THE INFORMALIZATION OF THE EGYPTIAN ECONOMY (1998-2012): A FACTOR IN GROWING WAGE INEQUALITY?[+]

Amirah El-Haddad[*] and May Gadallah[**]

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[*] German Development Institute/Deutsches Institut für Entwicklungspolitik (DIE), Tulpenfeld 6 D-53113 Bonn, Germany. Department of Economics, Faculty of Economics and Political Science, Cairo University, Gamma Street, Giza, 12613 Egypt and ERF. *E-mail*: Amirah.El-Haddad@die-gdi.de, amirah.elhaddad@feps.edu.eg

[**] Department of Statistics, Faculty of Economics and Political Sciences, Cairo University , Gamma Street, Giza, 12613 Egypt and ERF. *E-mail*: maygad@fep.edu.eg

ABSTRACT

Variations in hourly wage rates explain most of gross earnings inequality among all workers in most countries (OECD 2011). Through running re-centered influence function regressions (aka Unconditional Quantile Regressions), we use Firpo et al. (2007) distributional approach to identify each control variable's contribution on the traditional decomposition of wage changes into structure and composition effects. Contrary to the traditional Oaxaca-Blinder approach, we perform the decomposition at each wage quantile. We address this question for waged men using the Egyptian Labor Market Surveys for 1998, 2006 and 2012. A novel finding of this paper, which is in contrast to the previous evidence on inequality in Egypt (e.g. Paolo et al. 2014; Hlasny and Verme 2013), we find that wage changes between 1998 and 2012 mainly resulted in increased inequality. The richer percentiles have persistently enjoyed disproportionately larger positive changes in real hourly wages, especially between 2006 and 2012. Whilst increasing in all three wage gaps, inequality increased the most between the top and bottom deciles (the 90-10 gap). Informality of the private sector is the largest contributor to increased inequality. The sector does not adhere to a minimum wage. Being unregulated it has responded dramatically to the competitive pressures caused by the departing middle classes of the public sector by suppressing mid and low-end wages, thus resulting in the sharp wage gaps at the tails. Formality has a nuanced effect depending on sector. Wage setting dynamics of the public sector and the direction of labour movements since liberalization cause the sector to contribute much more to wage inequality than does its formal private counterpart. Hence, in a setting where the majority of the labour-force is outside the formal sector, yearly public sector wage raises and the minimum wage become instruments that increase inequality not ones that reduce it. Annual pay freezes are one option. Implementing self-targeted public works programs similar to those of the National Rural Employment Guarantee Act in India serve to increase the "effective informal minimum wage", thus curbing wage inequality. This in turn will potentially enable wage progression thereby breaking the informality trap of low skill-low wage inertia.

Keywords: informality, inequality, recentered influence function regression, inequality decomposition, Egypt, public sector, minimum wage, wage setting dynamics, middle class

1. INTRODUCTION

Whether or not inequality is a good thing remains debated. Some are against inequality on principle. Economists have argued both in its favor, since it allows incentives to reward effort, risk and sacrifice, and against it, since the creation of a new lower-middle class can generate savings and boost skills development. However, studies of subjective wellbeing show it to be largely driven by relative, not absolute, material wellbeing (cf. Easterlin 1995). Hence, as long argued by political theorists, inequality can be driver of discontent and even revolution.

In the development field this last point has been argued by Hirschman and Rothschild (1973) in their presentation of the ***tunnel effect***. Suppose someone is driving through a two lane tunnel in which both lanes are heading in the same direction. Both lanes are caught in a traffic jam. Suddenly, the other lane starts clearing, given the looming prospect of moving this gets the hopes of people in the stationary lane up. But here's the trick: if the other side keeps moving for long enough with no sign of things clearing for those who aren't moving they will get even more frustrated than they were when no one was moving at all. They may try to cross to the other lane, but if everyone does that, the whole tunnel comes to a halt (Ray 1998).

It follows that a person's response to economic improvements depends on what this implies for her own prospects. If she believes the improvements in others' fortunes indicate a brighter foreseeable future for herself, she may be even better off despite the decline in her relative income. This is the *tunnel effect*. If however, the perceived link between the growing fortunes of others and the person's own welfare is weak or non-existent, inequality may not be tolerated. The greater the extent of social segregation along the lines of social, cultural, racial and economic lines to begin with the more likely the person's belief that her fortunes are and will remain completely different from the others. As Hirschman put it: if, given the social structure, the tunnel effect is weak, and so tolerance of inequality is poor, a strategy of *grow first, distribute later* will not be successful. Even if tunnel effects are strong initially, the development process may be thwarted if politicians and policy makers fail to see the gradual erosion of these effects. The relative homogeneity of countries in the Arab region may explain why these societies tolerated dictatorship for so long, being bypassed by the wave of democratization which swept much of the developing world from the late eighties on. The alteration of the development model in these states from state-led to some hybrid form of liberalization has triggered inequality. But as inequality has increased in recent years – and in very visible forms of expensive cars, new gated compounds growing on the edge of overcrowded cities, and the glamourous lifestyles shown in films – then this tolerance was severely tested.

