**The Coverage Gap in the Egyptian Social Insurance System
during a Period of Reforms and Revolts**

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1. Introduction

Egypt has been implementing quite an inclusive social insurance system (SIS) since the early 1950s, which is regulated by several insurance schemes in order to cover almost all different types of workers.[1] The system operates as a Defined-Benefits Pay-As-You-Go (DB-PAYG) scheme, under which the pensions of the currently retired members are paid from the contributions of current active members in the system. Benefits are determined using a delineated percentage of the worker's average monthly wage. This calculation focuses on the worker's wage in the final years of work before retirement to determine his/her benefits (ILO 2009; SSA 2011; Roushdy and Selwaness, 2014).[2] According to social insurance law 79 of 1975 and 108 of 1976, it is compulsory for wage and non-wage workers, respectively, to participate in the social security system.[3] However, recent studies have shown that the SIS coverage gap among both types of workers has been significantly expanding over the last two decades, leaving an important portion of Egyptian workers with no social security.

Based on the data of the Egypt Labor Market Panel Surveys of 1998, 2006 and 2012, access to social insurance coverage has declined among both public and private wage workers during the 1998 to 2012 period. The share of the public sector socially insured wage workers went down from 97% in 1998 to 93% in 2012. In contrast, only 24% of the private sector wage workers were socially insured in 1998. This latter's share increased to 25% in 2006, then decreased again to 24.2% in 2012. A similar decline was also observed in the prevalence of social insurance coverage among non-wage workers, namely employers and self-employed, from 29.6% in 1998 to 14% in 2012 (Roushdy and Selwaness 2014).

Moreover, it is common for new entrants in the Egyptian labor market to struggle to find formal employment (Wahba 2009). This implies that access to social insurance coverage in the private sector does not often come at first entry. Roushdy and Selwaness (2012 and 2014) highlighted that workers who have recently entered the labor market make up the smallest proportion of the socially insured private sector, and those with five years of experience comprise the second smallest proportion. Workers with 10 years of work experience or more make up the largest proportion of the insured private sector.

This coverage gap has often been attributed to the decline of the public sector hiring[4], along with the failure of the formal private sector not only in absorbing the labor market new entrants,

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[1]The Egyptian SIS is mainly regulated by four laws, which are law 79 of 1975 for wage workers, law 108 of 1976 for employers and self-employed, law 50 of 1978 for Egyptians working abroad, and law 112 of 1980 for workers who are not included in any of the previous schemes.

[2] Insured persons can claim their pensions providing being 60 years old with 120 months of contributions or 50 years old with 240 months of contributions.

[3] Wage workers can only be enrolled in the SIS by their employers (the government, the public enterprises or the private enterprises), whereas other types of workers can register themselves in the system. See SSA (2011) and Sieverding and Selwaness (2012) for a detailed overview of the SIS in Egypt.

[4] Since the guaranteed employment scheme of the 1960s (due to law 14 in 1964, which was later amended by law 85 in 1973), the Egyptian public sector was the main provider of formal employment opportunities

but also in ensuring formality or social security coverage to all its entrants, both of which resulted in an expansion of informal employment (Assaad 2009; Assaad 2014). This expansion in the informal sector has been primarily attributed to the high cost of participation in the social insurance system, relative to the low pension amounts received after retirement (Sieverding and Selwaness 2012). As has often been highlighted in the literature, the high social insurance contribution rates requested from both the employers and employees, combined with weak enforcement of law, encourages employers and employees to either not participate in the social insurance system or to contribute with amounts that are lower than their actual wage (Helmy 2008; Sieverding and Selwaness 2012).[5]

Over the last decade, the government of Egypt has passed several regulations with the aim of boosting formalization of the private sector and improving the business climate. In 2003, a new labor law (No. 12, 2003) was decreed, which regulates the employee-employer relationship and specifies their rights. It provides increased flexibility for private firms in the hiring/firing process, which has been a major bottleneck for the creation of formal employment, by allowing for an indefinite number of renewals on definite duration contracts and layoffs with severance on indefinite duration contracts. Hence, this law is expected to have led to greater formalization of employment in recent years. Moreover, in 2004 the Egyptian government in its endeavor to make the business climate more conducive to micro and small enterprises (MSEs) decreed a new law (No. 141, 2004) to define, support and encourage MSEs. Incentives provided by this law include establishing local funds for MSEs and easing the process of obtaining licenses (see Attia 2009 and Wahba 2009 for a review of recent reforms).

On the other hand, this decade was not free of several shocks and downturns. It witnessed the global economic downturn due to the food and energy price shocks followed by the world financial crisis of 2008 and the January 25th, 2011 revolution. During the financial crisis period, Egypt witnessed a drop in real GDP growth from 7.2% in 2007/08 to 4.7% in 2009. Roushdy and Gadallah (2012) have shown that some crisis-related impact was observed during this period on the labor market outcomes (including hours of work, informality of employment and sectorial shifts) of youth and unskilled female workers. Furthermore, the Egyptian January 25th revolution and its aftermath is expected to have had adverse effects on the labor market, but limited data is yet available to properly measure those effects.

To the best of our knowledge, only Selwaness and Roushdy (2014) attempted to empirically investigate the dynamics of socially insured employment and the time a new entrant to the labor market takes to gain social insurance coverage during this period of reforms and revolt.

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until late 1980s. Nevertheless, following the implementation of the Economic Reform Structural and Adjustment Program with the World Bank and IMF in early 1991, the public sector jobs started declining.

