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Wage and labor mobility between public, formal private and informal private sectors in Egypt

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Abstract

Wage and labor between public and private sectors are main factors in economies. In developing countries, the private sector is divided into formal and informal private sectors. Little research has addressed temporal changes in wage and labor among public, formal private and informal private sectors within a single framework. We study the temporal wage gap, labor mobility and the impact of changing employment sectors on wages by Oaxaca-Blinder decomposition and difference-in-difference (DID) methods with the Egyptian Labor Market Panel Survey data from 1998 to 2012. The decomposition shows that the wage gap between public and formal (informal) private sectors has remained strong where education, age and working experience are driving forces. The DID method shows that the percentages and wage losses of movers to the informal private sector from the formal private sector are much higher and more significant than that from the public sector. In summary, Egyptian private sector employees face a high risk to unwillingly fall into and stay in the informal private sector, while the highly educated ones are attracted only to and stay long in the public sector. These results can be considered the obstacles for further economic growth and stability of Egyptian economy, which shall be the case in other developing and Arab countries with a sizable public sector. In this case, the government may need to restructure wage systems, employment practices and cultures, considering a balance with private sectors as well as providing people with incentive schemes and education to nurture (formalize) the formal (informal) private sectors.

JEL Classification: J21, J23, J24, J31, O17

Key Words: Wage gap; public sector; formal private sector; informal private sector; Oaxaca-Blinder method; difference-in-difference

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Contents

1 Introduction

Governments in developing countries with an authoritarian regime, especially in Arab countries, use the public sector employment as a bargaining power to ensure support and loyalty of people for decades (Assaad, 2014). Therefore, the public sector becomes a main employer in these countries (Lindauer and Nunberg, 1996, Rama, 1997, Rodrik, 2000). However, governments can not always sustain that level of public sector employment with excess supply of labor within their countries. At the same time, a formal private sector, which is small and not well developed in developing countries, can not absorb that excess supply in labor market. This leads to the thrive of informal private sectors in these economies, which has negative consequences on economic and political stability, such as high tax evasion, low wages and insecure jobs (Meghir et al., 2015). Given this state of affairs, this study addresses the temporal changes in wage gap and labor mobility among public, formal and informal private sectors by taking a case of the Egyptian labor market.

Economic literature studies the wage gap between public and private sectors in national and cross-national levels for developed countries. Papapetrou (2006) and San and Polat (2012) inves-

tigate the wage gap between public and private sectors, demonstrating that average wages in the private sector are lower than those in the public sector and the reasons why the public sector attracts employees in Greece and Turkey, respectively. Lucifora and Meurs (2006) analyze the pay gap between the private and public sectors in Italy, France and Great Britain. They find that the private sectors pay less to low skilled workers as compared to the public sectors, while the opposite is true for high skilled workers. In France and Italy, the wage between the private and the public sectors is not significantly different. These studies show that the wage gap varies across countries and the gap is one of the factors that attract individuals to one employment sector.

It is reported that informal private sector thrives in most of the developing countries because of an inability of the public and formal private sectors to absorb the new entries of labor supply. Although informal employment is considered a resort against unemployment in developing countries, it is associated with a pay penalty (Fields, 1975). Bargain and Kwenda (2014) investigate the wage gap between formal and informal sectors across Brazil, Mexico and South Africa, finding that the wages in informal sectors are significantly lower than those in the formal sectors in the countries. Glinskaya and Lokshin (2007) examine the wage gap among public, formal private and informal private sectors in India using cross-sectional data, pointing out that the public sector wage is the highest among the three sectors. These studies show that informal sector is accompanied by poor work conditions.

Some researchers study labor market and employment in Egypt. Assaad (2014) examines the structure of the labor market and find that informal employment had increased over the period 2006-2012, while the rate of employment in the formal private sector had not changed. Wahba (2009) studies the labor mobility between formal and informal sectors, finding that the highly educated individuals are likely to move from the informal to the formal sector, while the less educated ones are stagnated in the informal sector. Elsayed and Wahba (2018) investigate the informal sector and labor mobility after the Arab Spring revolution in Egypt. They demonstrate that informal employment increases significantly after the revolution due to the stagnation of the highly educated individuals in the informal sector, and less educated individuals are likely to lose

their formal status and become informally employed. These studies reveal that the informal sector in Egypt represents a major part of the labor market, while the formal private sector stops growing.

Previous literature has mainly studied the wage gap between two sectors (e.g., public-private or formal-informal), whereas the labor market in developing countries consists of three sectors (e.g., public, formal private and informal private sectors). Also, the previous studies do not focus on addressing the temporal relationship among the three sectors in developing countries that have the public sector as a main source of employment, huge informal private and small formal private sectors. Thus, this paper studies the temporal wage gap, labor mobility and the impact of changing jobs across public, formal private and informal private sectors within a single framework. A novelty in this research lies in including the three sectors in an analytic framework with panel data at individual and household levels and focusing on examining temporal changes in wages and labor. This approach enables us to identify sources of the temporal wage gap and labor mobility among the three sectors as well as individuals who stay in one sector or move to another sector over time with an associated wage impact. To this end, we use Oaxaca-Blinder decomposition and difference-in-difference (DID) methods with the Egyptian Labor Market Panel Survey (ELMPS).

2 Methods and materials

2.1 Summary of data

This paper uses data from the Egyptian Labor Market Panel Survey (ELMPS) (Assaad and Krafft, 2013, ELMPS, 1998, 2006, 2012). ELMPS is a panel data that consists of three waves: 1998, 2006 and 2012, enabling to investigate (i) the factors that explain the wage gap between public and private sectors over time, (ii) labor mobility and (iii) the impact of changing employment sectors on wages. The definition of the labor force used in this paper is "all the individuals between the age 15 and 65 including students because some of them work after school." However, those unemployed or self-employed (including agriculture workers) in the three waves are excluded because the unemployed individuals will not affect the wage gap between the two sectors, while

most of the self-employed workers do not report their hourly wage in ELMPS.

We distinguish between the formal private sector and the informal private sector. Using the definition of the formal employment by Assaad and Krafft (2015), "formal jobs are the jobs that have a contract and/or social insurance coverage, while the informal jobs are those with neither a contract nor social insurance." The difference in hourly wage for the public sector, formal private sector and informal private sector is shown in figure 1. In 1998, the wage gap between the three sectors is very narrow; however, this gap expands in 2006. The wage gap between public and formal private sectors becomes almost 0.5 LE or Egyptian pound,[1] while this gap is nullified in 2012. The informal sector workers have a wage penalty during the three waves and this penalty increases over time.