Hence, there is good reason to understand some of the sources of inequality in Egypt, how they have evolved over time, and what policies may ensure a more equitable distribution of rewards from growth which are compatible with the overall objective of market-led development. To address this question, this paper will analyze trends in wage inequality for waged men for the

period 1998-2012, using the Egyptian Labor Market Surveys for 1998, 2006 and 2012. It will also examine contributing factors to these trends with a special focus on sector - public versus private – and formality amongst other things in particular their interaction. Because different explanations infer different policy actions, it is necessary to understand the leading sources of the observed trends of Egyptian labor market wage inequality.

2. SOME DRIVERS OF INEQUALITY

The literature identifies various sources for rising income inequality. Typical sources include education with higher rewards, i.e wages accruing to higher levels of education (cf. Wahba 1996; Lopez-Acevedo 2006; OECD 2011; Tansel and Bircan 2011) and so the smaller the share of individuals with relatively higher levels of education the higher the wage dispersion. In line with this is the explanation of skill-biased technological change. If the latter increases the demand for the more productive, high-skilled labor then the skill premium is likely to increase, thus creating inequality (cf. Krueger 1993; Berman et al. 1994). This channel is debated: some authors challenge the idea that skill-biased technical change is a major driver of wage inequality (cf. Feenstra and Hanson 2003; Singh and Duhamel 2004).[1] Some believe education counteracts the skill bias of technical change (cf. Tinbergen 1975) whilst others believe it doesn't (cf. Goldin and Katz 2008).

Education is also often cited in the inequality of opportunity literature pioneered by Roemer (1998) and further developed by Roemer (2006), Bourguignon et al. (2003; 2007). This strand of literature distinguishes between predetermined characteristics of an individual (e.g. race, gender and ethnicity) and individual differences in effort. Children from remote or rural areas or those from disadvantaged backgrounds may be deprived of an equal opportunity in access to education; a strong determinant of improved employment prospects and higher lifetime earnings (cf. Checchi and Peragine 2005; Cogneau and Mesple-Somps 2008; Lefranc et al. 2008).

Alterations in labor market institutions following globalization and trade liberalization provide an alternative explanation. Prior to the nineties, predictions based on the Hecksher-Ohlin model and the Stolper-Samuelson theory predicted an improvement in inequality on account of trade liberalization. This prediction is countered by recent empirical findings especially from developing countries such as Mexico, Cambodia, Argentina, Brazil, Chile, China and India (cf. Goldberg and Pavenik 2007a, 2007b; Topalova 2007; Harrison and Hanson 1999). More empirical results support the hypothesis that liberalization is associated with an increase of wage inequality between industries. This is because liberalizations go hand-in-hand with anti-labor policies (Milanovic and Squire 2005) but again also because the derived labour demand favors the better educated and the more skilled.

Inequalities in income and wage distributions are strongly related to minorities or disadvantaged groups which are mainly relegated to lower-paid sectors, industries, occupations and firms (see

[1]Technological change could also affect inequality through increasing the returns to capital relative to labor. But this research only focuses on returns to labor so this strand of literature has no direct bearing to our analysis.

queuing and devaluation theories in Kirschenman and Neckerman 1991; Wilson 1996; Browne and Kennelly 1999; Kennelly 1999; Moss and Tilly 1995, 1996, 2001).[2] These stem from biases, for example against certain races, religions and stereotyping of gender roles for instance. Constrained mobility, indirectly linked to stereotyping, means it is considerably harder for women to relocate, thus limiting their ability to respond to positive labor market signals (cf. Palmer 1992; Collier 1994; Assaad and Arntz 2005).