[5] Around 41% of wage workers basic wage and 25% of variable wage are deducted as social security contributions which are jointly paid by employees, employers and the government. Employees pay 14% and 10% of workers' basic and variable earnings, respectively; while employers contribute 26% and 15% of the basic and variable earnings, respectively. The government contributes only 1% of the basic wage (Helmy 2008, Sieverding and Selwaness, 2012).

This paper aims to contribute in filling this gap in the empirical literature. We use recently available data from the new round of the Egyptian Labor Market Panel Survey of 2012 and survival analysis techniques, to model the duration to social insurance coverage in the private sector. This new data allows us to study the dynamics of social insurance coverage before and after the 2003 and 2004 laws; and to investigate whether the January 25th Revolution had any initial effects on workers' access to social insurance coverage. More specifically, the paper explores the following questions: (1) How long a worker who starts in the private non-agricultural wage sector needs to gain access to social insurance coverage? (2) Did the introduction of the 2003 labor law have any effects on the duration needed to get such coverage? (3) Did the duration to coverage change in the aftermath of the global financial crisis and the January 25th revolution?

The paper is organized into 6 sections. Following this introduction, section 2 provides an overview of related literature on formality and social insurance coverage. Section 3 presents the data used in this paper. Section 4 describes the methodology used to model the duration to the first covered job. Section 5 provides the results of the parametric and non-parametric duration models. Finally, conclusions and policy implications are provided in Section 6.

2. Literature Review

A large number of research has focused on labor market informality and access to social insurance coverage in the developing world. Several of these studies investigate the determinants of being informal using different definitions of informality (Angel-Urdinola and Tanabe 2012, Henley, Arabsheibano and Carneiro 2006). Tansel (1999) examines the wage differentials between the covered and uncovered wage workers in Turkey. Some other studies attempt to explain the low participation rates of wage workers in the social security system (Auerbach et al. 2007; Bosch et al. 2007; Pages and Madrigal 2008; Bosch and Maloney 2010; Cuesta and Olivera 2010).

A number of papers used survival analysis to study the duration of formal and informal employment. Ulyssea and Dimitri (2006) estimated the determinants of job duration in the formal and the informal sector in Brazil. The authors used non-parametric and parametric duration models to analyze workers mobility patterns. The main findings are that employment duration in the formal and informal labor market are determined by different individual characteristics. Schooling level and age are positively associated with job duration in the formal sector, but the opposite is true for the informal sector. The authors also argued that there exists a sort of an "informality trap" in the Brazilian labor market. In other words, if the worker does not move out of informal employment within the first 3-6 months, a long informal spell would be experienced. Moreover, several studies analyzed the potential impacts of introducing unemployment insurance (UI) benefits in different middle-income countries on employment and unemployment duration, job search intensity, job mobility

between formal and informal wage employment, and on wage level (Meyer 1990; Cunningham 2000; Margolis 2008; Nagler 2013).

In Egypt, several studies tackled the phenomenon of informality, defined as the lack of both legal contract and social security coverage (Wahba and Mokhar 2002; Assaad and Arntz 2005; Assaad 2009; Wahba 2009). The gender aspect of informalization was studied in Assaad (2009) and Assaad and Arntz (2005) who have found that, unlike Latin American countries, informality in Egypt was not associated with feminization of labor force. In order to better understand social insurance in Egypt, Roushdy and Selwaness (2012) assessed the determinants of workers' access to social insurance and studied the likelihood that insurable wages were being underreported (in order to evade high contributions payments). The study found that older, better educated males with higher skill sets were more likely to have social insurance when compared with their counterparts.

Only Wahba (2009) studied the impact of the 2003 labor law on labor market informality, defined as the lack of a job contract. The author found that the 2003 law had a positive impact on the formalization rate of existing wage workers in the private non-agricultural sector, but no significant impact was observed on the new entrants' probability of getting a formal job. On the revolution effects front, Assaad and Krafft (2014) investigated the labor market conditions in the aftermath of the January 25th revolution. The authors have shown that deteriorated labor market conditions have been observed after the revolution, which were either directly due to the turmoil caused by the revolution, or a continuity of a trend of deterioration that started even before the revolution. While principal indicators of the labor market, namely employment-to-population ratio and unemployment slightly changed between 2006 and 2012, involuntary part-time work and irregular jobs rose substantially. Informal employment in the private wage employment went up to 73% in 2012 from 71% in 2006. Moreover, working conditions worsened in the private sector; in contrast, the Egyptian government significantly improved the public sector working conditions in attempt to sooth and absorb the wide-spread protests of the temporary public sector workers following the revolution. Falling sales and lack of job security were among the aspects of deterioration that were widely observed in the private sector work after the revolution.