[Figure 1 about here.]

Figure 2 shows that more than half (54 %) of the observations were working in the public sector in 1998, while this decreased to 44 % in 2006 and 41 % in 2012. On the other hand, the percentage of workers in the formal private sector increased from 16 % in 1998 to 19 % in 2006, then it decreased to 16 % in 2012 due to the instability accompanied by the Arab Spring revolution in 2011. The informal-private sector was the only sector expanding in employment over time by increasing from 30 % in 1998 to almost 43 % in 2012. Figures 1 and 2 show that even though the informal sector average wage is lower than the average wage in the other two sectors, the percentage of employed individuals in that sector increases overtime. This indicates that there is a high proportion of labor in Egypt suffering from poor work conditions (e.g., lower wages, low insurance coverage, instability).

[Figure 2 about here.]

[1] The LE represents the national currency of Egyptian pound.

2.2 Analytical framework

Our analysis to determine the wage gap among public (PUB), formal private (FP) and informal private (IP) sectors is based on three different earning equations. We consider the following three wage equations:

$$ln(W_i^{PUB}) = \beta^{PUB} X_i + \epsilon_i^{PUB} \tag{1}$$

$$ln(W_i^{FP}) = \beta^{FP} X_i + \epsilon_i^{FP} \tag{2}$$

$$ln(W_i^{IP}) = \beta^{IP} X_i + \epsilon_i^{IP} \tag{3}$$

where W_i^{PUB}, W_i^{FP} and W_i^{IP} are respectively the hourly wage for public, formal private, and informal private sectors for indivdiual i; X is a vector of the independent variables; β^{PUB}, β^{FP} and β^{IP} are respectively the coefficients or the returns of variables; and ϵ_i^{PUB}, ϵ_i^{FP} and ϵ_i^{IP} are the error terms of each equation.

There are three sectors in our sample (public, formal private, and informal private sectors). To identify wage differentials among the three sectors, we consider two subsample analysis and apply the decomposition method, initiated by Oaxaca (1973), Blinder (1973), Reimers (1983), Neumark (1988), Oaxaca and Ransom (1994), for each subsample. The first subsample consists of workers in public and formal private sectors, dropping workers in informal private sector. The second subsample consists of workers in public and informal private sectors, dropping workers in formal private sector. For each subsample, the decomposition is obtained by estimating the following equation ($K \in \{FP, IP\}$):

$$\overline{ln(W^K)} - \overline{ln(W^{PUB})} = \underbrace{(\bar{X}^K - \bar{X}^{PUB})\hat{\beta}^\star}_{\text{Explained Effect}} + \underbrace{\bar{X}^K(\hat{\beta}^K - \hat{\beta}^\star) + (\hat{\beta}^\star - \hat{\beta}^{PUB})\bar{X}^{PUB}}_{\text{Unexplained Effect}} \tag{4}$$

where $\bar{X}^K$ and $\bar{X}^{PUB}$ are respectively the mean of the independent variables for formal (informal) private and public sectors; $\hat{\beta}^K$ and $\hat{\beta}^{PUB}$ are respectively the Ordinary Least Squares (OLS) estimates of coefficients of $\hat{\beta}^K$ and $\hat{\beta}^{PUB}$ in the wage equations in the formal (informal) private and

public sectors. $\hat{\beta}^{\star}$ is an estimate for a non-discriminatory parameter, obtained from pooled regression of two sectors (i.e. public-formal private sectors in the first sub-sample and public-informal private sectors in the second sub-sample). The first part of equation (4) is the difference in the log average wage between two sectors. In the right hand side of equation (4), the first part represents the component of the wage differentials which is caused by the differences in the endowment between two sectors (explained effect), whereas second (third) part represents the component due to the disadvantage (advantage) of formal/informal private (public) sector. The last two components represent the unexplained effect. We estimate equation (4) for each of the three periods (1998, 2006 and 2012).

This study next evaluates the wage differentials among the three sectors by applying the difference-in-difference method over each of six subsamples consisting of the workers who stayed in the same sector for two waves and those who changed the sector that they work in between two waves, which correspond to the control and treatment groups, respectively (Pages and Stampini, 2009, Elsayed and Wahba, 2018). Specifically, we consider six subsample analyses: (i) subsample 1 consisting of the workers who stayed in the public sector and those who moved from that sector to the formal private sector; (ii) subsample 2 consisting of the workers who stayed in the public sector and those who moved from that sector to the informal private sector; (iii) subsample 3 consisting of the workers who stayed in the formal private sector and those who moved from that sector to the public sector; (iv) subsample 4 consisting of the workers who stayed in the formal private sector and those who moved from that sector to the informal private sector; (v) subsample 5 consisting of the workers who stayed in the informal private sector and those who moved from that sector to the public sector; and (vi) subsample 6 consisting of the workers who stayed in the informal private sector and those who moved from that sector to the formal private sector.

Our panel data consists of three waves (e.g., 1998, 2006, and 2012). We conduct the empirical analysis over the first two waves between 1998 and 2006 and the last two waves between 2006 and

2012. The estimated models are described by

$$ln(W_{it}) = \alpha + \tau T_{it} + \gamma R_{it} + \delta T_{it} R_{it} + \epsilon_{it}, \tag{5}$$

where W_{it} is the hourly wage for individual i at time t, T_{it} is a dummy variable for the treatment which take a value of one when a worker changes her sector from (i) public sector to formal private sector; (ii) public sector to informal private sector; (iii) formal private sector to public sector; (iv) formal private sector to informal private sector; (v) informal private sector to public sector; and (vi) informal private sector to formal private sector. R_{it} is a dummy variable for time period, which equals zero for the base period and one for the second period. The base year is 1998 for the analysis over the first two waves, and it is 2006 for the analysis over the last two waves.

3 Results

Tables 1 to 3 present the summary statistics for all the variables in the three years of 1998, 2006 and 2012, respectively. In 1998, the average wage in the formal private sector is higher than those in the public and informal private sectors, while the public sector pays higher wages than the informal private sector. Tables 2 and 3 show that the wage in public sector is the highest among the three sectors and there is a wage penalty for working in the informal private sector, as compared to the formal private sector in 2006 and 2012. In summary, tables 1 to 3 show an overall temporal trend of the wage gap among the three sectors. The wage gap between public and formal private sectors is in favor of the private sector in 1998, while this gap turn over to become in favor of the public sector in 2006 and 2012. The informal private sector has consistently had a wage penalty, compared to the other two sectors, and this penalty has increased over the years.