Informality does not necessarily harm inequality if it adds to household income (OECD 2011). This assumption builds strongly on a counterfactual argument. That is informality allows individuals access to income they wouldn't have otherwise been able to generate on the formal market. But this argument itself is based on the assumption of preserving the status quo, that it is not desirable to change it, or if it is then it is not possible. It thus falls short of grasping the bigger picture of the necessity to integrate that enormous structure into the formal side of the economy, not only to generate taxes but also to ensure a decent job for each employee and worker, one that provides security through social security and health insurance. Additionally, informal jobs are mainly low-skill, low-pay; concentrated in sectors such as agriculture, construction, street vending and low value added services especially of rural migrants (El-Haddad 2015). So from an hourly wage perspective, informal jobs carry a wage penalty.[3] They are usually more unstable, limit human capital accumulation opportunities and thus wage progression. This inertia is known as the "informality trap". Indeed, there is strong supportive evidence that persistent informality leads to greater inequality (Jutting and Laigesia 2009).

3. METHODOLOGY AND CONCEPTUAL FRAMWORK

The Egyptian labour market is divided into four distinct segments: the informal private sector, the formal public sector, the formal private and the informal public sectors. The first two absorb the majority of the labour force, nearly 90 percent of all male workers in 2012. We will examine the contribution of each of these segments (formality/sector combinations) on wages and on changes in wage inequality in Egypt through a recently developed decomposition technique. The following part provides a brief review and a description of the method.

3.1 Review on Inequality Decomposition

The Oaxaca-Blinder (OB) is the traditional approach to inequality decomposition. According to Oaxaca (1973) and Blinder (1973), mean-wages or mean- earnings equations can be decomposed to attribute differences in mean-wages to (1) differences in productive attributes/covariates or the composition effect, (2) differentiated returns to those attributes or a wage structure effect, and (3) a residual 'pure discrimination' effect.

The OB decomposition technique has been criticized by its inability to provide consistent estimates of the wage structure and composition effects unless linearity of conditional expectations is

[2] For more detail on minority job concentration see Kmec (2003).
[3] Which this study will also be later showing.

assumed (Firpo et al. 2007a). Another shortcoming is that the method can only be performed on mean outcomes rather than on any other distributional measure such as dispersion (Jenkins and Van Kerm 2008).

Dispersion and inequality measures include the coefficient of variation[4], the Gini coefficient[5], ratio of the 90^{th} to the 10^{th} percentile, or their difference, and the Theil index.[6] All these measures summarize dispersion in just one statistic and so, like the mean, do not reflect on the entire distribution, but they give different weights to different observations along the distribution (e.g. Lemieux 2002).

As a result, the Oaxaca-Blinder approach has increasingly been replaced by other methods. Quantile Regression is an alternative technique that has been used in inequality decomposition. This technique utilizes more characteristics of the conditional distribution -beyond the mean (e.g. median, upper and lower quartiles, or different percentiles).

Other techniques, such as regression based decompositions, have been developed to identify the impact of different factors on inequality. Shorrocks (1982, 1984) introduced such a technique that was later extended by Fields 2003, and finally developed by Fiorio and Jenkins (2007). Regression based inequality decomposition has recently led researchers to identify the contribution of different income sources to household income inequality (Cowell and Fiorio 2009; Baye and Epo 2011). It has also been used to decompose income and wage inequality by covariates' contributions using household level data (Devicienti 2008; Naschold 2009).

However, like OB, these techniques fail to decompose the change in income or wage *distribution*. A recent development in the literature focuses on estimating the entire income or wage distribution and then decomposing the change in the distribution. This approach enables us to answer more questions about wage gaps in different parts of the distribution.[7] Machado and Mata (2005) proposed a decomposition procedure based on conditional quantile regression methods. They estimated counterfactual distributions for the other groups from parameter estimates of one group. They then used the counterfactual distribution to compute overall composition and wage structure effects.

DiNardo et al. (1996) introduced a semi parametric reweighting approach that also constructs counterfactual distributions. The advantage of their approach over the Machado and Mata's (2005) parametric approach is that the latter requires large scale simulations that are computationally intensive (Firpo et. al. 2007a).

[4] Coefficient of variation is defined by the standard deviation of a distribution divided by the mean of the distribution. For that measure only relative incomes matter (e.g. Ray 1998; Heshmati 2004).

[5] Gini coefficient divides the area between the Lorenz curve and the line of perfect equality by the area below the perfect equality line. Gini varies from 0 (perfect equality) to 1.

[6] Theil index measure the divergence between income shares and population shares using certain distance functions.

[7] For example the gender gap in the upper part of the wage distribution, testing for glass ceiling phenomena.

In 2007a Firpo et al. (henceforth FFL) developed a novel distributional approach based on generalizing OB decomposition on any distributional measure using the recentered influence function. This approach has been utilized in recent researches (Firpo et al. 2007; Wai 2009; Longhi et al. 2013) for its added advantage of identifying each control variable's contribution on the distributional statistic of choice to the traditional decomposition of wages into structure and composition effects.