Nevertheless, to the best of our knowledge, no study has focused on investigating the duration needed to get social insurance coverage on the Egyptian labor market, except an earlier analysis conducted by the authors of this paper. Roushdy and Selwaness (2014) provided a descriptive assessment of evolution of social insurance coverage and the time it takes a worker to get enrolled in the social insurance system. Non-parametric duration analysis, mainly Kaplan-Meier failure curves, were used to study the probability of first obtaining social insurance coverage among those aged 18-59 who started their work career as wage workers and were still employed in 2012. As was expected, the study indicated that workers who began their careers in the public sector were more likely to receive social insurance from the onset of working. In contrast, workers who started off in private sector wage employment (whether the work is irregular or regular) routinely worked for a duration

of time uninsured and had to wait until later in their careers for the opportunity to participate in social insurance. In terms of SIS coverage, evidence demonstrates that new entrants to irregular wage work are at the greatest disadvantage: Such workers not only face the most limited access to social insurance, but also on average experience a longer duration of waiting for coverage than other groups. The formality status and size of a given firm also affect the amount of time a worker must wait before having access to SI. On average, just one quarter of regular wage workers who started in informal firms had social insurance coverage. Informal firms are not the only companies in Egypt that hire their workers informally. Formal firms additionally do so often. This reality demonstrates the weak enforcement of the social insurance laws in Egypt, as even many registered enterprises fail to comply by them.

This paper aims to extend the earlier analysis on the duration to coverage in several regards. First, in addition to non-parametrically estimating the survivor function, we use parametric analysis techniques to model the hazard rate of obtaining social insurance coverage controlling for different worker- and enterprise- level characteristics. Second, we not only focus on those who were still employed in 2012, but those who got social insurance coverage before turning into unemployment or inactivity were also included in the analysis.[6] Third, we investigate whether the hazard of getting social insurance coverage was affected by the downturns and reforms experienced during the last decade.

3. Data

The analysis of this paper relies on data from the 2012 Egyptian Labor Market Panel Survey (ELMPS 12). The ELMPS 12 was conducted by the Economic Research Forum (ERF) in cooperation with the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). The data collection of this survey started in March 1st 2012 and ended in June 10th 2012 (Assaad & Krafft, 2013a). The ELMPS 12 is a follow-up survey to the 1998 Egypt Labor Market Survey (ELMS 98) and the 2006 Egypt Labor Market Sample Survey (ELMPS 06). This longitudinal survey captures both labor market and demographic characteristics of households and individuals, interviewed in each wave since the 1998 round. The survey additionally covers new households formed due to splits from the original household surveyed.

For the analysis, we focus on specific variables from the ELMPS 12 data. The dependent variable is the duration (measured in years) to a socially insured job (whether through getting coverage at first job or by switching jobs). As in Roushdy and Selwaness (2014), to compute the duration to the first socially insured job, As in Roushdy and Selwaness (2014), to compute the duration to the first socially insured job, we use a new set of questions which was only included in the 2012 interview: whether and how long each individual had to wait

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[6] It is worth mentioning that the unemployed and inactive individuals who ever worked but have not ever acquired social insurance coverage before falling into unemployment or inactivity were not included in the sample. Further research plan is to take this group into account and model unemployment or/and inactivity as a competing risk vis-à-vis the coverage risk.

on each new job to acquire social insurance coverage, if they ever did.[7] We include in the analysis only those who started their first job in the private non-agricultural wage sector, but in few occasions and especially in the descriptive statistics, we also include those working in the public sector for sake of comparison. To limit possible recall problems, we limit the duration analysis to those who started their first job in the year 2000 or later, i.e. in the last 12 years. We also focus on those aged 18-59, since by law, social security coverage is available for wage workers, in the state owned enterprises and the private sector, at age 18 to the retirement age of 60 years old.

The sample of individuals who started their first job in the private non-agricultural wage sector since the year 2000 consists of 3,049 individuals aged 18 to 59. As shown in Table 1, around 1,809 censored individuals never got insured and were observed till 2012 as working with no coverage. Only 788 workers got insured before the 2012 ELMPS interview, while 178 and 274 became unemployed and inactive, respectively, before ever getting social insurance coverage and remained in either of these two states till 2012. The group of workers who experienced these two latter risks, namely unemployment and inactivity, is excluded from the analysis. The results of these tables should be taken with caution as they are right censored with different entry dates to the labor market.

As discussed above, since the last decade was full of several downturns and reforms, we grouped the wage workers sample into four job start cohorts. The first cohort includes those who started their first job before the passage of the new labor law, i.e. between the year 2000 to 2003 (the reference category). The second cohort is the period following the new labor law implementation and before the food prices shock (from 2004 to 2007). The third cohort is the group starting first job during the period 2008 to 2010, which marked the food and financial crisis years. The final group includes those who started their first job after the January 2011 revolution and before the ELMPS 12 interview.

Table 1: Distribution of workers by coverage and job status in 2012, aged 18-59 who started working between 2000-2012

Job Status in 2012	Freq.	Percent
Not Insured Until 2012 (Censored)	1,809	58.07
Got Social Insurance	788	26.34
Got Unemployment	178	5.65
Got Inactive	274	9.93
Total	3,049	100

Source: Constructed by the authors using ELMPS 2012

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[7] This information is computed through combining the year of first job, the start date of each new job and the time taken to get social insurance at this job. It is worth mentioning that the question of enrollment time was only asked for workers who have already claimed that their job was covered. Others with uninsured jobs did not answer this question. Hence, we compute the time it took them to get covered on the same job or the time to get the first job with social insurance (Roushdy and Selwaness 2014).

To avoid the above mentioned censored problem, in Table 2 we only focus on those who got socially insurance coverage during the study period and examine how their job start cohort influenced their duration to such coverage. The table presents the percent of workers who got socially insured within their respective job start cohort and the average duration to this coverage.[8] Those who started their first job after the new labor law of 2003 and before the January 25th revolution, i.e. within the two job start cohorts of 2004-2007 (24%) and 2008-2010 (25%), were more likely to be enrolled in the pension system within the duration of their job start cohort (i.e. in a maximum of three years), than those who started during the three years preceding the 2003 law (19%). However, the duration to coverage did not differ much among those three job start cohorts. After the revolution, less than 14% of those who started working between 2011 and the ELMPS12 interview have acquired social insurance coverage during this period. This latter figure should be taken with caution since very few individuals in the dataset started their first job between 2011 and 2012.

