifically, around 22.9% of the older age group (50-64) was covered in 2006 versus 20.8% of the prime age group (30-49) and 13.8% of the young age group (15-29).

Education plays an important role in segmenting people into covered and uncovered workers, especially for wage workers where social security coverage is more spread among those with higher educational levels. It is worth noting that those who have acquired above than intermediate levels of education became less likely to be uncovered in 2006 compared to 1998 (41.9% versus 29.3%). However, non-wage workers who have acquired less than intermediate level are almost as likely as those with intermediate levels to be covered. Therefore, education role may not be that pronounced for non-wage workers compared to wage workers. Non-wage workers with above than intermediate levels tend to be less covered in 2006 than 1998 (46.2% versus 58.7%).

Clearly, the covered wage workers have more years of experience, on average, than their uncovered peers whereas there is no important difference in working experience between the covered and the uncovered non-wage workers. This might reflect that the social security coverage for the wage workers is acquired with more working experience in the labor market (as shown in figures 2 and 3), while the social security coverage for the non-wage workers is not that correlated with the time spent in the labor market.

The share of covered among workers in the services sectors is higher than their share in the industry or the agriculture services sector, whether for wage workers or non-wage workers.

Finally, social security coverage is negatively correlated with weekly performed hours since the covered wage workers perform lower weekly hours on average than the uncovered ones. On the other hand, the covered non-wage workers perform higher weekly hours on average than the uncovered ones, thus coverage is positively correlated with worked hours for non-wage work. Overall, covered non-wage workers have a significantly higher number of weekly hours than covered wage workers (57.8 versus 46.1, respectively, in 2006).

### ***3.4 Underreporting Insurable Basic Earnings***

To see the extent of the phenomenon of underreporting insurable earnings, we again use ELMPS 06 since it includes information on individuals' basic wages and the amount of this basic wage that is actually reported to the social security system. Over a sample of 4,323 wage workers, about 23.54% had reported a lower salary than the actual amount for social security deduction. As noted in table 4, females are more likely to fully report their basic

wages. There is no difference according to marital status, age groups, area of residence (urban/rural) or being head of the household. Those with an intermediate education level or above are more likely to fully report than those with less than intermediate education level. Wage workers in the private sector are significantly more likely to underreport their basic wages, compared to those in the government sector or the state-owned enterprises (SOEs) (40.8 % of private sector wage workers versus around 18% for government and SOEs workers). Likewise, workers in the industry sector are more likely to fully report than workers in the services or the agriculture sectors (25.7% versus 23.2 and 18%, respectively). Surprisingly, tenure years are slightly higher on average for workers who underreport than for workers who fully report. Such an observation could mean that workers do not have a tendency to underreport during their early years but to fully report before their retirement. It is important to empirically check such an effect. Also, workers who underreport earn on average a higher basic monthly wage and a higher hourly wage than workers who fully report. This could confirm the assumed characteristic of the system that it acts as a regressive tax where low-income workers pay on their full earnings while high-income workers pay on a part of their earnings since the latter group exceeds the maximum bound of the insurable earnings that the law stipulates.

#### 4. Methodology and Empirical Findings

This section empirically investigates the characteristics of workers who have SI coverage. We differentiate in this section between wage workers and employers or self-employed since as discussed above, the laws regulating SI for each type of these workers are different. On the one hand, the sample selection process between wage employment and non-wage employment may introduce selectivity bias in estimating the probability of SI coverage. On the other hand, the expectation of having SI in the wage employment could play a motivational role for workers making them choose to become wage workers, while persons with less interest in SI opt for non-wage work. Hence, the employment status might be endogenous to the SI coverage. Therefore, to analyze the SI simultaneously with the employment status taking into account the potential selectivity bias or the endogeneity of the employment status, three models are estimated. First, through a bivariate probit model, the probability of being covered by the SIS is estimated taking into account the selection into employment statuses. Second, we estimate a bivariate recursive probit model, in which the endogenous “employment status” is among the explanatory variables of the SI coverage equation. Third, a switching probit model is estimated, as another method to treat the endogeneity of the employment status and allowing for the distributions of the SI coverage to differ according to the employment status. Mainly, the model consists of the switch equation that corresponds to the probability of being a wage-worker versus a non-wage worker (employer or self-employed) and two probit equations for the probability of SI corresponding to each group of the switch (Ridao-Cano 2001; Assaad et al. 2005). Therefore, determinants of SI will be different for each of these two employment statuses.

Moreover, underreporting of insurable wage is investigated using a probit model to estimate the probability of having the basic wage of covered wage workers underreported to the social security authorities.

As a first model, in the bivariate probit model, the probability of being covered by the SIS is estimated taking into account the selection into employment status (wage work or non-wage work).

$$SI_i^* = X_{si}\beta_2 + u_{si} \quad (1)$$

$$W_i^* = X_{wi}\beta_1 + u_{wi} \quad (2)$$

Where  $W^*$  and  $SI^*$  represent the two latent variables for the two dichotomous variables: the Employment Status ( $W$ ) and the Social Insurance Coverage ( $SI$ ), respectively, where

$W_i = 1$  (Wage Worker) if  $W_i^* > 0$   
 $W_i = 0$  (Non – Wage Worker) if  $W_i^* \leq 0$

And,

$SI_i = 1$  (Covered) if  $SI_i^* > 0$   
 $SI_i = 0$  (Uncovered) if  $SI_i^* \leq 0$

Vectors of explanatory variables are given by  $X_w, X_s$  whereas  $\beta_1, \beta_2$  are the parameters' vectors. The errors terms  $u_w, u_s$  follow a bivariate normal distribution  $\Phi_2$ , with zero mean and a variance-covariance matrix  $\Sigma$ . The correlation between the error terms of the two equations is given by  $\rho$  and reflects the possibility that some unobserved factors influence both decisions of employment statuses and of SI coverage.

$$(u_{wi}, u_{si}) \sim \Phi_2(0, 0, 1, 1, \rho)$$

$$\Sigma = \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}$$

The log likelihood function is given by :

$$\begin{aligned} LL = & \ln \Pr(W = 1, SI = 1) \\ & + \ln \Pr(W = 1, SI = 0) \\ & + \ln \Pr(W = 0, SI = 1) \\ & + \ln \Pr(W = 0, SI = 0) \end{aligned}$$

Where

$$\Pr(W = 1, SI = 1) = \Phi_2(X_w\beta_1, X_s\beta_2, \rho)$$

$$\Pr(W = 1, SI = 0) = \Phi_2(X_w\beta_1, -X_s\beta_2, -\rho)$$

$$\Pr(W = 0, SI = 1) = \Phi_2(-X_w\beta_1, X_s\beta_2, -\rho)$$

$$\Pr(W = 0, SI = 0) = \Phi_2(-X_w\beta_1, -X_s\beta_2, \rho)$$

In a second model, one should take into account the impact of being a wage worker on social coverage. Since being a wage worker could be endogenous to the decision of coverage, therefore, we also estimate a bivariate recursive model following Maddala (1983) in which the endogenous “employment status” is assumed to influence the probability of a worker being covered.

$$SI_i^* = X_{si}\beta_2 + W_i\delta + u_{si} \quad (3)$$

$$W_i^* = X_{wi}\beta_1 + Z_i\xi + u_{wi} \quad (4)$$

Under the bivariate recursive model, the Social Insurance Coverage (SI) and the Employment Status (W) are simultaneously specified by the following likelihood function

$$\Pr(W = 1, SI = 1) = \Phi_2(X_w\beta_1 + Z\xi, X_s\beta_2 + W\delta, \rho)$$

The propensity to work as a wage worker depends on a set of covariates  $X_w$ , which may or may not coincide with those affecting the SI coverage decision  $X_s$ . For instance, according to Gatti et al. (2011), the factors that affect SI coverage could be the lack of awareness or myopia about future needs, exclusion factors such as geographical location or human capital level. Therefore, the explanatory variables  $X_w$  and  $X_s$  include individual-level characteristics such as: a dummy variable for being female, a dummy for being married, age groups (30-49 and 50-64), dummies for education level (less than intermediate, intermediate, above than intermediate) and five regional dummies (Alex and Canal cities, Urban Lower Egypt, Rural Lower Egypt, Urban Upper Egypt and Rural Upper Egypt). Household structures are controlled for and included as a dummy for being head of the household, a dummy for the

presence of any other members in the household who have SI coverage, the share of members in the household out of the labor force by their age categories (0-14, 15-64, and above 65), and the household size. In the SI equation, we control for the experience and its square to study the time dimension in acquiring the SI coverage.