3.2 Methodology

As stated earlier we will examine the contribution of each informality/sector combination on wages and changes in wage inequality by decomposing the change in the wage distribution during two sample periods 1998-2006 and 2006-2012.

The paper applies the Recentered Influence Function (RIF) regression or Unconditional Quantile Regression approach proposed by Firpo et.al. (2009, 2011) to estimate the impact of explanatory variables on quantiles of the unconditional (marginal) distribution of log hourly wages. The method is based on running a regression of the RIF of the unconditional quantile on the explanatory variables. This paper will also follow the FFL approach in decomposing the change in wage inequality over time. The approach is thus based on both methods; the RIF regression and the Oaxaca-Blinder.

RIF Regression (The Unconditional Quantile Regression)[8]

The influence function IF(Y; v, F_Y)[9] of a distributional statistic, $v(F_Y)$[10], represents the influence of an individual observation on that distributional statistic. Let the recentered influence function of the distributional statistic $v(F_Y)$ be:

$$\text{RIF}(Y; v, F_Y) = v(F_Y) + \text{IF}(Y; v, F_Y) \quad (1)$$

The expectation of the RIF is thus equal to $v(F_Y)$[11], which is not usually the case in the regular quantile regression. Because influence functions can be computed for most distributional statistics, the method can be extended to other choices of v beyond quantiles, such as the variance, the Gini coefficient and other commonly used inequality measures.[12]

[8] This part draws heavily on Firpo et al. 2009.

[9] Let the *v(Fy)* be a statistic of interest (mean, percentile, Gini coefficient). The influence function of v is a function of y and *F* defined as

$$IF(y; v, F) = \lim_{\varepsilon \downarrow 0} \frac{v((1-\varepsilon)F + \varepsilon\Delta_y) - v(F)}{\varepsilon}$$

The IF captures the effect on *v(F)* on an infinitesimal change of F at point mass y. From:

https://www.stata.com/meeting/uk15/abstracts/materials/uk15_vankerm.pdf

[10] The illustration is for the percentiles but it also applies for other distributional statistics such as variance and Gini coefficient.

[11] In Firpo et al. (2007b), the recentering is useful because it allows us to identify the intercept and performs Oaxaca-type decomposition at various quantiles.

[12] See Firpo et al. (2007b) for such regressions on the variance and Gini.

For quantile q_τ, the RIF will have the form:

$$RIF(Y; q_\tau) = q_\tau + \frac{\tau - I(Y \leq q_\tau)}{f_y(q_\tau)} \quad (2)$$

The conditional expectation of the RIF (Y; v, F_Y) can be modeled as a function of the explanatory variables:

E [RIF (Y; v, F_Y) $|X$] = $m_v(X)$. With the implication that the RIF *regression model* is the same as an OLS regression of Y on X in case of the mean. In the case of quantiles, the expression is:
E [RIF (Y; q_τ, F_Y) $|X$] = $m\tau$ (X) and can be thus viewed as an *unconditional quantile regression* (UCQ). In the RIF (e.g. *unconditional quantile regression)* the dependent variable is replaced by the recentered influence function (RIF) of a distributional statistic of interest (for example the quantile). In other words, an estimate of the influence function corresponding to an observed wage y for a distributional statistic of interest, ν_τ (τ -quantile), is found and then recentered. This RIF then becomes the dependent variable in a regression of RIF on the covariates and the effect of each covariate on different quantiles of the of log hourly wages is estimated.

Firpo et al. (2009) computed the UCQ by estimating the sample quantile q_τ, estimating the density $f_Y(q_\tau)$ at that point q_τ using kernel methods, and forming a dummy variable, $I(Y \leq q_\tau)$, indicating whether the value of the outcome variable is below q_τ. They then ran an OLS regression of this new dependent variable on the covariates (RIF-OLS). The RIF-OLS approach estimates the *unconditional quantile partial effect* (UQPE) or the average marginal effect in case of quantiles as follows:

$$E[m'_\tau(X)] = E(dE[RIF(Y; v)|X = x]/dX)]$$
$$= E[d\Pr[Y > q_\tau|X]/dX]^{13}/f_y(q_\tau) \quad (3)$$

Equation (3) provides consistent estimates if Pr [$Y > q_\tau|X = x$] is linear in x. Firpo et al. (2009) showed that the average derivative of the unconditional quantile regression corresponds to the marginal effect on the unconditional quantile of a small location shift in the distribution of covariates, holding everything else constant.[14]