The average age in the overall sample for each year of 1998, 2006 and 2012 is around 35 years old. Employees in the public sector are, on an average, 5 years older than their counterparts in the formal private sector and their working experience is around three years longer than their counterpart in the formal private sector. The informal private sector has the youngest employees

with an average age of 30 years old, being consistent with the fact that it has the least experienced individuals with the average of 13 working years. The occupation variables are defined by management, profession, technician, clerk, worker, craftsman, operator, elementary categories and so on, following Central agency for public mobilization and statistics (1985). Around 50 % of employees in the public sector work as technicians and professions in the three waves, while 30 % of workers in the formal private sector serve as managers or professions. On an average, 46 % of the informal private sector employees are craftsmen. Employees in different sectors are concentrated on specific areas of Egypt. More than 50 % of employees in the formal and informal private sector employees are concentrated in urban and big cities (e.g., Greater Cairo and Alexandria), while the public sector employees are equally distributed across the areas of residence.

Table 1 shows that 77 % of employees in the public sector have high level of education (e.g., preparatory or higher) in year 1998, while the percentages in the formal and informal private sectors are 56 % and 32 %, respectively. Table 2 presents the percentage of employment with high education in 2006 and find that the education level in public, formal and informal sectors increases to become 82 %, 68 % and 46 %, respectively. It confirms that highly educated employees in the public sector are representing 86 % of public overall employment in 2012 and the percentage of highly educated employees in the formal and informal private sectors are 76 % and 52 %, respectively. These results show that the public sector always had a higher percentage of the highly educated employees than the other two sectors, while some considerable portion of highly educated people end up working in the informal sector.

[Table 1 about here.]

[Table 2 about here.]

[Table 3 about here.]

The Oaxaca-Blinder decomposition results of wage gaps over time for formal private-public and informal private-public sectors are presented in tables 4 and 5, respectively. Tables 4 and 5

show total log wage difference and the decompositions into two parts: explained and unexplained ones. As of table 4, the sign of the "total explained" part in 1998 is negative, which is different from the sign of the total log wage gap (e.g., positive). This means that the sum of the differences in observable characteristics (total explained) do not contribute to the total log wage gap. Therefore, an explained variable with a negative (positive) sign is interpreted to decrease (increase) the private formal-public wage gap because the total log wage difference in 1998 is positive. In 2006 and 2012, the sign of the "total explained" part is the same as the sign of the total log wage gap (e.g., negative), implying that the differences in observable characteristics contribute to the total wage gap. The explained variable with a negative (positive) sign is interpreted to increase (decrease) the wage gap because the total log wage gap in 2006 and 2012 are negative. These interpretations mean that the observable variables with negative signs in explained parts do not contribute to the total raw wage gap in 1998, while those contribute to the wage gap in 2006 and 2012.

Table 4 demonstrates the decomposition results between formal private-public sectors. "Total explained" part contributes to the "total log wage gap" in 2006 and 2012, while it does not contribute in 1998. Age, work experience and education variables are statistically significant at 1 % and married variable at 10 % and they contribute to the "total explained" part of wage gap in 1998 by 45 % ($= \frac{-0.049}{-0.108} \times 100$), 26 %, 48 % and 4.6 %, respectively. In 2006 (2012), married, age, work experience, education and occupation variables also contributes to the "total explained" part by 5.6 %, 64 %, 17 %, 22 % and 22 % (7 %, 67 %, 20 %, 28 % and 28 %), respectively. On the other hand, male (residence area) variable reduces the "total explained" part by 5.5 %, 17 % and 25 % (18 %, 17 % and 27 %) at 1 % statistical significance in 1998, 2006 and 2012, respectively. These results show that the total log wage gap between formal private and public sector originates from the differences in employees' age, education and work experience in 2006 and 2012. It also shows the fact that employees in the public sector have higher age, education level on average than those in the formal private sector and remain long in the same sector once they get a position there.

[Table 4 about here.]

The decomposition results for the informal private-public wage gaps over years are presented in table 5. "Total explained" part contributes to the "total log wage gap" for all the three years. Married, age, work experience and education variables are statistically significant and contribute to the "total explained" part by 4.6 %, 36 %, 17 % and 47 % in 1998 and 7.5 %, 41 %, 16 % and 34 % in 2006 and 9.3 %, 49 %, 8 % and 53 % in 2012, respectively.[2] Male and part time job variables reduce the "total explained" part of the wage gap and their magnitudes are considered small over the period from 1998 to 2012. The results indicate that total log wage gap between the two sectors is mainly explained by differences in employees' average age, work experience and educational level between informal private sector and public sector.

Tables 4 and 5 reveals that age, work experience and education variables contribute to the explained part of the total log wage gap between formal (informal) private and public sectors on an average over the three waves by 57 %, 21 % and 33 % (42 %, 14 % and 39 %), respectively.[3] In summary, These three variables are the main contributor to the total log wage gap over the period from 1998 to 2012 between formal (informal) private and public sectors. Results in tables 4 and 5 imply that the wage gap remains strong between the public and the formal (informal) private sectors; therefore, the public sector attracts and retains the highly educated and experienced employees. On the other hand, the informal private sector employment witnessed a rapid growth in employment share of labor market from 1998 to 2012 (see figure 2), which may have hindered the development of the formal private sector. These results are aligned with Assaad (1997) in that the employees with higher education in Egypt are usually attracted to the public sector and the return to education is higher in public sector than that in the formal private sector in 1988.

[Table 5 about here.]