Table 2 Percent of socially insured workers within the first three years of first job, by cohort of first job, aged 18-59.

Cohort of first job	Percent of socially insured workers before the end of the respective job start cohort	Average duration within the job respective start cohort (years)	S.d.	Total covered within the respective job start cohort	Total employed within the respective job start cohort
2000-2003	19.1	0.3	0.9	171	910
2004-2007	24.2	0.3	0.9	213	940
2008-2010	24.9	0.2	0.5	129	551
2011- ELMPS 12 interview	13.8	0	0	26	194

Source: Constructed by the authors using ELMPS 2012

4. Empirical Modeling: Discrete Time Survival Analysis

This section presents the parametric modeling of the duration to social insurance coverage. It consists of estimating the discrete-time survival models, controlling for individual characteristics, job characteristics, and unobserved heterogeneity. These models aim at estimating the determinants of the "hazard rate" - $h_i(t)$ - which is the probability of obtaining social insurance coverage at time t, conditional on having no coverage up to time $t - 1$.

Although the time to obtain social insurance coverage is a continuous transition process, we opt to group the time into discrete intervals of years due to the presence of many tied observations or multiple observations whose transitions occur at specific points in time. These ties are observed in the data because individuals often tend to report time (such as employment, unemployment and inactivity durations or time to first social insurance coverage) in periods of 3 to 6 months or years. Since these ties are generally not genuine, it would be more appropriate to use a grouped-duration methodology (Sueyoshi 1995).

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[8] The censored average duration to SI coverage for the full sample is presented in the appendix.

Accordingly, we adopt a framework similar to Jenkins (2005) and Wahba (2009) as the duration data is a continuous variable grouped in intervals of years.

The duration to obtain social insurance is measured by years since first entry to the labor market (among those who started in the year 2000 or after) to the year 2012. This is called random sample with right censoring due the common censor date which is the survey time (2012). The data is organized in a person-period data structure, i.e. each individual has as many as observation rows as he/she was at risk of transitioning to coverage (Jenkins 2005). Through maximum likelihood, two proportional hazard models are estimated. The first model is the Prentice-Gloeckler (1978) grouped duration model which assumes that the continuous instantaneous hazard rate function can be written under this following proportional form:

$$h_{it} = h_0(t)\exp(X_{it}{}'\beta) \qquad (1)$$

Where $h_0(t)$ is the baseline hazard function and h_{it} is the instantaneous hazard rate function for individuals i at time t (t is greater than zero). The vector of covariates X_i consists of individual characteristics and his/her job characteristics[9], and β is the vector of coefficients. In a discrete time framework, the hazard rate in the jth interval is

$$h_j(X_{ij}) = 1 - \exp[-\exp(X'_{ij}\beta + \gamma_j)] \qquad (2)$$

$$\text{Where } \gamma_j = \log \int_{a_{j-1}}^{a_j} \lambda_0(\tau)d\tau$$

The term γ_j can be interpreted as the logarithm of the integral of the baseline hazard over the relevant interval. The specification of the baseline hazard can be fully non-parametric such as the piece-wise constant hazard rate, semi-parametric or parametric. We will consider the piece-wise constant hazard rate. According to Jenkins (2004), such specification, which allows some non-parametric flexibility in the duration dependence specification[10], may help estimation precision when there are few observations in spells.

The second model is the extension that Meyer (1990) developed on the Prentice-Gloeckler (1978) to allow for the unobserved heterogeneity ("Frailty") as in Jenkins (2004). This model uses a Gamma distributed random variable to describe unobserved (or omitted) heterogeneity between individuals. The instantaneous hazard rate is now specified as 5in equation (1):

$$h_{it} = h_0(t)\varepsilon_i \exp(X'_{it}\beta) = h_0(t)[\exp(X'_{it}\beta) + \log(\varepsilon_i)] \qquad (3)$$

Where ε_i is a Gamma distributed random variate with unit mean and variance $\sigma^2 \equiv$ v. As for the discrete-time hazard function, it is given by:

$$h_j(X_{ij}) = 1 - \exp\{-\exp[X'_{ij}\beta + \gamma_j + \log(\varepsilon_i)]\} \qquad (4)$$

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[9] Time variant covariates are also allowed in this model.
[10] Duration dependence is how the hazard rate changes over time.

5. Econometrics Results

This section explores the amount of time it takes for a new entrant into the job market to obtain a position that provides social insurance coverage for the first time. We will start by presenting the Kaplan Meier (KM) failure curves[11]– i.e. the non-parametric estimates of the survivor function, then move to the parametric analysis.

5.1 Non-parametric Investigation

In the first part of the empirical analysis, we estimate the non-parametric Kaplan-Meier (KM) failure curves by different background characteristics. Figure 1 shows the cumulative probability of obtaining social insurance coverage at various years spent on the labor market among those who started their first job in the private sector as compared to those who started their first job in the public sector during the 2000-2012 period.