Inequality Decomposition

Inequality decomposition in this paper utilizes Reweighting and Recentered Influence Function Regressions as developed by (DiNardo et al. 1996) and Firpo et al. (2007a). Just as the standard regression can be used to perform Oaxcxa-Blinder decomposition, the RIF regression performs the

[13] Based on Firpo, Fortin and Lemieux (2009): $dE[RIF(Y; v)|X = x]/dX]$ is the k vector of partial derivatives $[\partial E[RIF(Y; v)|X = x_j]_{j=1}^{k}/\partial X]$

[14] The paper applies the STATA command rifreg-ado proposed by Firpo et al. (2010)

same decomposition but for any distributional parameter (Firpo et al. 2011). The following section gives a brief illustration of the method, which is known as the FFL approach.

The FFL Approach[15]

Let γ_t^v (for time t=1,0) be the estimated coefficients from a regression of $RIF(y_t; v)$ on the covariates in the wage equations (X). Using the estimated coefficients, the equivalent expression for the OB decomposition for any unconditional quantile is:

$$\Delta_o^v = E[X|T=1](\gamma_1^v - \gamma_0^v) + (E[X|T=1] - E[X|T=0])\,\gamma_0^v = \Delta_S^v + \Delta_X^v \qquad (4)$$

Where ($\hat{\Delta}_S^v$) represents the wage structure or price effect and ($\hat{\Delta}_X^v$) (the estimation of the second term) represents composition or share effect.

If the no reweighting method is used, then no new weights are applied and the composition effect can be written using the sampling weights provided in the survey data, w_t for each year t.

$$\Delta_X^v = (\sum_{i=1}^N w_{1i}\, X_{1i} - \sum_{i=1}^N w_{0i}\, X_{0i})\gamma_0^v \qquad (5)$$

Since the linear specification used in the regression is a local approximation, which does not generally hold for the changes in the covariates, the no reweighting method may produce a biased decomposition (*ibid*.) Accordingly, FFL approach proposed the use of the DiNardo et al. (1996) approach in reweighting. Suppose $v(Y)$ is a quantile of wage distribution Y, again the difference between the quantiles of year 1 and 0 can be decomposed as follows:

$$\begin{aligned} \nu\left(F_{Y_1|T=1}\right) - \nu\left(F_{Y_0|T=0}\right) &= \left[\nu\left(F_{Y_1|T=1}\right) - \nu\left(F_{Y_0|T=1}\right)\right] + \left[\nu\left(F_{Y_0|T=1}\right) - \nu\left(F_{Y_0|T=0}\right)\right] \\ &= \Delta_S^v \quad + \quad \Delta_X^v \\ &= \text{wage structure effect + composition effect} \end{aligned} \qquad (6)$$

Where $\nu\left(F_{Y_0|T=1}\right)$ is the counterfactual distributional statistics of log hourly wage for workers in year 1, where they are given identical characteristics as of those in year 0. The counterfactual wage can be obtained using DiNardo et al. (1996) reweighting function:

$$\Psi(X) = \frac{P(T=1|X)/P(T=1)}{P(T=0|X)/P(T=0)} \qquad (7)$$

Where $P(T=1|X)$ is the predicted probability of belonging to period 1 and $P(T=0|X)$ is the predicted probability of belonging to period 0. $P(T=0)$and $P(T=1)$ are the sample proportions in period 0 and 1 respectively. For the conditional probability $P(T=1|X)$, a logit model is used. The reweighting function will make the distribution of the X's in period 0 similar as to that of

[15]This part draws heavily on equations from Chi et al. 2007, Wai 2009, Firpo et al. 2011 and Kim 2014.

period 1. (Firpo et al. 2007; Chi et al. 2007; Wai 2009). The counterfactual weights can be found by multiplying a reweighing function (Ψ) by the sampling weights (w_t).