[2]Occupation variable contributes only in 2006 by 16 % of the "total explained" part at 5 % statistical significance

[3]Three percentages associated with age, work experience and education in tables 4 and 5 are calculated, respectively, as follows:

$$= \left[\left(\frac{\text{Variable coefficient 1998}}{\text{Total explained 1998}} + \frac{\text{Variable coefficient 2006}}{\text{Total explained 2006}} + \frac{\text{Variable coefficient 2012}}{\text{Total explained 2012}} \right) \div 3 \right] \times 100.$$

We apply difference-in-difference (DID) methods to clarify temporal labor mobility among the different sectors as well as the impacts of changing employment sectors on wages, and tables 6 and 7 show the results of DID estimations over periods of 1998-2006 and 2006-2012, respectively. First, we report labor mobility among the three sectors and next discuss the impacts of changing employment sectors on wages. Tables 6 and 7 show that, from 1998 to 2006 (from 2006 to 2012), 24 % (18 %) of workers are identified to be movers from the informal private sector to the formal private sector, while 20 % (35 %) of workers are movers from the formal private sector to the informal private sector, implying that the net labor mobility to the formal private sector from the informal private one has been negligible or even negative. Regarding the labor mobility to the public sector from the formal (informal) private sector, we can see that the percentage of movers from the formal (informal) private sector to the public sector, e.g., 27 % (14 %) in 2006-2012, is more dominant than the counterpart from the public sector to the formal (informal) private sector, e.g., 3 % (2 %) in 2006-2012. This implies that the public sector has been attracting labor forces from both formal and informal private sectors.

Tables 6 and 7 also show the impact of changing employment sectors on wages by comparing movers from one sector to another one with stayers between two periods from 1998 to 2006 and from 2006 to 2012. Movers from the formal private sector to the informal private one are demonstrated to incur the wage losses by 19.2 (20.8) log points between 1998 and 2006 (2006 and 2012) at 5 % (1 %) significance level. Movers from the public sector to the informal private one are identified to have wage losses by 21.2 (2.6) log points at 10 % significance level (insignificant level) between 1998 and 2006 (2006 and 2012). Overall, it can be concluded that movers from the formal private (or public) sector to the informal private one tend to accompany significant (less significant) wage losses. On the other hand, movers from the informal private to the formal private sectors between 1998 and 2006 (2006 and 2012) are identified to have a wage gain by 12.4 (19.6) log points at 10 % (1 %) statistical significance. These results indicate that changing the employment sectors do not necessarily affect the wages except for the cases in which people move to the informal private sector or move from the informal private sector to the formal private one. The

wage loss (gain) is expected for movers from the formal (informal) private sectors to the informal (formal) private sectors, while movers to and/or from the public sectors do not accompany any wage change.

The DID results imply that workers in the formal private sector are more unstable and are likely to face a high risk to fall into the informal private sector. The percentages and wage losses of movers to the informal private sector from the public sector are consistently much smaller than that from the formal private sector over the periods of 1998-2006 and 2006-2012. It implies that a majority of movers to the informal private sector come from the formal private sector in Egypt and suffer from wage losses. These can be considered important empirical evidences of how the public sector has been more attractive than any other sector in Egypt and how employment in the informal (formal) private sector has expanded (shrunk).

[Table 6 about here.]

[Table 7 about here.]

Overall, the Oaxaca-Blinder decomposition and DID methods demonstrate that the highly educated ones are attracted only to and stay long in the public sector, and Egyptian employees in private sector face a high risk to unwillingly fall into and stay in the informal private sector. The results can be considered the obstacles for further economic growth and stability of Egyptian economy. The Egyptian government should restructure the wage system and other benefits associated with employment, considering a balance with private sectors and providing people with incentive schemes to nurture (formalize) the formal (informal) private sector. However, it is reported that Egyptians are more risk averse, preferring to work in the public sector, than people in other countries (Barsoum, 2015, Farid, 2007).[4] Given this state of affairs, we conjecture that the growth of

[4]In particular, Barsoum (2015) notes that people in Egypt prefer the public sector jobs to the private sector jobs even if the first one provides lower wages than the latter one due to their culture, claiming that working in the public sector has remained and/or will remain the best choice among the available employment sectors in Egypt. During 1960s, the government had applied a policy to guarantee public sector jobs for highly educated individuals. However, this policy got suspended under Egypt's Structural Adjustment Program in 1991 (Elhaddad and Gadallah, 2018, Assaad, 1997). Barsoum (2015) claims that this policy still has an enormous effect on economy and culture as the public sector is believed by a majority of Egyptian people to be the best employer where highly educated individuals are employed with insurance, social status, paid leaves, pension plans and job security.

the formal private sector cannot be well expected without changing not only the wage and employment systems but also Egyptians' culture and ways of thinking. Along with restructuring the wage system and employment, fostering entrepreneurship and changing individual cultures might be necessary steps to grow (shrink) formal (informal) private sector. To this end, some education programs and government policies for restructuring of labor market or facilitating entrepreneurship in Egypt shall be necessary to take a balance among public, informal and formal private sectors.

4 Conclusion

We have investigated the wage gap and labor mobility among the public, formal private and informal private sectors with Oaxaca-Blinder decomposition and difference-in-difference (DID) methods, using panel ELMPS data that provides information in the Egyptian labor market for three waves, 1998, 2006 and 2012. The results show that the wage gap between public and formal private (informal private) sectors has consistently remained strong where education, age and working experience are important driving forces, and the percentages and wage losses of movers to the informal private sector from the public sector are consistently much smaller than that from the formal private sector. Egyptian private sector employees have a higher risk to unwillingly fall into the informal private sector than public sector employees, while the highly educated ones are attracted to and stay long only in the public sector. Overall, these results suggest some implications for further economic growth and stability in the Egyptian economy, which might be the case in other developing countries.

Changes in Egyptian labor market and employment policies appear to be needed. The Egyptian government should restructure the wage system and other benefits associated with employment, considering a balance with private sectors and providing people with incentive schemes to nurture (formalize) the formal (informal) private sector. Along with such restructuring, we suggest that fostering entrepreneurship as well as changing individual cultures might be necessary steps to grow (shrink) formal (informal) private sector, because a majority of Egyptian people do not pay

attention to entrepreneurship, believing that the public sector is the best employer in economies (Barsoum, 2015). Therefore, it shall be recommended to implement educational programs and/or government policies for not only restructuring wage and employment systems but also facilitating entrepreneurship among people. Of course, altering individual culture and attitude for employment is a big challenge. However, it is our belief that such changes shall be inevitable for sound growth of the country.

We finally note some limitations and future avenues of research. This research does not fully address culture and motivational aspects of individual preferences over sectors of employment in Egyptian labor market. In Egypt or other African countries, social status or acceptance from family, neighbors and friends regarding whether you work in public or private sector really matters, influencing many events in the future such as marriage and others. Further data collection and future research should focus on not only economic factors but also motivational and cultural factors of how people choose the sectors of employment, revealing necessary policies from cognitive and cultural aspects in labor markets. These caveats notwithstanding, we hope that this research is considered the important first step to understand the problems of the wage gap and labor mobility among sectors in not only Egypt but also other developing countries.