Estimating the bivariate probit model poses the usual challenge which is to identify the social security insurance equation. Wage work equation must include a variable that affects the wage work but that is exogenous and not directly related to social coverage outcomes. It is necessary to impose some exclusion restriction to improve identification. Nevertheless, identification by functional form could be assumed since it relies on the bivariate normality of the error terms. Hence, parental employment status or parental educational levels could represent an instrument that can be associated with the wage work decision but not directly with the SI coverage. Therefore, the vector  $X_w$  (equation 2) and the vector  $Z$  (equation 4) in the employment status equation include dummies for parental education levels and their employment status as exclusion variables.

In the bivariate recursive model, besides all the explanatory variables included before, the employment status dummy, given by  $W$  in equation (3) taking on 1 if wage worker and 0 if non-wage worker, is controlled for in the SI equation.

As for the third model, the switching probit model, each worker  $i$  has two potential SI coverage outcome ( $SS_{1i}$ ,  $SS_{0i}$ ) corresponding to the potential SI coverage outcome for the wage work state ( $W_i = 1$ ) and the potential SI coverage outcome for the non-wage work state ( $W_i = 0$ ), respectively. The observed SI coverage outcome is given by:

$$SS_i = W_i SS_{1i} + (1 - W_i) SS_{0i} \quad (5)$$

The three variables,  $W$ ,  $SS_1$  and  $SS_0$ , are the results of a set of linear latent variables:

$$W_i = 1 (W_i^* \geq 0) = 1(X_i \beta_w + U_{wi} \geq 0) \quad (6)$$

$$S_{1i} = 1 (S_{1i}^* \geq 0) = 1(Z_{1i} \beta_1 + U_{1i} \geq 0) \text{ iff } W_i = 1 \quad (7)$$

$$S_{0i} = 1 (S_{0i}^* \geq 0) = 1(Z_{0i} \beta_0 + U_{0i} \geq 0) \text{ iff } W_i = 0 \quad (8)$$

The latent variables  $W_i^*$ ,  $S_{1i}^*$ ,  $S_{0i}^*$  represent the three latent variables, that may reflect the utilities for the worker  $i$  from working as wage worker, from having SI coverage in the wage work state and from having SI coverage in the non-wage work state, respectively. The vector of explanatory variables for the wage work equation is given by  $X_i$  while  $Z_{1i}$  and  $Z_{0i}$  are the vectors of the control variables for the SI coverage equation for wage workers and non-wage workers, respectively. The vectors  $X_i$ ,  $Z_{1i}$  and  $Z_{0i}$  include all the variables as in the bivariate probit models (gender, marital status, age groups, education level, region, and household structure variables: being head, share of dependents in the household, household size, if others are covered). The vector  $X_i$  also includes the exclusion variable, mainly the parental education and their employment status. To identify the SI equations,  $Z_{1i}$  includes the firm size as an exclusion variable. Also, we control for experience and its square in both  $Z_{1i}$  and  $Z_{0i}$  to study how their impacts differ between wage workers and non-wage workers.

Unobservable characteristics generating the employment status state, the SI outcome for the wage workers and the SI outcome for the non-wage workers, are given by  $U_{wi}$ ,  $U_{1i}$  and  $U_{0i}$  respectively. The unobservable characteristics are assumed to be normally distributed with zero mean and covariance matrix  $\Sigma$  that is:

$$\begin{pmatrix} 1 & \rho_{10} & \rho_{1w} \\ & 1 & \rho_{0w} \\ & & 1 \end{pmatrix}$$



The correlation  $\rho_{10}$  cannot be identified since one worker since the probability of SI under the non-wage work and the probability of SI under the wage work could not be observed simultaneously, i.e. the joint distribution of  $(U_1, U_0)$  is not identified (Ridao-Cano 2001).

#### **4.1 Bivariate Probit Model: Findings**

Table 4 presents the results for the bivariate probit model used to estimate the probability of SI coverage (dependent variable which takes the value of 1 if the worker is covered, 0 if uncovered), taking into account the selection into the employment status (dummy variable that takes the value of 1 if wage employment and 0 if non-wage employment). The reference is an unmarried male, aged 15 to 29, with no education level or can read and write, living in greater Cairo, not a head of his household, and has no members covered in the household, whose father's and mother's education is none or read and write.

Results show that being a female significantly decreases the probability of being a wage worker relative to males. Conditional on the wage work, females have a significantly higher likelihood of coverage than males. Being married does not have a significant impact on employment status but is one of the main determinants of the social security coverage, where the probability of social security coverage is higher for married workers than for single ones.

Olderworkers (50-64) have a significantly lower probability to work as wage worker and thus are more significantly inclined to non-wage work, as compared to the young age group (15-29). The prime age working group (30-49) is not significantly different from the reference regarding their employment status probability. However, conditional on wage work, being 30 and above significantly increases the probability of SI coverage, as compared to the young age group (15-29). Moreover, those aged 50 to 64 are more likely to be insured than those aged 30 to 49. As could be expected, older workers, being closer to the retirement age (60 years), either become less myopic and more concerned with insuring their lives after retirement or become more aware of the system and its procedures. Indeed, Gatti et al. (2011) confirms the myopia effect, i.e. lack of awareness about retirement needs and health risk. Moreover, people tend to fulfill short-term consumption needs (Stewart 2011). Likewise, since the decision of contribution to SI is made jointly by the firm and the worker, older workers might also have greater negotiation power than prime age or young workers. Such findings also confirm that young people in Egypt are the most likely to be informally employed and uncovered in our particular concern (Wahba 2009; Wahba and Mokhtar 2002)

Education level matters in the employment status decision and the access to SI. As compared to illiterate or those who can read or write, those who have higher education levels (lower than intermediate, intermediate or above intermediate) have are more likely to be wage workers and are also more likely to contribute in the SIS. As expected, those with above than intermediate education level have significantly greater probability of social security coverage than those with intermediate education level. The latter group also has higher coverage probability than those with less than intermediate education levels. Since participation in the SI is one of the definitions of a formal job, thus this result is a further confirmation to the known finding that better educated workers have more chances to work formally, i.e. with contracts or with SI. The access to social security varies with the area of residence; workers in Greater Cairo have higher probabilities of SI than rural areas, whether upper or lower Egypt, conditional on the employment state. Differences in enforcement levels between metropolitan governorates and other parts of Egypt could be one reason for such difference (Tansel 1999). Moreover, the perception of individuals regarding SI could also differ from rural areas to urban areas where rural workers may rely on social networks or family as a social safety net rather than the SIS. Furthermore, the level of awareness about the SIS could be lower in rural areas than urban areas.