The counterfactual coefficients $\hat{\gamma}_{01}^{v}$can then be estimated from a RIF regression on the reweighted sample for any distributional statistics. The standard Oaxaca-Blinder decompositions will be applied twice on the estimated recenetered influence functions. Once to compare time 0 with the reweighted time 0 similar to time 1 distribution. As a result, equation (8) provides the pure composition effect $\hat{\Delta}_{X,p}^{v}$. $\hat{\Delta}_{X,e}^{v}$ is the specification error.

$$\begin{aligned}\hat{\Delta}_{X,R}^{v} &= (\bar{X}_{01} - \bar{X}_{0})\hat{\gamma}_{0}^{v} + \bar{X}_{01}[\hat{\gamma}_{01}^{v} - \hat{\gamma}_{0}^{v}] \\ &= \hat{\Delta}_{X,p}^{v} \quad + \hat{\Delta}_{X,e}^{v}\end{aligned} \tag{8}$$

The second Oaxaca-Blinder decomposition will compare time 1 and reweighted time 0. Equation (9) thus provides the pure wage structure effect $\hat{\Delta}_{S,p}^{v}$ as well as the reweighting error $\hat{\Delta}_{S,p}^{v}$. This error tends to zero as $\bar{X}_{01} \to \bar{X}_{1}$ (Firpo et al. 2011).

$$\begin{aligned}\hat{\Delta}_{S,R}^{v} &= \bar{X}_{1}[\hat{\gamma}_{1}^{v} - \hat{\gamma}_{01}^{v}] + (\bar{X}_{1} - \bar{X}_{01})\hat{\gamma}_{01}^{v} \\ &= \hat{\Delta}_{S,p}^{v} \quad + \hat{\Delta}_{S,e}^{v}\end{aligned} \tag{9}$$

4. THE STATE OF TEMPORAL INEQUALITY (1998-2012)

The data used in the analyses is from the 1998 Egypt Labor Market Survey (ELMS) and the 2006 and 2012 Egypt Labor Market Panel Surveys (ELMPS) which are nationally representative Household Sample Surveys carried out by Egypt's statistical office (CAPMAS)[16] in 1998 and later by the Economic Research Forum in cooperation with CAPMAS. All three questionnaires have three major modules: (i) a household questionnaire administered to the household head or his/her spouse; (ii) an individual questionnaire administered to every individual in the household age six and above; and (iii) a household enterprise and income module (Assaad 2009). An important note is that the data here excludes all unreported and unrecorded activities. These include legal, illegal or quasi-legal activity covering black market, grey market operations and any domestic economic activities of military conscriptions.

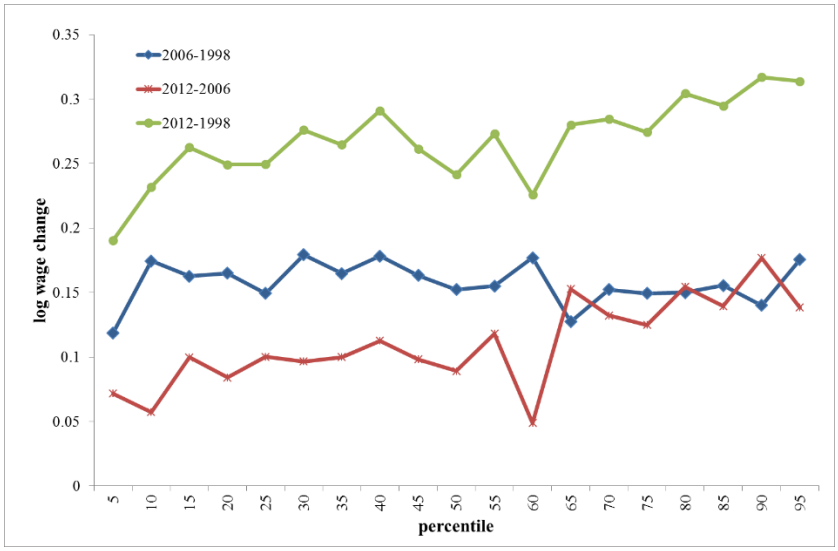
We limit ourselves to the log hourly wage[17] structure as opposed to income or total earnings because variations in hourly wage rates explain the largest part of the level of gross earnings inequality among all workers in most countries (55-63% on average, OECD 2011). This means that self-employed and employers are excluded as well as capital, land and entrepreneurial income. We also limit our sample to male waged workers in the age group 15-64 because of relatively low female labor market participation. This results in a sample of 3617, 5911 and 8266 for the years 1998, 2006 and 2012 respectively. A waged worker has worked for monetary or in-kind in compensation for at least one hour in the reference week of the survey.[18] S/he will be considered

[16] Central Agency for Public Mobilization and Statistics
[17] Of the main job.
[18] Real log hourly wages are computed taking 2012 as base year.

formal if s/he has both a contract and social insurance. If s/he does not have either or both s/he will be considered informal.