The figure shows that only about 16% of workers who started their work career in the private non-agricultural wage sector got social insurance immediately upon their recruitment or within their first year of employment, relative to around 71% of workers who started in the public sector. Furthermore, it took almost 5 years for a quarter of this group of workers starting in the private sector and around 10 years for only a third of them to acquire social insurance coverage. Even after 12 years since first job, more than 65% of the workers sample remains with no social insurance coverage. As for those who started in the public sector, it took 5 years for 81% of them and around 10 years for 86% to get socially insured. As mentioned previously, this access to social insurance coverage might have happened by either changing jobs and/or sectors or by staying in the same first job.

The results of this figure go in line with the above mentioned feature of the Egyptian labor market. Acquiring social insurance coverage in the private sector does not often come at first entry, but getting enrolled in the insurance system takes time, if it ever happens (Wahba 2009; Roushdy and Selwaness 2012 and 2014). This limited access might be primarily due to the lengthy procedures of the social security system that make employers reluctant to ensure their workers, such as the time it takes to un-enroll a socially insured worker in case he/she quits. Sometimes, the employer keeps paying contributions even after the worker's separation from the firm until the social insurance administration takes action. Nevertheless, the limited access might also be a worker's choice. A worker might opt against being enrolled in the system due to either the high contribution rates relative to his/her current wage and expected

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[11] The Kaplan Meier failure curves show the cumulative probability of getting social insurance coverage for the first time by time elapsed since the first job start. It calculates the likelihood that an individual obtains his/her first covered job by a certain time.

future pension amount, or that he/she does not expect to contribute regularly and long enough to be eligible for any pension amount at time of retirement.[12]

On the gender front, Figure 2 shows that the failure risk (i.e. becoming a socially insured worker) is slightly higher among females compared to their males' counterpart. During the first year of employment, around 21% of female workers got SI coverage, compared to only 15% among males. However, males' and females' failure risks curves start to converge narrowing this gender gap through their years in the labor market. For instance, after 10 years, the same percent of males and females (32.6%) got enrolled in the pension system.

Figure 3 shows the KM failure curves by the four first job start cohorts. Workers who entered the labor market between 2004 and 2007 appear to have had slightly better chances of getting social insurance coverage before the end of their first year of work as compared to those who started their first job either during its preceding (2000-2003) or succeeding (2008-2010) periods. The figure also shows that, as expected, those who entered the labor market for the first time after the January 25th revolution were less likely to acquire social insurance upon job start, compared to their counterparts who entered the labor market just before the revolution.[13] Nevertheless, the log-rank test showed that these slight differences in the hazard rate by job cohort are not significant. [14]

It is also important to investigate the effect of the first job type of work place on worker's access to social insurance coverage in the private non-agricultural wage sector. Figure 4 compares those whose first job was inside an establishment to those who started in an out-of an establishment job. Those whose first job was inside an establishment were more likely to have access to social insurance coverage, as compared to their peers whose first job was outside an establishment.[15] Around 20% of those starting inside the establishment got social insurance coverage at start of their jobs compared to only 5.3% of those who started in a job that was outside an establishment.

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12 According to the social insurance law, a wage worker is eligible to claim full pension amount at age 60 after at least 10 years of contribution to the social insurance system. Early retirement, but with penalty, is also allowed after at least 20 years of contribution.

[13] Since only one full year data is available after the revolution, once again, one should take this result with caution.

[14] The log rank tests showed that the KM estimates by the job start cohort were insignificant whereas the differences by gender and the first job type of workplace (in/out establishment) were significant at the 5% and 1% significance level, respectively.

Figure 1: Kaplan Meier Failure Estimates by First Job Sector of Work, Ages 18-59, Waged Non Agricultural Start Job - ELMPS 2012
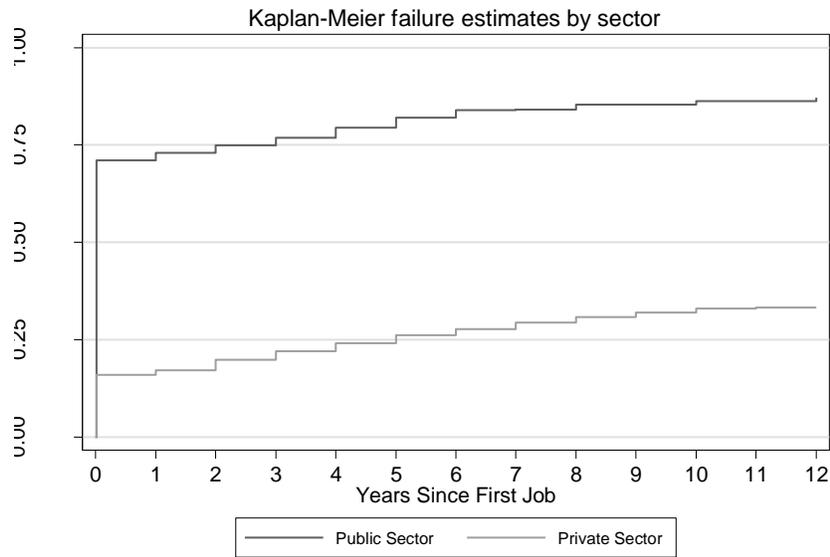
Source: Constructed by the authors using ELMPS 2012

Figure 2: Kaplan Meier Failure Estimates by Gender, Ages 18-59, Start job in the Private Sector (Waged Non-Agricultural) – ELMPS 2012