As in Auerbach et al. (2007), the structure of the household could affect the labor market decisions. Household heads are less likely to work as wage workers than other members of the household but are not significantly different with regards to coverage. The presence of covered members in the household does not only increase the likelihood of wage work, it is also a driver for the worker to contribute or to be covered by the SI. This effect may be due to the spread of awareness regarding the importance of SI or the participation procedures, among household members. The lack of awareness is pointed out as one of the main reasons of noncompliance to SI—and hence informality—in qualitative research. The higher the share of dependents (0-14) and inactive adult members (15-64) in the household<sup>9</sup>, the higher is the probability of SI coverage conditional on wage work. Larger households decrease the likelihood of being a wage worker, i.e. non-wage workers tend to be from bigger households. However, large households do not have any significant impact on the SI coverage. Conditional on the employment status, having higher years of experience<sup>10</sup> increases the probability of SI coverage.

To account for the gender difference, the bivariate probit model is fitted separately for men and women. Marriage is the main determinant of SI coverage only for women, where married women have higher likelihood of being covered. This is not the case for men where marriage is insignificant. The impact of age groups (30-49) and (50-64) on the employment status and the coverage is the same as found for the whole sample and do not differentiate between men and women. Higher education levels significantly increase the probability of wage work and the probability of coverage, for both men and women. Nevertheless, education plays a more important role for women than for men in that the probability of coverage increases for women with higher levels of education more than it does for men. Separate Estimates for men and women show that being a head has insignificant impact on the employment status; rather it increases significantly the coverage. This is an inverse finding to the estimates on the whole sample that showed that being head is a significant determinant for the employment status (negatively correlated with the wage work), but insignificant for coverage. The presences of covered members in the household increases wage work and coverage probabilities for men. For women, it has a positive impact only on their coverage but not on wage work. The share of dependents (0-14) and inactive adult members (15-64) continues to play a positive impact on both wage work and coverage only for men. As found for the whole sample, large households increase significantly the probability of non-wage work for both men and women. Moreover, women in large households have a lower probability of being covered, conditional on the employment status.

Table 6 shows the results for the bivariate recursive probit model estimating simultaneously the probability of employment status and SI coverage. What makes the difference with the bivariate probit model fitted in table 5 is that the endogenous “wage work”—that takes on 1 if wage worker and 0 if employer or self-employed—is included among the regressors in the SI coverage equation. It is shown that being a wage worker significantly increases the probability of SI coverage. Taking into account the gender aspect, the same effect of wage work is noticed for both men and women. The other determinants previously discussed such as marriage, age, education level and household structure have the same impact as results shown in table 5.

The bivariate probit and the bivariate recursive model show that there is a positive significant correlation between the errors of the employment status and the errors of the SI coverage. Thus, it is important to take into account the employment status while analyzing the SI coverage. It also means that once wage work is controlled for in the equation of SI coverage

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<sup>9</sup> The share of a certain group in the household is measured as their number relative to the household size.

<sup>10</sup> Experience is only added to the social insurance equation.

(as in the bivariate recursive model), unobserved characteristics—such as risk aversion—that make an individual more likely to be covered, make them more likely to engage in wage work.

#### **4.2 Switching Probit Model Results**

Estimates of the parameters of the employment status equation  $W_i$  (wage work versus non-wage work), the social security coverage outcome for the wage workers ( $S_{1i}$ ) and the social security coverage outcome for the non-wage workers ( $S_{0i}$ ) are presented in Table 10. The Wald test shows that the model fits the data. This model allows the determinants for the probability of coverage to be different between wage workers and non-wage workers. It also allows the distribution of errors for the SI coverage to be different between wage-workers and non-wage workers, i.e. there will be two correlation terms, one indicating the correlation between the errors of the employment status and the errors of the SI coverage for wage workers and the other one representing the correlation between the errors of employment status and those of the SI coverage for non-wage workers ( $\rho_{1w}$  and  $\rho_{0w}$ , respectively).

As previously shown in the findings of the bivariate probit models (Tables 5 and 6), women are significantly less likely to work as wage workers. Moreover, they are significantly more likely to be covered in the wage work state but significantly less likely to be covered by social security in the non-wage work state, as observed in the stylized facts. In the simple probit estimation of coverage for wage workers<sup>11</sup>, females had a negative impact on the coverage. However, when we took into account the possible correlation between wage work and the SI coverage, women are more likely to be covered if they are wage workers and more likely to be uncovered if they are non-wage workers, conditional on the choice of employment status. Being married does not impact the probability of wage work yet it increases significantly the likelihood of social security coverage in the wage work state, but has no significant, albeit positive, impact for the non-wage work state. Such a finding makes a difference with regards to the bivariate probit results, since the switching differentiates between the determinants of coverage for wage workers and non-wage workers. It reveals that marriage is a significant determinant for wage workers but not for non-wage workers, whereas in the bivariate probit model, this difference is not noticed since we have only one determinant for the social security coverage.

Workers in the prime age working group (30-49) and those in the older age group (50-64) have significantly higher chances of being non-wage workers, and also have higher chances of being covered in the wage work state than young workers (15-29). However, in the non-wage work, the age is insignificant to the coverage, as compared to the reference. In other terms, the older the age, the higher is the incidence of being non-wage worker. It also means that new entrants or young workers may find it hard to work as entrepreneurs or self-employed in the beginning of their career and they also more prone to informality (or not being covered) if they work as wage workers. This means that, conditional on the working state, young wage workers face lower probabilities of social security coverage while young non-wage workers do not face such challenge of coverage as compared to older categories.

Education plays a significant role in determining the working state and the social security coverage outcomes. Specifically, going up the education ladder increases significantly the likelihood of wage work and enhances the social security coverage incidence in either working states (wage work and non-wage work), as compared to the reference group (those with no education).

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<sup>11</sup> Results are provided upon request from the author.

As found in the bivariate probit analysis for the determinants of SI<sup>12</sup>, the household structure influences whether or not the person is covered. While heads of households have significantly more chances of being non-wage workers as compared to the reference group, their probability to have SI is not different from other members of the household (as in the bivariate probit estimates for the whole sample, reported in Table 5). Households with a higher share of dependent members aged (0-14) are more likely to be wage workers and to have social security in this state, while this variable has a positive but insignificant impact on the SI coverage for the non-wage working state. The share of dependent members (15-64) significantly increases the probability of wage work and the probability of SI in either working state. Finally, the presence of other members with social security does not only increase the likelihood of being a wage worker but also increases the likelihood of getting social security in either working states.

Years of experience in the labor market plays a significant role in determining coverage as highlighted in the stylized facts. Experience for both wage workers and non-wage workers has a positive and significant impact on the SI coverage. It is important to note that experience is less significant for non-wage workers than for wage workers.

Wald tests show that each of the estimated  $\rho_{1w}$  and  $\rho_{0w}$  are statistically significant, and both are jointly estimated. There exists a positive significant correlation between the residuals of the wage-work decision and the residuals of the SI coverage for each of the two employment statuses (wage work and non-wage work). As explained above, a positive correlation between the residuals of wage work and coverage for wage workers reflects that unobserved characteristics which make the individual more likely to be covered make the individual more likely to be a wage worker. At the same time, a positive significant correlation between the residuals of the wage work and the residuals of coverage for non-wage workers exists. This means that those who would be wage workers will opt for social insurance in their non-wage work. This may indicate that either they are in search for wage work and since they cannot afford waiting, they go to non-wage work or that they might have a certain "taste" for coverage that lead them to go non-wage workers to get it faster than the wage worker since coverage in the wage work state requires longer waiting period, i.e. higher years of experience.

#### **4.3 Reporting Wage for Social Insurance Deduction**

As explained in section 2, the SIS has set a maximum bound for the monthly earnings for contributions. The defined benefit feature of the social system in Egypt implies that the retirement pension is calculated based on the average monthly wage in the five years before the last two years or the last two years multiplied by 1.4 (whichever is lower for private sector employees) and the monthly average wage in the last two years for civil sector employees. Therefore, private sector employees tend to minimize their contributions by underreporting their monthly insurable earnings up until the last years of their service where they declare their true higher earnings. Moreover and on the other hand, sometimes the employees do not have the upper say in deciding the percentage of their earnings to report to social security. In this analysis, the aim is to analyze the determinants of the probability of underreporting the monthly earnings for social security deductions.