5 Bibliography

Assaad, R. (1997). The effects of public sector hiring and compensation policies on the Egyptian labor market. *World bank economic review*, 11:85–118.

Assaad, R. (2014). Making sense of Arab labor markets: The enduring legacy of dualism. *IZA journal of labor and development*, 3:1–25.

Assaad, R. and Krafft, C. (2013). The Egypt labor market panel survey: Introducing the 2012 round. *IZA journal of labor and development*, 2:1–30.

Assaad, R. and Krafft, C. (2015). *The structure and evolution of employment in Egypt*. Oxford university press.

Bargain, O. and Kwenda, P. (2014). The informal sector wage gap: New evidence using quantile estimations on panel data. *Economic development and cultural change*, 63:117–153.

Barsoum, G. (2015). The public sector as the employer choice among youth in Egypt: The relevance of public service motivation theory. *International journal of public administration*, 39:205–215.

Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *Journal of human resources*, 8:436–455.

Central agency for public mobilization and statistics (1985). *Occupation Codebook*. Central agency for public mobilization and statistics.

Elhaddad, A. and Gadallah, M. (2018). The informalization of the Egyptian economy (1998-2012): A factor in growing wage inequality? Economic Research Forum, Cairo, Egypt, Working paper 1210.

ELMPS (1998). Egyptian labor market panel survey 1998. Economic Research Forum, Cairo, Egypt, (www.erfdataportal.com).

ELMPS (2006). Egypt labor market panel survey 2006. Economic Research Forum, Cairo, Egypt, (www.erfdataportal.com).

ELMPS (2012). Egypt labor market panel survey 2012. Economic Research Forum, Cairo, Egypt, (www.erfdataportal.com).

Elsayed, A. and Wahba, J. (2018). Political change and informality: Evidence from the Arab spring. *Economics of transition and institutional change*, 27:31–66.

Farid, M. (2007). Entrepreneurship in Egypt and the US compared: Directions for further research suggested. *Journal of management development*, 26:428–440.

Fields, G. S. (1975). Rural-urban migration, urban employment and underemployment, and job search activity in LDCs. *Journal of development economics*, 2:165–187.

Glinskaya, E. and Lokshin, M. (2007). Wage differentials between the public and private sectors in India. *Journal of international development*, 19:333–355.

Lindauer, D. and Nunberg, B. (1996). Rehabilitating government: Pay and employment reform in Africa. Technical report, World Bank 13711.

Lucifora, C. and Meurs, D. (2006). The public sector pay gap in France, Great Britain and Italy. *Review of income and wealth*, 52:43–59.

Meghir, C., Narita, R., and Robin, J.-M. (2015). Wages and informality in developing countries. *American economic review*, 105:1509–46.

Neumark, D. (1988). Employers' discriminatory behavior and the estimation of wage discrimination. *Journal of human resources*, 23:279–295.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International economic review*, 14:693–709.

Oaxaca, R. L. and Ransom, M. R. (1994). On discrimination and the decomposition of wage differentials. *Journal of econometrics*, 61:5–21.

Pages, C. and Stampini, M. (2009). No education, no good jobs? Evidence on the relationship between education and labor market segmentation. *Journal of comparative economics*, 37:387–401.

Papapetrou, E. (2006). The public-private sector pay differential in greece. *Public finance review*, 34:450–473.

Rama, M. (1997). Efficient public sector downsizing. Technical report, World Bank RPO 679-51.

Reimers, C. W. (1983). Labor market discrimination against hispanic and black men. *Review of economics and statistics*, 65:570–579.

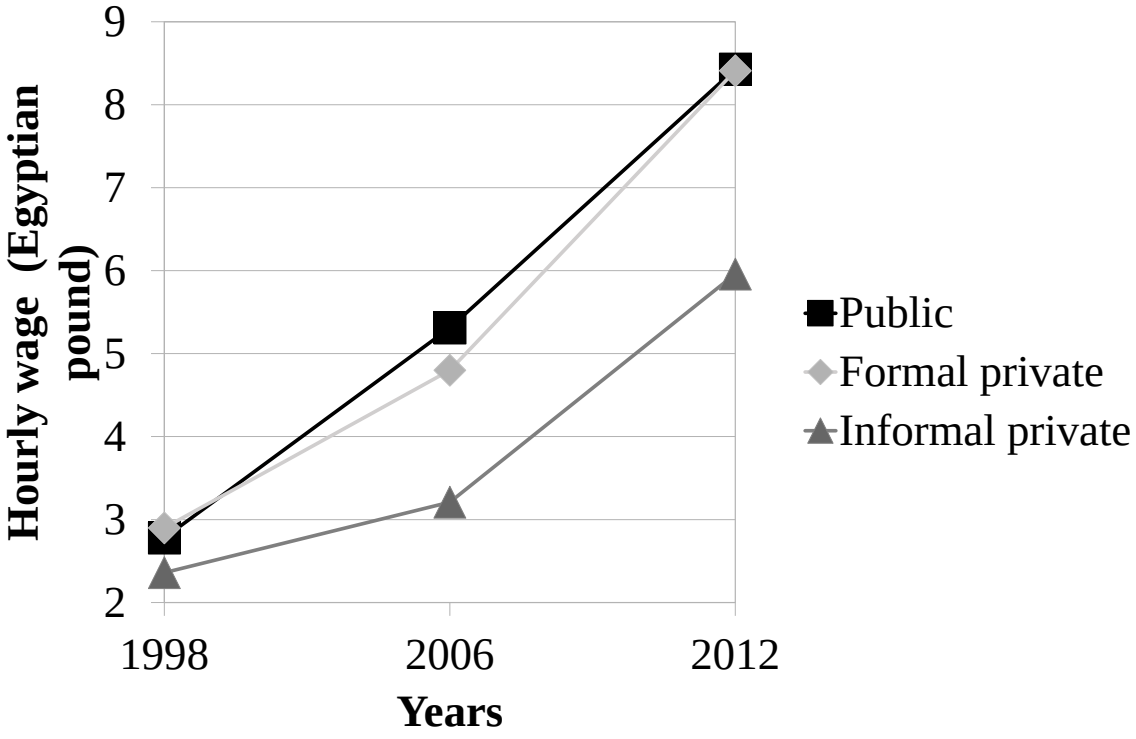
Rodrik, D. (2000). What drives public employment in developing countries? *Review of development economics*, 4:229–243.