Source: Constructed by the authors using ELMPS 2012

Figure 3: Kaplan Meier Failure Estimates by Job Start Cohorts, Ages 18-59, Start job in the Private Sector (Waged Non-Agricultural) – ELMPS 2012
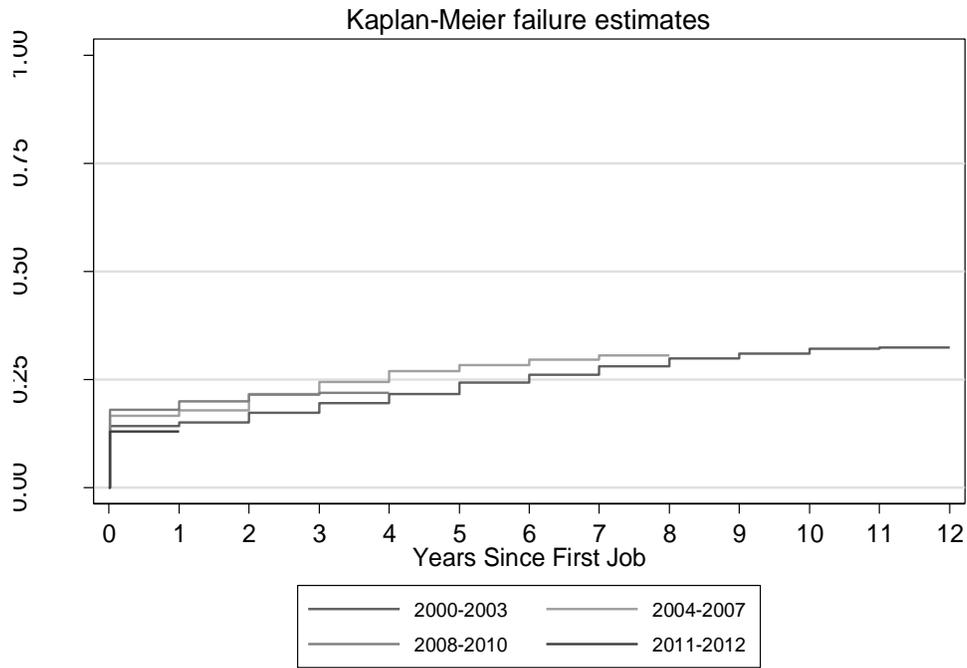
Source: Constructed by the authors using ELMPS 2012

Figure 4: Kaplan Meier Failure Estimates by In/Out of Establishment Ages 18-59, Start job in the Private Sector (Waged Non-Agricultural) – ELMPS 2012

Source: Constructed by the authors using ELMPS 2012

5.2 Parametric Results

In Table 3, the parametric analysis results are presented in the form of hazard ratio, i.e. $exp(B_j)$. Hence, coefficients lower than 1 means that the hazard rate associated with the corresponding covariate is lower than 1. This implies that the effect of the corresponding variable on the exit rate to coverage is negative, i.e. longer duration to coverage is associated. Inversely, when the hazard rate exceeds 1, the corresponding variable has a positive impact on the exit rate to coverage, i.e. implying shorter time to coverage.

In order to accommodate for the piece-wise constant baseline hazard specification, the duration variable measured in years ranging from 0 to 12 is categorized into four discrete dummies. The first is a dummy that takes 1 if the duration to obtain social insurance coverage is at the start of first job (0 time) or during the first year on the labor market, and 0 otherwise. The second dummy takes the value of 1 for times starting from the second to the fifth year and 0 otherwise. The third dummy takes the value of 1 for all spells starting from the sixth to the tenth year and 0 otherwise. The fourth dummy is for the eleventh and twelfth years (reference category).[16]

Additional explanatory variables are included in the model to control for individual and first job characteristics. Individual characteristics controlled for in the model are: gender, age at first entry to the labor market and education level. Gender takes the value 1 for females, and 0 for males. Education level is grouped into three categories: illiterate/read and write and less than secondary (reference), secondary and above, and university and above. In addition to the first job cohort, the model also controls for the three first job characteristics: (1) economic activity groups: manufacturing (reference category), Wholesale & retail trade, and other services and transportation; (2) work place: in (reference category) or out of establishment;[17] and (3) first job firm size in terms of number of workers: micro size, i.e. less than 10 workers (reference category), small size (10-49 workers), medium size (50-99 workers), large firms (more than 100 workers). The reference individual in Tables 3 is a man with below than secondary education[18] who started his first waged job during the period 2000 to 2003 in the manufacturing sector in an establishment of micro size.

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[16] This baseline hazard specification was chosen upon investigation of the non-parametric hazard function. It was observed that after the first year, the hazard drops down during the second year and keeps almost at same level until the fifth employment year, then between the sixth to the tenth year, the hazard level declines further and is almost constant during this period, etc.

[17] We would like to investigate the effect of the job regularity status, however, since this analysis is based on individuals retrospective data, we expect that one would find it hard to remember whether and when his/her status has changed from being regular to irregular. Accordingly, we opt to using the in or out of establishment status, which is likely to be recalled more accurately and is often associated with regularity of employment.

[18] The below secondary education attainment encompass those who can read and write and illiterate as well as those with primary and preparatory education.