We construct a dummy variable that takes on 1 if the amount considered as basic salary for deduction of social security is lower than the basic salary declared earlier in the questionnaire, i.e. when there is an underreporting of earnings for contributions. If the amount reported for contributions is the same as the actual basic salary, this means that earnings are fully reported and this variable equals 0. Simple probit estimations of the

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<sup>12</sup>Simple probit results are available upon request from the author.

probability of underreporting the amount of basic wage for social security contributions were fit to understand the factors that most determine the underreporting or full reporting behavior (Table 7).

The reference is a male worker aged 15 to 29, non-educated or can read and write, residing in greater Cairo, having access to paid leave, medical insurance, and works inside the establishment and in a firm which has less than 30 employees. The probability that the reported basic wage for contributions is lower than the true basic wage varies with gender where females have a lower probability than males (reference category) to underreport. While age is an insignificant determinant, once substituted by the remaining years to retire, it is found that the more the remaining years to retirement, the higher is the likelihood to underreport. Surprisingly, tenure is positively correlated with the probability of underreporting, i.e. the more the years of actual experience in the firm, the more the probability to underreport. Regional variables show that workers from Alexandria and Canal Cities as well as Lower Egypt have higher probabilities to fully report their wages than the reference region (greater Cairo). Upper Egypt is not significantly different than the reference. This trend could show that informality or fraud could be higher in Greater Cairo and Upper Egypt than in Alexandria, Canal Cities and Lower Egypt. Workers with temporary contracts have a significantly higher probability of underreporting than those who work with permanent contracts.

As expected, the probability of underreporting decreases with the firm size where workers in firms with 30 workers or more have a higher probability to fully report their wages than workers in firms with less than 30 workers. Earning more than the insurance monthly ceiling (LE700 in 2006) increases the probability of underreporting. By construction, this is logical since the monthly basic wage exceeds the ceiling, therefore the worker will pay only on the maximum bound permitted (which is LE700). Thus, this confirms that the system could be a regressive tax, where high-income workers whose earnings are greater than the monthly bound pay less since they pay only on a part of their income, while the low-income workers whose earnings do not exceed the bound pay the contributions on all their earnings.

## **5. Conclusion**

This paper contributes to a growing literature that investigates the informal market in Egypt and is considered the first attempt to study SI coverage in the Egyptian labor market in wage workers and non-wage workers. We estimate a bivariate probit model and a switching probit model to study the determinants of the social security coverage for workers, taking into account their employment status (wage-workers and non-wage workers). This paper is one of the first studies that focus on the phenomenon of underreporting wages to the social security administration.

Results show that older, married and better educated workers tend to have social security coverage. Non-wage workers are slightly different than wage workers in terms of the impact of age, gender and household characteristics. Young workers (15-29) are less likely to be non-wage workers than older age groups (30-49) and (50-64). In the case of wage work, young workers are less likely to be covered whereas in the case of non-wage work, they are as likely as their older peers to be covered. Findings show that females are more likely to be covered if they are wage workers, but less likely to be covered if they are non-wage workers. Empirical findings confirm the stylized facts that experience in the job market could be more important to wage workers than non-wage workers for acquiring SI coverage. Moreover, it is shown that the employment status is positively correlated and jointly determined with the social security coverage, i.e. workers self-select into wage work or non-wage work when deciding about their coverage by the SI. Likewise, the significant positive correlation between the probability of wage work and the probability of social insurance for the non-

wage workers indicates that those who have higher propensity to be wage workers have higher propensity to be covered if they are non-wage workers. This suggests that those who would be wage workers would opt for SI in their non-wage work. This could also reflect that covered non-wage workers were the most potential to be wage workers, indicating that either they were in search for wage work and since they cannot afford waiting in the unemployment state, they opt for non-wage work or that they might have a certain “taste” for coverage that lead them to go non-wage workers to get it faster than the wage worker since coverage in the latter state requires longer period, i.e. higher years of experience. Further investigation is conducted to ensure this result and to test it. Also, it was found that underreporting insurable wages is negatively correlated with high levels of education and years to retirement age. Intuitively, workers who earn more than the maximum reportable insurable wage are more likely to underreport their wages. This presents more evidence that the presence of a ceiling for the insurable wage is harmful to equality. One of the next steps for this study is to take into account the selection bias that could occur from the decision of whether or not to participate in the labor force. Moreover, it is important to correct for the selectivity bias of being a covered wage worker when analyzing the underreporting phenomenon. Thus, a trivariate estimation will be implemented in future research work.

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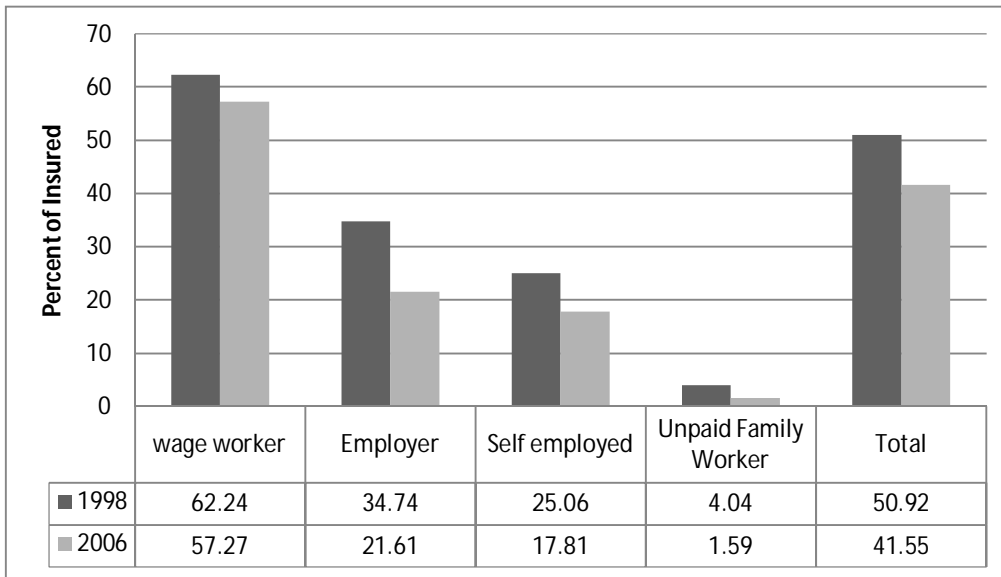
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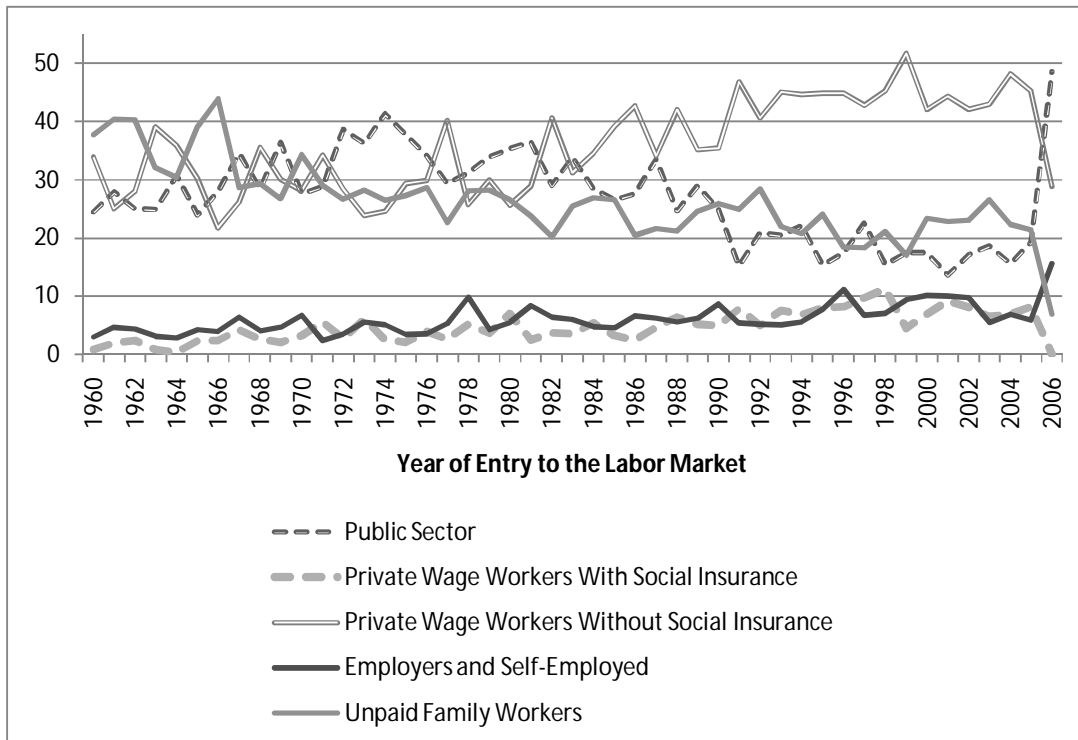
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**Figure 1: Percent of Workers (15-64 years old) who have Social Insurance Coverage by Employment Status in 1998, and 2006**