Equality in Egypt has steadily worsened through 1998-2012, where the richer percentiles have persistently enjoyed disproportionately larger positive changes in real hourly wages (Figure 1). Everybody is better off but growth is pro-rich, notably for the top half of the distribution (top 50 percentiles). But aggregation blurs the temporal picture. A closer look at our rounds shows that the later period 2006-2012 is responsible for the larger part of the bulk of inequality of the entire period. It is during this period when inequality increased everywhere unlike in the preceding period 1998-2006 where wage increases have been stable across the distribution and inequality therefore more or less stagnant. For the later period, wage inequality has been rising at a much higher rate at the top of the distribution compared to the bottom. It thus requires further investigation as to the main contributor to this inequality trend.

Figure 1: Changes in Real Hourly Wages by Percentile, Men



Source: authors' calculations using ELMPS data, 1998, 2006, 2012

4.1 Unconditional Quantile Regressions: RIF Regressions

The covariates included in the unconditional quantile regressions (Table 1) reflect the different explanations that are associated with changes in the wage distribution over each sample period. The key set of covariates which we focus on are formality and sector (4 groups). We use other controls such as economic activity, years of experience, education and occupation. We will refer to the other controls for any particular interesting insights or anomalies. Sample descriptives are in Table A1 in the Annex. The base group used in the RIF-regression models consists of informal public, rural, illiterate[19], 10-24 years of experience, manager, and agriculture and mining.

[19] or at best read and write

Table 1: Unconditional Quantile Regressions

Variables	Q10 1998	Q10 2006	Q10 2012	Q50 1998	Q50 2006	Q50 2012	Q90 1998	Q90 2006	Q90 2012
Formality and sector (ref Informal Public)									
Informal & private sector	0.439	0.658***	0.279**	0.284***	0.270***	0.078	0.127	0.0298	0.004
	(0.280)	(0.153)	(0.112)	(0.093)	(0.060)	(0.060)	(0.156)	(0.113)	(0.121)
Formal & private sector	0.418	0.813***	0.459***	0.291***	0.417***	0.212***	0.234	0.326**	0.255*
	(0.287)	(0.154)	(0.113)	(0.101)	(0.064)	(0.064)	(0.191)	(0.130)	(0.144)
Formal & public sector	0.439	0.763***	0.379***	0.129	0.307***	0.194***	-0.027	0.075	0.183
	(0.286)	(0.153)	(0.109)	(0.090)	(0.059)	(0.058)	(0.155)	(0.113)	(0.117)
Region (ref Rural)									
Urban	0.066	0.049*	0.099***	0.100***	0.118***	0.075***	0.212***	0.218***	0.208***
	(0.040)	(0.028)	(0.028)	(0.028)	(0.020)	(0.019)	(0.048)	(0.035)	(0.039)
Education (ref Illiterate & Read & Write)									
Less than intermediate	0.088	0.073	0.003	0.176***	0.080**	0.068**	0.086	0.092**	0.062
	(0.064)	(0.045)	(0.048)	(0.042)	(0.031)	(0.031)	(0.055)	(0.044)	(0.048)
Intermediate	0.321***	0.163***	0.092**	0.273***	0.198***	0.168***	0.168***	0.178***	0.145***
	(0.076)	(0.045)	(0.046)	(0.049)	(0.031)	(0.029)	(0.064)	(0.048)	(0.049)
Above intermediate	0.422***	0.262***	0.130	0.434***	0.342***	0.187***	0.429***	0.224**	0.263**
	(0.096)	(0.063)	(0.082)	(0.072)	(0.049)	(0.052)	(0.122)	(0.089)	(0.127)
University & higher	0.555***	0.299***	0.128*	0.681***	0.395***	0.296***	1.089***	0.708***	0.587***
	(0.097)	(0.064)	(0.070)	(0.065)	(0.043)	(0.041)	(0.133)	(0.092)	(0.093)
Years of experience (ref 20-24 years)									
less than 5years	-0.582***	-0.506***	-0.329***	-0.592***	-0.433***	-0.276***	-0.419***	-0.359***	-0.415***
	(0.081)	(0.063)	(0.065)	(0.056)	(0.039)	(0.039)	(0.087)	(0.074)	(0.085)
5-9	-0.251***	-0.145***	-0.149***	-0.348***	-0.300***	-0.212***	-0.252***	-0.258***	-0.268***
	(0.069)	(0.046)	(0.050)	(0.055)	(0.037)	(0.035)	(0.093)	(0.072)	(0.084)
10-14	-0.163**	-0.089**	-0.009	-0.253***	-0.132***	-0.058*	-0.325***	-0.238***	-0.238***
	(0.065)	(0.043)	(0.045)	(0.055)	(0.037)	(0.034)	(0.082)	(0.069)	(0.086)
15-19	0.019	-0.031	0.015	-0.094*	-0.077**	-0.04	-0.062	-0.215***	-0.082
	(0.055)	(0.042)	(0.044)	(0.055)	(0.038)	(0.035)	(0.097)	(0.071)	(0.088)
25+	0.059	-0.018	-0.0008	0.110**	0.123***	0.095***	0.198**	0.201***	0.020
	(0.049)	(0.037)	(0.043)	(0.047)	(0.032)	(0.032)	(0.087)	(0.073)	(0.082)
Occupations (ref Managers)									
Professionals	0.151**	0.031	0.013	-0.086	-0.064*	-0.130***	-1.098***	-0.720***	-0.806***
	(0.059)	(0.032)	(0.046)	(0.054)	(0.035)	(0.035)	(0.173)	(0.158)	(0.190)
Technicians and associate professionals	0.164**	-0.006	-0.027	-0.047	-0.250***	-0.272***	-0.825***	-0.940***	-1.028***
	(0.076)	(0.043)	(0.056)	(0.070)	(0.042)	(0.044)	(0.180)	(0.155)	(0.194)
Clerical support workers	-0.017	0.031	-0.030	-0.186***	-0.260***	-0.345***	-0.975***	-1.168***	-1.273***
	(0.092)	(0.048)	(0.072)	(0.071)	(0.054)	(0.057)	(0.176)	(0.159)	(0.203)
Service and sales workers	-0.141	-0.277***	-0.326***	-0.350***	-0.499***	-0.532***	-1.133***	-1.110***	-1.204***
	(0.104)	(0.061)	(0.074)	(0.070)	(0.044)	(0.048)	(0.171)	(0.152)	(0.190)
Skilled agricultural, forestry and fishery workers	0.244	0.072	-0.181	-0.113	-0.489***	-0.498***	-0.932***	-1.390***	-1.411***
	(0.189)	(0.091)	(0.115)	(0.106)	(0.083)	(0.111)	(0.230)	(0.222)	(0.321)
Craft and related trades workers	0.085	0.077	-0.045	-0.039	-0.201***	-0.285***	-1.001***	-1.072***	-1.207***
	(0.103)	(0.063)	(0.080)	(0.075)	(0.051)	(0.051)	(0.181)	(0.163)	(0.191)
Plant and machine operators, and assemblers	0.300***	-0.013	-0.134*	0.027	-0.264***	-0.426***	-0.954***	-1.200***	-1.214***
	(0.101)	(0.065)	(0.073)	(0.081)	(0.054)	(0.052)	(0.189)	(0.162)	(0.203)
Elementary occupations	0.090	-0.307***	-0.470***	-0.228**	-0.550***	-0.631***	-1.118***	-1.120***	-1.312***
	(0.149)	(0.118)	(0.086)	(0.101)	(0.063)	(0.049)	(0.193)	(0.165)	(0.186)