Table 3 presents the estimation results while taking into account the individual heterogeneity "frailty" which revealed to be significant in a battery of specifications.[19] Accordingly, in the following we will focus on the model that accounts for individual heterogeneity. The model estimation without controlling for heterogeneity is presented in Table A2 in the appendix. Assuming that observations who acquire social insurance coverage rapidly have higher values of ε and are called "leavers" while those who tend to stay with no insurance have lower values of ε and are called "stayers". Therefore, "leavers" will exit faster than the "stayers" and the sample of survivors will become disproportionately composed of "stayers". Hence, a model that does not take into account such heterogeneity will over-estimate the degree of negative dependence of hazard with time or under-estimate the degree of positive dependence of hazard with time (Jenkins, 2004).

Table 3 shows that females often take longer than their males peers to acquire social insurance coverage in the private wage sector. Age at first entry showed positive and significance effect on the exit rate to coverage, i.e. workers who started working late are more likely to obtain social insurance coverage faster than the early career beginners. This is most probably due to the fact that the latter group constitutes those who cannot afford waiting for a good quality job, as compared to those who can afford waiting to self-select themselves into jobs with steep upward profile. The hazard rate of obtaining SI coverage among those who started their first jobs between 2004 to 2007 is not significantly different than that of those who started prior to the new labor law (from 2000-2003). This confirms the findings of Wahba (2009) that the new labor law of 2003 did not have a significant impact on the formality status of new entrants.[20] Those who started their first job during the three years before the revolution (from 2008 to 2010) or after the revolution (from 2011-2012) have hazard rates that are significantly lower than 1, implying longer time to coverage relative to those who entered the labor market in the early years of the last decade (from 2000-2003). Individuals whose first waged jobs started outside of establishments (i.e. more likely to be irregular) have lower exit rates to coverage than those starting in the private waged in-establishment sector. Firm size of the worker's first job significantly affects the duration to social insurance coverage. The smaller the firm's size, the higher is the likelihood of falling into a long spell with no social insurance coverage.

Table 3 Maximum Likelihood for Discrete Time Proportional Hazard Model with unobserved heterogeneity

Prentice-Gloeckler Meyer Model – Complementary with individual heterogeneity				
VARIABLES	(1)	(2)	(3)	(4)
Individual Characteristics				
Female	0.713**	0.704**	0.719**	0.710**

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[19]The presence of heterogeneity implies that the hazard differs between observations based on unobserved characteristics.

[20] Wahba (2009) found that the new law improved the situation of those who were already working before the law, rather than the new entrants.

	(0.114)	(0.118)	(0.115)	(0.118)
Age at first job	1.075***	1.079***	1.079***	1.083***
	(0.0174)	(0.0184)	(0.0176)	(0.0186)

Education Attainment Level (Reference: Illiterate/Read and write - Less than secondary)

Secondary and above	3.143***	3.258***	3.130***	3.239***
	(0.617)	(0.659)	(0.614)	(0.655)
University and above	7.333***	7.810***	7.307***	7.767***
	(1.713)	(1.907)	(1.709)	(1.896)

Job Start Cohort(Reference: 2000-2003)

2004-2010	0.738**	0.749**		
	(0.0911)	(0.0962)		
2011-2012	0.270***	0.265***		
	(0.0815)	(0.0826)		
2004-2007			0.805	0.816
			(0.107)	(0.112)
2008-2010			0.598***	0.607***
			(0.103)	(0.108)
2011-2012			0.264***	0.259***
			(0.0796)	(0.0806)

First Job Characetristics

First Job Economic Activity (Reference: Manufacturing)

Wholesale & retail trade	1.133	1.150	1.127	1.143
	(0.178)	(0.189)	(0.177)	(0.187)
Other Services & Transportation	2.502***	2.677***	2.487***	2.652***
	(0.474)	(0.542)	(0.469)	(0.534)

First Job in/out estbalishment Status (Reference: Private in establishment)

out of establishment	0.546***	0.538***	0.544***	0.537***
	(0.0888)	(0.0907)	(0.0884)	(0.0903)

First Job Firm Size(Reference:Large or DK size)

Start in micro-size firm	0.0824***	0.0721***	0.0833***	0.0734***
	(0.0226)	(0.0216)	(0.0227)	(0.0218)
Start in small firm	0.225***	0.205***	0.225***	0.206***
	(0.0539)	(0.0529)	(0.0535)	(0.0526)
Start in medium firm	0.475***	0.449***	0.483***	0.458***
	(0.128)	(0.129)	(0.129)	(0.130)

Duration Dependance

d1: Within the first year	7.847***		7.968***	
	(5.866)		(5.953)	
d2: Second to Five Year	2.671		2.675	
	(1.943)		(1.946)	
d3: Sixth to Tenth Year	3.604*		3.574*	
	(2.604)		(2.583)	
Within the first year		2.047***		2.104***

		(0.470)		(0.482)
Within the Second year		0.616**		0.630**
		(0.125)		(0.128)
Within the third to Fifth		0.818		0.823
		(0.130)		(0.131)
Constant	0.00867***	0.0323***	0.00804***	0.0296***
	(0.00705)	(0.0133)	(0.00654)	(0.0121)
Ln(var)	2.350***	2.638***	2.323***	2.598***
	(0.503)	(0.562)	(0.497)	(0.555)
Person-years	14,830	14,830	14,830	14,830
Log Likelihood	-2288	-2289	-2286	-2287

Notes: (i) Exponentiated coefficients are reported
(ii) t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001

6. Conclusion and Policy Implication

The coverage gap in terms of access to social security coverage in Egypt has been increasing over the last decades, particularly in the private wage sector, implying that more workers might not be financially secure in times of unforeseen events, sickness, disability and old-age. This coverage gap has often been attributed to several shortcomings in the rules regulating the social insurance system, such as the high cost of participation in the social insurance system compared to the low pension amounts received during retirement years.