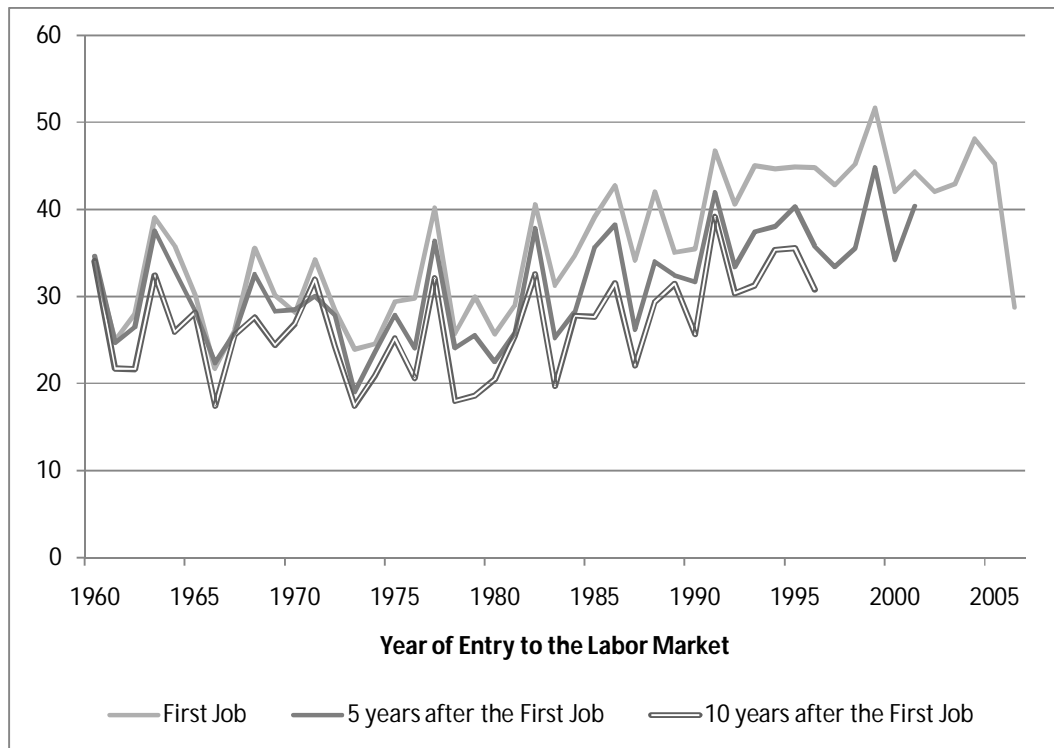


Source: Constructed by the author from ELMS 98, and ELMP5 2006

**Figure 2: Distribution of First Job Employment Status, Working Age Population (15-64) in 2006**



**Figure 3: The Distribution of the Share of Wage Workers without Social Insurance from Total Employment, in First Job, and 5 Years and 10 Years after First Job, WAP (15-64), 1960 to 2006**



**Table 1: Characteristics of Wage Workers and Employers/ Self-Employed, Working Age Population (15-64), in 1998, 2006 and 2009 (in %)**

	Wage workers		Non-wage workers	
	1998	2006	1998	2006
Contributing to the social security	62.24	57.27	30.24	19.98
Female	85.66	77.37	14.34	22.63
Male	75.78	72.79	24.22	27.21
Married	73.48	69.57	26.52	30.43
Otherwise	84.72	87.09	15.28	12.91
<i>Age</i>				
15-29	88.96	83.95	11.04	16.05
30-49	76.13	72.07	23.87	27.93
50-64	63.42	58.75	36.58	41.25
Urban	82.08	80.07	17.92	19.93
Rural	73.18	67.88	26.82	32.12
Head	69.96	66.43	30.04	33.57
Not Head	87.33	83.78	12.67	16.22
<i>Education</i>				
Illiterate/read & write	63.45	51.78	36.55	48.22
Less than intermediate	75.97	72.23	24.03	27.77
Intermediate	87.05	82.94	12.95	17.06
Above intermediate	89.16	88.08	10.84	11.92
<i>Establishment</i>				
In establishment	86.04	85.69	13.96	14.31
Out of establishment	56.28	48.44	43.72	51.56
<i>Stability</i>				
Permanent	73.28	69.44	26.72	30.56
Temporary	96.35	95.8	3.65	4.2
Seasonal	95.06	83.13	4.94	16.87
Intermittent	95.76	92.8	4.24	7.2
<i>Economic Activity</i>				
Agriculture	50.96	39.09	49.04	60.91
Industry	86.69	83.15	13.31	16.85
Services	80.86	79.56	19.14	20.44
Weekly hours	46.62	48.22	51.92	49.48
	(15.65)	(15.35)	(21.34)	(20.62)
Observations (for observed hours)	4626	7409	1181	2622
Observations	4,636	7,464	1,184	2,633