San, S. and Polat, Ö. (2012). Estimation of public-private wage differentials in Turkey with sample correction. *Developing economies*, 50:285–298.

Wahba, J. (2009). Informality in Egypt: A stepping stone or a dead end. Economic Research Forum, Cairo, Egypt, Working paper 456.

List of Figures

Figure 1: Hourly wage per sector



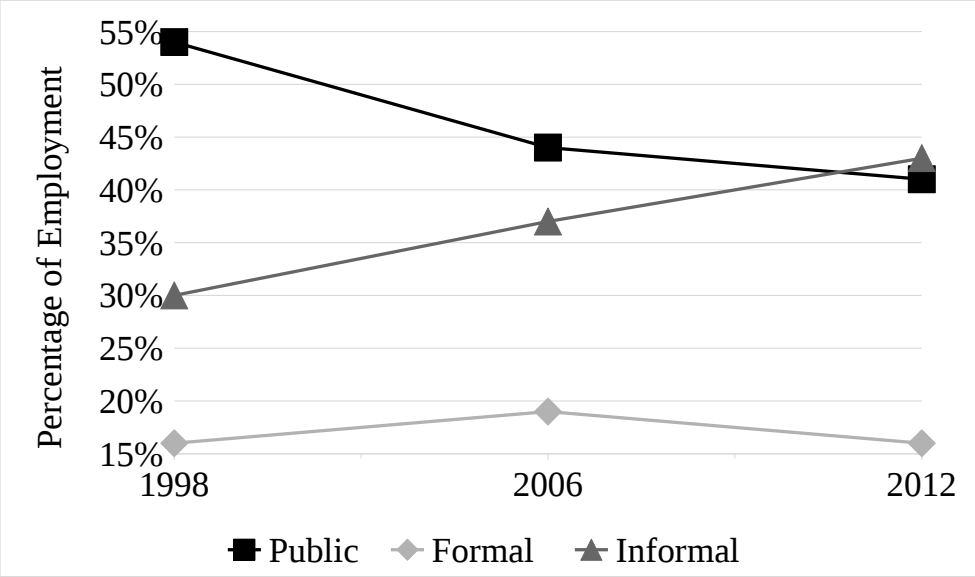


Figure 2: Percentage of employment per sector

List of Tables

Table 1: Summary statistics for year 1998

	Public Sector			Formal Private Sector			Informal Private Sector			Total		
	Mean	p(50)	SD	Mean	p(50)	SD	Mean	p(50)	SD	Mean	p(50)	SD
Hourly Wage	2.78	2.38	1.44	2.9	2.5	1.66	2.36	2.11	1.54	2.68	2.31	1.51
Male	0.69	–	–	0.91	–	–	0.87	–	–	0.78	–	–
Married	0.8	–	–	0.7	–	–	0.42	–	–	0.67	–	–
Age	40.24	40	9.99	37.41	36	11.27	29.27	26	11.57	36.49	36	11.74
Work Experience	19.49	19	11.7	19.04	18	13.36	13.36	9	12.53	17.58	16	12.54
Part Time Job	0	–	–	0.01	–	–	0.08	–	–	0.03	–	–
Education												
Illiterate	0.05	–	–	0.1	–	–	0.28	–	–	0.13	–	–
Read and Write	0.06	–	–	0.14	–	–	0.12	–	–	0.09	–	–
Primary school	0.11	–	–	0.21	–	–	0.27	–	–	0.18	–	–
Preparatory school	0.32	–	–	0.24	–	–	0.24	–	–	0.28	–	–
Secondary school	0.13	–	–	0.07	–	–	0.03	–	–	0.09	–	–
University	0.3	–	–	0.24	–	–	0.05	–	–	0.21	–	–
Postgraduate	0.02	–	–	0.01	–	–	0	–	–	0.01	–	–
Occupation												
Management	0.09	–	–	0.27	–	–	0.08	–	–	0.12	–	–
Profession	0.37	–	–	0.14	–	–	0.03	–	–	0.23	–	–
Technician	0.12	–	–	0.04	–	–	0.01	–	–	0.07	–	–
Clerk	0.17	–	–	0.06	–	–	0.01	–	–	0.11	–	–
Worker	0.12	–	–	0.13	–	–	0.24	–	–	0.16	–	–
Craftsman	0.08	–	–	0.17	–	–	0.49	–	–	0.22	–	–
Operator	0.04	–	–	0.17	–	–	0.05	–	–	0.07	–	–
Elementary	0.01	–	–	0.01	–	–	0.08	–	–	0.03	–	–
Residence Area												
Greater Cairo Area	0.28	–	–	0.44	–	–	0.32	–	–	0.32	–	–
Alexandria and Canal Area	0.17	–	–	0.19	–	–	0.14	–	–	0.17	–	–
Urban Upper Egypt Area	0.22	–	–	0.13	–	–	0.15	–	–	0.18	–	–
Rural Upper Egypt Area	0.06	–	–	0.02	–	–	0.1	–	–	0.07	–	–
Urban Lower Egypt Area	0.15	–	–	0.14	–	–	0.16	–	–	0.15	–	–
Rural Lower Egypt Area	0.09	–	–	0.06	–	–	0.09	–	–	0.09	–	–
% of Employment	54%			16%			30%			100%		