The findings of the paper highlights that workers who started in the private wage sector rarely acquire social insurance coverage at start of their jobs, but may get such coverage after some time either by staying in the same job or through changing jobs. A quarter of workers starting in the private sector got social insurance after 5 years, and almost 10 years was required for an additional third of them to get access to social insurance. Furthermore, the results of this paper go in line with the international findings regarding the existence of a sort of an "informality trap" in the labor markets. Workers who start in out-of establishment jobs or in small firms (which are usually informal), are more likely to experience a long spell with no social insurance coverage.

This paper calls for a set of measures aiming at narrowing the increasing coverage gap in the Egyptian social insurance system. Procedures of entry to and exit from the social security system should be more simplified to encourage employers and employees to enroll in the system. Also, relaxing the rules governing when an employee can benefit from the system will certainly make it more attractive to irregular workers, who are often not sure that they would work long enough to get the reward of their discontinuous contributions. Studying other countries' experience in insuring irregular and casual workers can also be an option to policy makers. Tax-incentives tied to MSEs affiliating their workers to the social insurance system security can be introduced. Finally, the DB-schemes shortcomings such as high

contribution rates along with low pension values call for a holistic actuarial evaluation of the system.

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Appendix

Table A1: Average Duration to SI coverage, wage workers starting in non-agricultural private sector, aged 18-59[21]

	Mean (years)	S.d.	Total
First Job Cohort			
2000-2003	2.8	3.2	326
2004-2007	1.3	1.9	301
2008-2010	0.3	0.6	135
2011-2012	0.01	0	26
Total	2.3	2.7	788

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[21] On average, longer duration to social insurance coverage is observed among those who started their first job during the four years before the new law as compared to those who started their first job during the four years following the passage of the new labor law. However, this result is misleading since workers observed before the new law introduction started their employment before the workers who entered the labor market after 2004. Moreover, 1809 observations are censored, therefore still waiting for social insurance coverage, resulting in an upward bias in the average duration for coverage.

Table A2 Maximum Likelihood for Discrete Time Proportional Hazard Model without controlling for unobserved heterogeneity

Prentice-Gloeckler Meyer Model – Complementary log log without individual heterogeneity				
VARIABLES	No Frailty	No Frailty	No Frailty	No Frailty
Individual Characteristics				
Female	0.818**	0.820**	0.820**	0.821**
	(0.0800)	(0.0802)	(0.0802)	(0.0804)
Age at first job	1.041***	1.041***	1.043***	1.043***
	(0.00976)	(0.00976)	(0.00983)	(0.00983)
Education Attainment Level (Reference: Illiterate/Read and write - Less than secondary)				
Secondary and above	2.555***	2.559***	2.555***	2.558***
	(0.395)	(0.395)	(0.394)	(0.395)
University and above	4.437***	4.452***	4.429***	4.443***
	(0.725)	(0.727)	(0.723)	(0.725)
Job Start Cohort(Reference: 2000-2003)				
2004-2010	0.806***	0.813***		
	(0.0628)	(0.0636)		
2011-2012	0.408***	0.410***		
	(0.0860)	(0.0865)		
2004-2007			0.851*	0.859*
			(0.0707)	(0.0715)
2008-2010			0.706***	0.712***
			(0.0772)	(0.0781)
2011-2012			0.401***	0.403***
			(0.0847)	(0.0852)
First Job Characetristics				
First Job Economic Activity (Reference: Manufacturing)				
Wholesale & retail trade	0.953	0.952	0.950	0.949
	(0.0942)	(0.0941)	(0.0939)	(0.0938)
Other Services & Transportation	1.432***	1.433***	1.427***	1.428***
	(0.131)	(0.131)	(0.131)	(0.131)
First Job in/out estbalishment Status (Reference: Private in establishment)				
out of establishment	0.586***	0.586***	0.583***	0.583***
	(0.0694)	(0.0694)	(0.0691)	(0.0691)
First Job Firm Size(Reference:Large or DK size)				
Start in micro-size firm	0.254***	0.254***	0.255***	0.254***
	(0.0235)	(0.0235)	(0.0236)	(0.0235)
Start in small firm	0.499***	0.497***	0.495***	0.494***
	(0.0514)	(0.0513)	(0.0511)	(0.0510)
Start in medium firm	0.728**	0.728**	0.728**	0.727*

	(0.0949)	(0.0949)	(0.0948)	(0.0948)
Duration Dependance				
d1: Within the first year	24.81***		24.97***	
	(17.63)		(17.74)	
d2: Second to Five Year	4.609**		4.573**	
	(3.282)		(3.257)	
d3: Sixth to Tenth Year	4.251**		4.190**	
	(3.041)		(2.998)	
Within the first year		6.232***		6.358***
		(0.757)		(0.773)
Within the Second year		1.102		1.124
		(0.187)		(0.191)
Within the third to Fifth		1.187		1.186
		(0.165)		(0.165)
Constant	0.00306***	0.0121***	0.00296***	0.0115***
	(0.00228)	(0.00310)	(0.00221)	(0.00298)
Person-years	14,830	14,830	14,830	14,830
Log Likelihood	-2314	-2317	-2312	-2315

Notes: (i) Exponentiated coefficients are reported
(ii) t statistics in parentheses * $p<0.05$, ** $p<0.01$, *** $p<0.001$