**Table 2: Characteristics of Workers, by Coverage Status and Employment Status, WAP (15-64), 1998, 2006 and 2009**

	Wage Work				Non-Wage Work			
	Uncovered		Covered		Uncovered		Covered	
	1998	2006	1998	2006	1998	2006	1998	2006
Female	22.01	28.14	77.99	71.86	90.71	94.69	9.29	5.31
Male	41.51	46.3	58.49	53.7	67.13	77.2	32.87	22.8
Married	26.45	31.32	73.55	68.68	66.88	78.73	33.12	21.27
Not married	60.47	68.23	39.53	31.77	83.76	86.98	16.24	13.02
Age								
15-29	66.18	69.63	33.82	30.37	88.9	86.24	11.1	13.76
30-49	23.95	29.19	76.05	70.81	68.94	79.19	31.06	20.81
50-64	22.1	17.49	77.9	82.51	62.2	77.05	37.8	22.95
<i>Education Level</i>								
Illiterate/read or write	64.69	66.99	35.31	33.01	79.95	88.83	20.05	11.17
Less than intermediate	50.07	58.32	49.93	41.68	62.57	73.94	37.43	26.06
Intermediate	29.32	41.91	70.68	58.09	61.76	76.34	38.24	23.66
Above than intermediate	10.72	18.98	89.28	81.02	41.33	53.83	58.67	46.17
Years of experience	14.8	13.46	19.5	19.8	25.34	25.3	29.5	26.2
Urban	27.5	34.56	72.5	65.44	50.06	65.52	49.94	34.48
Rural	48.62	51.37	51.38	48.63	82.21	88.08	17.79	11.92
Head	28.01	32.14	71.99	67.86	63.75	76.53	36.25	23.47
Not head	47.94	54.54	52.06	45.46	88.39	90.22	11.61	9.78
<i>Firm Size</i>								
0_4 Workers	88.28	71.07	11.72	28.93	70.79	79.27	29.21	20.73
5_9 Workers	89.56	85.11	10.44	14.89	68.27	84.12	31.73	15.88
10_29 Workers	75.41	73.47	24.59	26.53	45.68	77.89	54.32	22.11
30_49 Workers	51.38	52.3	48.62	47.7	66.24	86.7	33.76	13.3
50+ Workers	33.07	33.94	66.93	66.06	0	74.42	100	25.58
Don't know	7.46	10.13	92.54	89.87		89.18		10.82
<i>Sector Ownership</i>								
Government	3.33	4.97	96.67	95.03				
SOE	3.47	5.65	96.53	94.35				
Private sector	78.04	75.34	21.96	24.66	69.76	80.02	30.24	19.98
<i>Sector</i>								
Agriculture	88.42	84.45	11.58	15.55	92.19	96.84	7.81	3.16
Industry	54.26	59.18	45.74	40.82	64.95	77.38	35.05	22.62
Services	20.82	29.28	79.18	70.72	55.06	66.52	44.94	33.48
Weekly hours	48.62	51.02	45.43	46.15	49.71	47.41	57.02	57.76
S.d.	(19.45)	(16.87)	(12.68)	(13.75)	(21.10)	(21.43)	(18.52)	(18.83)
Observations for hours	1514	3042	3111	4367	748	2044	433	578
Observations	1522	3071	3112	4381	750	2052	433	579

**Table 3 Characteristics of Workers with Underreported Insurable Wages, WAP (15-64) in 2006**

	<b>Underreporting</b>	<b>Full reporting</b>
Male	25.55	74.45
Female	17.5	82.5
Married	22.76	77.24
Not married	27.26	72.74
<b>Age_Group</b>		
15-29	25.7	74.3
30-49	22.8	77.2
50-64	23.6	76.4
<b>Education</b>		
Illiterate/read or write	31.11	68.89
Less than intermediate	31.91	68.09
Intermediate	21.47	78.53
Above intermediate	21.16	78.84
Urban	24.11	75.89
Rural	22.71	77.29
Head	24.15	75.85
Not head	22.53	77.47
<b>Sector Ownership</b>		
Government	18.83	81.17
SOE	17.89	82.11
Private sector	40.82	59.18
<b>Economic Activity</b>		
Agriculture	17.95	82.05
Industry	25.74	74.26
Services	23.16	76.84
Experience (mean)	20.27	19.65
Tenure (mean)	13.4	12.55
Basic monthly wage (mean)	963.26	349.46623
25% Percentile	285	218
75% Percentile	652.2	400
Hourly Wage	9.29	3.93
25% Percentile	1.9	1.67
75% Percentile	4.55	3.82
Sample	918	3,404
	100	100

**Table 4: Seemingly Unrelated Bivariate Model for the Employment Status and the Social Insurance Coverage, 2006**

Variables	Wage Work		SI		SI	
	Wage Work	SI	Wage Work	SI	Wage Work	SI
			Males		Females	
Female	-0.197** (0.0788)	0.165** (0.0818)				
Married	0.101 (0.0749)	0.258*** (0.0762)	0.0976 (0.116)	0.0910 (0.115)	-0.154 (0.195)	0.437** (0.211)
Age30_49	0.000551 (0.0524)	0.511*** (0.0529)	0.00245 (0.0577)	0.545*** (0.0587)	-0.0769 (0.165)	0.544*** (0.145)
Age50_64	-0.125** (0.0621)	0.863*** (0.0688)	-0.187*** (0.0693)	0.876*** (0.0761)	-0.357* (0.189)	0.617*** (0.193)
Less than Intermediate	0.344*** (0.0525)	0.581*** (0.0538)	0.255*** (0.0557)	0.518*** (0.0564)	0.328* (0.193)	0.554*** (0.209)
Intermediate	0.789*** (0.0476)	1.165*** (0.0490)	0.547*** (0.0526)	0.958*** (0.0536)	2.013*** (0.140)	2.338*** (0.150)
Above Intermediate	1.080*** (0.0577)	1.709*** (0.0575)	0.814*** (0.0628)	1.520*** (0.0628)	2.637*** (0.197)	2.761*** (0.171)
Alex and Canal Cities	8.31e-05 (0.0720)	0.0759 (0.0689)	-0.0148 (0.0783)	0.0366 (0.0750)	0.228 (0.220)	0.407** (0.195)
Urban Lower Egypt	-0.240*** (0.0667)	-0.00528 (0.0657)	-0.292*** (0.0728)	-0.0456 (0.0719)	0.0964 (0.199)	0.167 (0.177)
Urban Upper Egypt	-0.0664 (0.0646)	0.00202 (0.0625)	-0.0215 (0.0713)	-0.0111 (0.0689)	-0.220 (0.179)	0.162 (0.162)
Rural Lower Egypt	-0.0764 (0.0621)	-0.161*** (0.0594)	-0.0555 (0.0677)	-0.170*** (0.0647)	-0.0801 (0.181)	-0.0341 (0.162)
Rural Upper Egypt	-0.198*** (0.0693)	-0.417*** (0.0662)	-0.0624 (0.0759)	-0.365*** (0.0717)	-0.807*** (0.209)	-0.654*** (0.195)
Being Head	-0.297*** (0.0833)	0.130 (0.0867)	-0.215 (0.139)	0.273** (0.139)	-0.0907 (0.203)	0.781*** (0.226)
If any covered HH members	0.378*** (0.0506)	0.622*** (0.0519)	0.439*** (0.0597)	0.628*** (0.0611)	0.0310 (0.121)	0.576*** (0.111)
Share of dependents 0_14	0.354*** (0.110)	0.353*** (0.111)	0.392*** (0.122)	0.424*** (0.122)	0.232 (0.311)	-0.0947 (0.302)
Share of dependents 65	0.516 (0.476)	-0.0166 (0.499)	1.520 (0.945)	0.190 (0.890)	0.917 (0.666)	1.031 (0.708)
Share of OLF 15_64	0.355*** (0.105)	0.800*** (0.108)	0.397*** (0.121)	0.851*** (0.122)	0.128 (0.302)	0.787*** (0.305)
HH Size	-0.0524*** (0.0111)	-0.0136 (0.0114)	-0.0540*** (0.0124)	-0.00527 (0.0126)	-0.0535* (0.0317)	-0.0662** (0.0331)
Father less than Intermediate	-0.128** (0.0595)		-0.137** (0.0673)		-0.0830 (0.167)	
Father Intermediate	-0.280*** (0.0804)		-0.310*** (0.0889)		-0.285 (0.233)	
Father above Intermediate	-0.203** (0.102)		-0.222* (0.115)		-0.138 (0.276)	
Mother less than Intermediate	0.00631 (0.0896)		-0.0107 (0.101)		0.102 (0.250)	
Mother Intermediate	-0.286** (0.133)		-0.334** (0.154)		-0.552* (0.298)	
Mother above Intermediate	-0.279 (0.185)		-0.461** (0.219)		-0.178 (0.409)	
F_Regular WageWorker	-0.138** (0.0645)		-0.176** (0.0716)		-0.114 (0.182)	
F_Irregular Wage Worker	-0.547*** (0.0365)		-0.626*** (0.0405)		-0.214** (0.108)	
F_Employer/Self-Employed	-0.219 (0.389)		-0.427 (0.415)		5.223 (1.953e+06)	
F_No Job	-0.345 (0.276)		-0.388 (0.340)		-0.318 (0.533)	
M_Regular WageWorker	-0.0986 (0.345)		-0.370 (0.372)		6.904 (42.462)	
M_Irregular Wage Worker	-0.697*** (0.175)		-0.517** (0.211)		-1.153*** (0.381)	
M_Employer/Self-Employed	-0.461*** (0.169)		-0.487** (0.198)		-0.591 (0.394)	
M_No Job	-0.448*** (0.149)		-0.581*** (0.177)		-0.154 (0.307)	
Experience		<b>0.0391***</b> <b>(0.00551)</b>		<b>0.0297***</b> <b>(0.00604)</b>		<b>0.0735***</b> <b>(0.0167)</b>
Experience Squared		- <b>(0.000140)</b>		<b>-0.000752***</b> <b>(0.000151)</b>		<b>-0.00153***</b> <b>(0.000447)</b>
Constant	1.060*** (0.204)	-2.063*** (0.145)	1.250*** (0.236)	-1.937*** (0.161)	0.280 (0.427)	-2.890*** (0.331)
<b>Rho</b>		<b>0.690***</b> <b>(0.0270)</b>		<b>0.626***</b> <b>(0.0284)</b>		<b>0.963***</b> <b>(0.0986)</b>
Observations	6,752	6,752	5,285	5,285	1,467	1,467