Table 2: Summary statistics for year 2006

	Public Sector			Formal Private Sector			Informal Private Sector			Total		
	Mean	p(50)	SD	Mean	p(50)	SD	Mean	p(50)	SD	Mean	p(50)	SD
Hourly Wage	5.31	3.53	12.12	4.8	3.4	3.4	3.21	2.67	3.83	4.53	3.2	9.41
Male	0.69	–	–	0.88	–	–	0.88	–	–	0.8	–	–
Married	0.85	–	–	0.72	–	–	0.51	–	–	0.7	–	–
Age	40.76	41	10.12	35.41	33	10.89	29.81	27	10.69	35.67	34	11.58
Work Experience	20.52	20	11.54	16.93	14	12.39	13.89	11	11.44	17.37	15	12.04
Part Time Job	0	–	–	0.01	–	–	0.04	–	–	0.02	–	–
Education												
Illiterate	0.06	–	–	0.09	–	–	0.23	–	–	0.13	–	–
Read and Write	0.04	–	–	0.08	–	–	0.08	–	–	0.06	–	–
Primary school	0.09	–	–	0.16	–	–	0.23	–	–	0.16	–	–
Preparatory school	0.37	–	–	0.34	–	–	0.35	–	–	0.36	–	–
Secondary school	0.08	–	–	0.06	–	–	0.03	–	–	0.06	–	–
University	0.35	–	–	0.27	–	–	0.08	–	–	0.23	–	–
Postgraduate	0.02	–	–	0.01	–	–	0	–	–	0.01	–	–
Occupation												
Management Level	0.09	–	–	0.15	–	–	0.07	–	–	0.1	–	–
Profession	0.35	–	–	0.17	–	–	0.03	–	–	0.2	–	–
Technician	0.22	–	–	0.09	–	–	0.04	–	–	0.13	–	–
Clerk	0.1	–	–	0.04	–	–	0.02	–	–	0.06	–	–
Worker	0.13	–	–	0.15	–	–	0.25	–	–	0.18	–	–
Craftsman	0.05	–	–	0.17	–	–	0.45	–	–	0.22	–	–
Operator	0.04	–	–	0.19	–	–	0.09	–	–	0.09	–	–
Elementary	0.01	–	–	0.02	–	–	0.06	–	–	0.03	–	–
Residence Area												
Greater Cairo Area	0.24	–	–	0.33	–	–	0.26	–	–	0.26	–	–
Alexandria and Canal Area	0.16	–	–	0.21	–	–	0.13	–	–	0.16	–	–
Urban Upper Egypt Area	0.2	–	–	0.13	–	–	0.13	–	–	0.16	–	–
Rural Upper Egypt Area	0.1	–	–	0.07	–	–	0.16	–	–	0.12	–	–
Urban Lower Egypt Area	0.13	–	–	0.13	–	–	0.13	–	–	0.13	–	–
Rural Lower Egypt Area	0.14	–	–	0.11	–	–	0.14	–	–	0.13	–	–
% of Employment		44%			19%			37%			100%	

Table 3: Summary statistics for year 2012

	Public Sector			Formal Private Sector			Informal Private Sector			Total		
	Mean	p(50)	SD	Mean	p(50)	SD	Mean	p(50)	SD	Mean	p(50)	SD
Hourly Wage	8.43	6.48	9.58	8.41	5.62	11.26	5.96	5	6.05	7.45	5.7	8.77
Male	0.67	–	–	0.9	–	–	0.93	–	–	0.82	–	–
Married	0.88	–	–	0.76	–	–	0.63	–	–	0.75	–	–
Age	40.8	41	10.34	35.48	33	10.32	31.5	29	10.1	35.92	34	11.08
Work Experience	19.04	18	11.31	14.91	12	10.83	13.86	12	10.34	16.15	14	11.09
Part Time Job	0.01	–	–	0.02	–	–	0.13	–	–	0.07	–	–
Education												
Illiterate	0.04	–	–	0.07	–	–	0.2	–	–	0.11	–	–
Read and Write	0.03	–	–	0.04	–	–	0.05	–	–	0.04	–	–
Primary school	0.08	–	–	0.13	–	–	0.23	–	–	0.15	–	–
Preparatory school	0.38	–	–	0.36	–	–	0.39	–	–	0.38	–	–
Secondary school	0.07	–	–	0.05	–	–	0.03	–	–	0.05	–	–
University	0.38	–	–	0.34	–	–	0.1	–	–	0.25	–	–
Postgraduate	0.03	–	–	0.01	–	–	0	–	–	0.02	–	–
Occupation												
Management Level	0.07	–	–	0.13	–	–	0.07	–	–	0.08	–	–
Profession	0.39	–	–	0.2	–	–	0.03	–	–	0.21	–	–
Technician	0.24	–	–	0.1	–	–	0.03	–	–	0.13	–	–
Clerk	0.07	–	–	0.04	–	–	0.01	–	–	0.04	–	–
Worker	0.06	–	–	0.12	–	–	0.21	–	–	0.13	–	–
Craftsman	0.03	–	–	0.1	–	–	0.45	–	–	0.22	–	–
Operator	0.04	–	–	0.26	–	–	0.13	–	–	0.12	–	–
Elementary	0.1	–	–	0.07	–	–	0.07	–	–	0.08	–	–
Residence Area												
Greater Cairo Area	0.19	–	–	0.36	–	–	0.18	–	–	0.21	–	–
Alexandria and Canal Area	0.15	–	–	0.19	–	–	0.11	–	–	0.14	–	–
Urban Upper Egypt Area	0.18	–	–	0.1	–	–	0.14	–	–	0.15	–	–
Rural Upper Egypt Area	0.15	–	–	0.07	–	–	0.23	–	–	0.17	–	–
Urban Lower Egypt Area	0.12	–	–	0.11	–	–	0.11	–	–	0.11	–	–
Rural Lower Egypt Area	0.19	–	–	0.15	–	–	0.19	–	–	0.18	–	–
% of Employment		41%			16%			43%			100%	

Table 4: Oaxaca Blinder for Formal Private-Public

VARIABLES	(1) 1998	(2) 2006	(3) 2012
Explained			
Married	−0.005*	−0.008**	−0.008***
	(0.003)	(0.004)	(0.003)
Male	0.006**	0.024***	0.028***
	(0.003)	(0.004)	(0.005)
Age	−0.049***	−0.090***	−0.076***
	(0.009)	(0.016)	(0.009)
Work Experience	−0.028***	−0.025**	−0.023***
	0.006)	(0.012)	(0.009)
Part Time Job	0.003	0.003	0.002
	(0.002)	(0.002)	(0.002)
Education	−0.052***	−0.032***	−0.032***
	(0.007)	(0.006)	(0.006)
Occupation	−0.002	−0.032***	−0.033***
	(0.010)	(0.011)	(0.011)
Residence Area	0.019***	0.019***	0.030***
	(0.003)	(0.004)	(0.004)
Total Explained	−0.108***	−0.141***	−0.113***
	(0.014)	(0.015)	(0.015)
Total Unexplained	0.135***	0.092***	0.044***
	(0.019)	(0.022)	(0.020)
Total Log Wage Gap	0.027	−0.050**	−0.069***
	(0.020)	(0.020)	(0.020)
Observations	3,088	4,516	5,307

[a] Robust standard errors in parentheses

[b] *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

[c] Education includes read and write, primary school, preparatory school, secondary school, university, and postgraduate.