**Table 5: Bivariate Recursive Probit Model for the Employment Status and the Social Insurance Coverage, 2006**

Variables	All		Males		Females	
	Wage Work	SI	Wage Work	SI	Wage Work	SI
Wage Worker		0.494*** (0.169)		0.378** (0.164)		2.269*** (0.389)
Female	-0.219*** (0.0793)	0.331*** (0.0900)				
Married	0.0912 (0.0755)	0.258*** (0.0803)	0.0963 (0.117)	0.121 (0.119)	-0.243 (0.199)	0.684*** (0.236)
Age30_49	-0.00906 (0.0531)	0.358*** (0.0631)	-0.00503 (0.0584)	0.404*** (0.0725)	-0.0438 (0.171)	0.487*** (0.165)
Age50_64	-0.134** (0.0626)	0.478*** (0.0972)	-0.193*** (0.0697)	0.553*** (0.113)	-0.390** (0.194)	0.578** (0.256)
Less than Intermediate	0.342*** (0.0528)	0.628*** (0.0576)	0.254*** (0.0559)	0.574*** (0.0599)	0.285 (0.196)	0.348 (0.249)
Intermediate	0.783*** (0.0479)	1.274*** (0.0587)	0.542*** (0.0529)	1.089*** (0.0634)	1.964*** (0.141)	1.386*** (0.308)
Above Intermediate	1.070*** (0.0584)	1.885*** (0.0694)	0.806*** (0.0634)	1.724*** (0.0771)	2.637*** (0.204)	1.614*** (0.334)
Alex and Canal Cities	-0.00267 (0.0726)	0.0927 (0.0717)	-0.0141 (0.0788)	0.0434 (0.0768)	0.0433 (0.233)	0.500** (0.216)
Urban Lower Egypt	-0.237*** (0.0671)	0.0615 (0.0710)	-0.288*** (0.0731)	0.0137 (0.0771)	0.0382 (0.212)	0.176 (0.190)
Urban Upper Egypt	-0.0634 (0.0650)	0.0328 (0.0657)	-0.0148 (0.0717)	0.00848 (0.0710)	-0.327* (0.190)	0.392** (0.181)
Rural Lower Egypt	-0.0774 (0.0625)	-0.129** (0.0619)	-0.0520 (0.0679)	-0.147** (0.0665)	-0.231 (0.190)	0.0373 (0.175)
Rural Upper Egypt	-0.187*** (0.0698)	-0.411*** (0.0692)	-0.0545 (0.0763)	-0.373*** (0.0734)	-0.904*** (0.215)	-0.196 (0.235)
Being Head	-0.296*** (0.0837)	0.175* (0.0942)	-0.223 (0.140)	0.247* (0.146)	-0.137 (0.203)	1.052*** (0.256)
If any covered HH	0.377*** (0.0506)	0.573*** (0.0552)	0.439*** (0.0597)	0.565*** (0.0644)	0.0130 (0.123)	0.697*** (0.124)
Share of dependents 0_14	0.349*** (0.110)	0.262** (0.117)	0.391*** (0.122)	0.321** (0.128)	0.105 (0.320)	-0.280 (0.330)
Share of dependents 65	0.526 (0.479)	-0.102 (0.526)	1.509 (0.956)	0.0639 (0.925)	0.931 (0.706)	0.439 (0.805)
Share of OLF 15_64	0.362*** (0.106)	0.714*** (0.114)	0.407*** (0.121)	0.759*** (0.127)	0.0679 (0.307)	0.707** (0.352)
HH Size	-0.0516*** (0.0111)	-0.0126 (0.0124)	-0.0538*** (0.0124)	-0.00568 (0.0136)	-0.0461 (0.0313)	-0.0315 (0.0376)
Father less than	-0.118* (0.0624)		-0.130* (0.0698)		-0.134 (0.174)	
Father Intermediate	-0.263*** (0.0845)		-0.306*** (0.0921)		-0.0158 (0.269)	
Father above Intermediate	-0.187* (0.107)		-0.222* (0.118)		0.0307 (0.317)	
Mother less than	-0.000485 (0.0933)		-0.0167 (0.104)		0.123 (0.271)	
Mother Intermediate	-0.315** (0.138)		-0.360** (0.159)		-0.650* (0.340)	
Mother above Intermediate	-0.299 (0.195)		-0.448** (0.227)		-0.697 (0.471)	
F_Regular WageWorker	-0.187*** (0.0691)		-0.214*** (0.0756)		-0.196 (0.204)	
F_Irregular Wage Worker	-0.578*** (0.0387)		-0.656*** (0.0427)		-0.266** (0.116)	
F_Employer/Self-	-0.285 (0.403)		-0.519 (0.429)		6.295 (29.656)	
F_No Job	-0.380 (0.285)		-0.423 (0.349)		-0.307 (0.582)	
M_Regular WageWorker	-0.0917 (0.360)		-0.372 (0.384)		6.613 (39.027)	
M_Irregular Wage Worker	-0.799*** (0.184)		-0.569*** (0.217)		-1.544*** (0.423)	
M_Employer/Self-	-0.509*** (0.176)		-0.499** (0.203)		-0.949** (0.434)	
M_No Job	-0.499*** (0.156)		-0.611*** (0.182)		-0.366 (0.353)	
Experience		0.0451*** (0.00678)		0.0371*** (0.00826)		0.0608*** (0.0137)
Experience Squared		-0.000441*** (0.000122)		-0.000380*** (0.000141)		-0.000790*** (0.000261)
		0.383*** (0.103)		0.398*** (0.102)		-0.275 (0.233)
Constant	1.148*** (0.210)	-2.806*** (0.226)	1.309*** (0.241)	-2.508*** (0.236)	0.727 (0.461)	-4.539*** (0.406)
Observations	6.763	6.763	5.291	5.291	1.472	1.472