[d] Occupation includes management, profession, technician, clerk, worker, craftsman and operator.

[f] Residence area includes Alexandria and Canal Area, Urban Upper, Rural Upper, Urban Lower and Rural Lower.

Table 5: Oaxaca Blinder for Informal Private-Public

VARIABLES	(1) 1998	(2) 2006	(3) 2012
Explained			
Married	−0.013**	−0.020***	−0.018***
	(0.005)	(0.007)	(0.005)
Male	0.007**	0.027***	0.036***
	(0.003)	(0.004)	(0.005)
Age	−0.100***	−0.108***	−0.095***
	(0.014)	(0.022)	(0.012)
Work Experience	−0.046***	−0.042***	−0.016**
	(0.009)	(0.014)	(0.007)
Part Time Job	0.015***	0.009***	0.023***
	(0.004)	(0.002)	(0.003)
Education	−0.131***	−0.090***	−0.103***
	(0.009)	(0.009)	(0.012)
Occupation	−0.010	−0.042**	−0.021
	(0.019)	(0.019)	(0.023)
Residence Area	0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)
Total Explained	−0.277***	−0.264***	−0.193***
	(0.018)	(0.018)	(0.016)
Total Unexplained	0.118***	−0.068***	−0.093***
	(0.018)	(0.024)	(0.020)
Total Log Wage Gap	−0.159***	−0.332***	−0.285***
	(0.011)	(0.013)	(0.012)
Observations	3,670	5,648	7,373

[a] Robust standard errors in parentheses

[b] *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

[c] Education includes read and write, primary school, preparatory school, secondary school, university and postgraduate.

[d] Occupation includes management, profession, technician, clerk, worker, craftsman and operator.

[f] Residence area includes Alexandria and Canal Area, Urban Upper, Rural Upper, Urban Lower and Rural Lower.

Table 6: Difference-in-difference in log hourly wages between 1998 - 2006

	(1) Informal[1] to formal[2]	(2) Formal to informal	(3) Informal to public	(4) Public to informal	(5) Formal to public	(6) Public to formal
			1998 ($R = 0$)			
Remain in Sector (C)	0.437	0.347	0.468	−0.102	0.357	−0.111
	(0.084)	0.161	(0.087)	(0.091)	(0.181)	(0.086)
Moved to Another (T)	0.467	0.342	0.426	−0.191	0.295	−0.060
	(0.093)	0.170	(0.105)	(0.105)	(0.199)	(0.089)
Diff ($T - C$)	0.0299	−0.005	−0.042	−0.089*	−0.061	0.051
	(0.037)	(0.056)	(0.045)	(0.053)	(0.080)	(0.043)
			2006 ($R = 1$)			
Remain in Sector (C)	0.827	0.876	0.859	0.482	0.886	0.470
	(0.083)	0.177	(0.086)	(0.092)	(0.195)	(0.087)
Moved to Another (T)	0.981	0.679	0.791	0.181	0.698	0.641
	(0.105)	0.172	(0.127)	(0.153)	0.220	(0.132)
Diff ($T - C$)	0.154**	−0.197***	−0.067	−0.301**	−0.188	0.167
	(0.068)	(0.074)	(0.078)	(0.121)	(0.126)	(0.113)
Diff-in-Diff	0.124*	−0.192**	−0.025	−0.212*	−0.126	0.116
	(0.067)	(0.085)	(0.087)	0.125	0.130	(0.109)
No. of obs. controlled group	578	342	578	2964	342	2964
No. of obs. treated group	186	68	102	42	70	82
Total No. of Observations	764	410	680	3006	412	3046
% of individuals that changed the sector[3]	24%	20%	15%	1%	17%	3%

Robust Standard Errors in Parentheses

*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$

[1] "Informal" refers to informal private sector.

[2] "Formal" refers to formal private sector.

[3] % of individuals that changed the sector $= \frac{\text{No. of obs. treated group}}{\text{Total No. of Observation}}$

Table 7: Difference-in-difference in log hourly wages between 2006 - 2012

	(1) Informal[1] to formal[2]	(2) Formal to informal	(3) Informal to public	(4) Public to informal	(5) Formal to public	(6) Public to formal
			2006 ($R = 0$)			
Remain in Sector (C)	0.861	0.722	0.871	0.391	0.711	0.373
	(0.080)	(0.137)	(0.091)	(0.125)	(0.177)	(0.124)
Moved to Another (T)	0.796	0.714	0.914	0.313	0.666	0.472
	(0.083)	(0.131)	(0.101)	(0.128)	(0.179)	(0.135)
Diff ($T - C$)	-0.065**	-0.008	0.0431	-0.077	-0.045	0.0998
	(0.030)	(0.052)	(0.056)	0.056	(0.063)	(0.060)
			2012 ($R = 1$)			
Remain in Sector (C)	1.483	1.353	1.494	1.099	1.341	1.081
	(0.081)	(0.135)	(0.091)	(0.124)	(0.179)	(0.124)
Moved to Another (T)	1.614	1.136	1.469	0.996	1.316	1.117
	(0.091)	(0.131)	(0.108)	(0.164)	(0.194)	(0.144)
Diff ($T - C$)	0.131***	-0.216***	-0.025	-0.104	-0.025	0.036
	(0.046)	(0.057)	(0.060)	0.097	(0.085)	(0.081)
Diff-in-Diff	0.196***	-0.208***	-0.068	-0.026	0.020	-0.064
	(0.052)	(0.070)	(0.076)	(0.104)	(0.089)	(0.074)
No. of obs. controlled group	1470	564	1470	4024	564	4024
No. of obs. treated group	320	306	234	84	210	130
Total No. of Observations	1790	870	1704	4108	774	4154
% of individuals that changed the sector[3]	18%	35%	14%	2%	27%	3%

Robust Standard Errors in Parentheses
*** $p < 0.01$, **$p < 0.05$, *$p < 0.1$

[1] "Informal" refers to informal private sector.
[2] "Formal" refers to formal private sector.
[3] % of individuals that changed the sector $= \frac{\text{No. of obs. treated group}}{\text{Total No. of Observation}}$