**Table 6: Switching Probit Model for 2006**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Wage Work	SI_Wage Work	SI_Non Wage Work	Wage Work	SI_Wage Work	SI_Non Wage Work
Female	-0.237*** (0.0817)	0.265** (0.131)	-0.554*** (0.176)	-0.245*** (0.0817)	0.279** (0.133)	-0.557*** (0.179)
Married	0.0645 (0.0775)	0.346*** (0.115)	-0.0383 (0.149)	0.0585 (0.0776)	0.345*** (0.116)	-0.0436 (0.151)
Age30_49	-0.0276 (0.0542)	0.276*** (0.0838)	0.0802 (0.121)	-0.0202 (0.0542)	0.287*** (0.0844)	0.0841 (0.124)
Age50_64	-0.119* (0.0641)	0.256* (0.147)	0.0519 (0.168)	-0.107* (0.0640)	0.275* (0.149)	0.0551 (0.171)
Less than Intermediate	0.227*** (0.0544)	0.462*** (0.0854)	0.413*** (0.0921)	0.222*** (0.0542)	0.456*** (0.0877)	0.413*** (0.0935)
Intermediate	0.664*** (0.0494)	0.988*** (0.0896)	0.744*** (0.104)	0.638*** (0.0486)	0.968*** (0.0975)	0.737*** (0.108)
Above Intermediate	0.928*** (0.0603)	1.443*** (0.107)	1.280*** (0.119)	0.847*** (0.0566)	1.412*** (0.117)	1.277*** (0.122)
Alex and Canal Cities	0.0250 (0.0730)	0.127 (0.0919)	0.168 (0.130)	0.0399 (0.0726)	0.133 (0.0926)	0.172 (0.132)
Urban Lower Egypt	-0.211*** (0.0674)	0.0998 (0.101)	-0.0103 (0.118)	-0.186*** (0.0669)	0.123 (0.102)	0.000272 (0.120)
Urban Upper Egypt	0.0209 (0.0658)	0.0609 (0.0895)	0.0745 (0.117)	0.0328 (0.0656)	0.0717 (0.0902)	0.0831 (0.118)
Rural Lower Egypt	0.113* (0.0645)	0.119 (0.0862)	-0.121 (0.116)	0.148** (0.0637)	0.125 (0.0869)	-0.124 (0.118)
Rural Upper Egypt	0.0587 (0.0727)	-0.261*** (0.0954)	-0.123 (0.129)	0.0859 (0.0722)	-0.253*** (0.0962)	-0.123 (0.131)
Head	-0.338*** (0.0859)	0.106 (0.134)	-0.0814 (0.177)	-0.342*** (0.0859)	0.119 (0.136)	-0.0666 (0.181)
If any covered HH members	0.337*** (0.0513)	0.528*** (0.0806)	0.467*** (0.0972)	0.328*** (0.0511)	0.524*** (0.0826)	0.465*** (0.0990)
Share of dep (0_14)	0.297*** (0.112)	0.314** (0.147)	0.144 (0.213)	0.317*** (0.112)	0.314** (0.149)	0.127 (0.217)
Share of dep (65+)	0.178 (0.478)	-0.519 (0.720)	0.00880 (0.984)	0.190 (0.479)	-0.540 (0.726)	0.0337 (0.998)
share of OLF (15_64)	0.269** (0.108)	0.572*** (0.164)	0.766*** (0.194)	0.278*** (0.108)	0.568*** (0.166)	0.775*** (0.196)
HH size	-0.0406*** (0.0114)		-0.0433*** (0.0201)	-0.0386*** (0.0114)		-0.0422*** (0.0205)
Industry	0.924*** (0.0606)	0.924*** (0.130)	1.241*** (0.125)	0.929*** (0.0605)	0.887*** (0.143)	1.228*** (0.130)
Services	0.806*** (0.0538)	1.393*** (0.113)	1.470*** (0.106)	0.806*** (0.0537)	1.368*** (0.124)	1.467*** (0.109)

**Table 6: Continued**

Variables	(1) Wage Work	(2) SI_Wage Work	(3) SI_Non Wage Work	(4) Wage Work	(5) SI_Wage Work	(6) SI_Non Wage Work
Father less than Intermediate	-0.116* (0.0623)					
Father Intermediate	-0.221*** (0.0841)					
Father above Intermediate	-0.124 (0.107)					
Mother less than Intermediate	-0.0219 (0.0925)					
Mother Intermediate	-0.333** (0.137)					
Mother above Intermediate	-0.354* (0.195)					
F_Regular WageWorker	-0.139** (0.0698)			-0.113 (0.0698)		
F_Irregular Wage Worker	-0.541*** (0.0397)			-0.511*** (0.0382)		
F_Employer/Self-Employed	-0.116 (0.442)			-0.116 (0.443)		
F_No Job	-0.264 (0.293)			-0.250 (0.294)		
M_Regular WageWorker	-0.0546 (0.363)			0.203 (0.358)		
M_Irregular Wage Worker	-0.800*** (0.188)			-0.551*** (0.170)		
M_Employer/Self-Employed	-0.469*** (0.178)			-0.203 (0.157)		
M_No Job	-0.533*** (0.157)			-0.272** (0.133)		
5_9 workers		-0.343*** (0.101)			-0.347*** (0.102)	
10_29 workers		0.0509 (0.114)			0.0567 (0.115)	
30_49 workers		0.434*** (0.144)			0.441*** (0.145)	
50+ workers		1.017*** (0.104)			1.033*** (0.103)	
Don't Know		1.459*** (0.0786)			1.476*** (0.0723)	
Experience		0.0504*** (0.0104)	0.0204* (0.0119)		0.0508*** (0.0106)	0.0208* (0.0122)
Experience Square		-0.000423** (0.000205)	-4.24e-05 (0.000202)		-0.000422** (0.000208)	-4.12e-05 (0.000206)
$\rho_{1w}$		0.330* (0.194)			0.231 (0.222)	
$\rho_{0w}$			0.554*** (0.124)			0.514*** (0.138)
Constant	0.493** (0.217)	-4.014*** (0.245)	-2.105*** (0.385)	0.170 (0.196)	-3.971*** (0.269)	-2.176*** (0.395)
Observations	6,756	6,756	6,756	6,757	6,757	6,757

**Table 7: Probit Estimations for Wages Underreporting to Social Security Administration**

Variables	Underreporting (1)	Underreporting (2)
Female	-0.0220 (0.0197)	-0.0455** (0.0187)
Married	-0.0137 (0.0200)	-0.0160 (0.0200)
Years to Retire (60)	0.00394*** (0.000891)	0.00179** (0.000881)
Tenure	0.00588*** (0.00226)	0.00662*** (0.00226)
Tenure_sq	-5.87e-05 (6.04e-05)	-6.58e-05 (6.02e-05)
Less than Intermediate	0.0228 (0.0287)	0.0358 (0.0290)
Intermediate	-0.0513** (0.0221)	-0.0222 (0.0225)
Above Intermediate	-0.0714*** (0.0232)	-0.0323 (0.0233)
Alex and Canal Cities	-0.0669*** (0.0189)	-0.0706*** (0.0187)
Urban Lower Egypt	-0.0277 (0.0209)	-0.0390* (0.0203)
Urban Upper Egypt	0.0174 (0.0202)	-0.000208 (0.0195)
Rural Lower Egypt	-0.0432** (0.0190)	-0.0634*** (0.0181)
Rural Upper Egypt	0.0613** (0.0273)	0.0265 (0.0253)
Head	-0.0258 (0.0204)	-0.0247 (0.0202)
Temporary contract	0.328*** (0.0624)	0.377*** (0.0601)
Paid Leave	0.130*** (0.0346)	0.132*** (0.0342)
Medical Insurance	-0.0232 (0.0255)	0.00243 (0.0270)
Firm Size above 30 workers	-0.0518*** (0.0184)	-0.0554*** (0.0183)
Ln_monthlyBasicWage	0.181*** (0.0114)	
If Wage>700		0.300*** (0.0278)
Observations	4,308	4,308