Variables	Q10			Q50			Q90		
	1998	2006	2012	1998	2006	2012	1998	2006	2012
Economic activity (ref Agriculture & Mining)									
Manufacturing	0.009	-0.053	-0.236***	0.089	-0.064	-0.096	0.212	-0.192	-0.245
	(0.165)	(0.062)	(0.091)	(0.080)	(0.071)	(0.103)	(0.172)	(0.175)	(0.270)
Construction	0.283	0.127*	0.017	0.253***	0.160**	0.086	0.128	-0.171	-0.263
	(0.173)	(0.068)	(0.094)	(0.089)	(0.075)	(0.105)	(0.176)	(0.178)	(0.269)
Trade	-0.037	-0.190**	-0.346***	0.193**	-0.081	-0.134	0.153	-0.299*	-0.368
	(0.179)	(0.081)	(0.101)	(0.089)	(0.073)	(0.105)	(0.186)	(0.172)	(0.277)
Transport	-0.097	0.0823	-0.178*	0.205**	0.115	0.013	0.226	-0.065	-0.143
	(0.168)	(0.068)	(0.097)	(0.088)	(0.074)	(0.105)	(0.184)	(0.180)	(0.268)
Services, electricity and finance	-0.177	-0.148***	-0.247***	0.014	-0.114*	-0.085	0.023	-0.393**	-0.308
	(0.154)	(0.057)	(0.089)	(0.077)	(0.067)	(0.102)	(0.170)	(0.169)	(0.272)
Constant	-0.082	0.028	0.683***	0.954***	1.313***	1.669***	2.598***	3.168***	3.539***
	(0.330)	(0.176)	(0.155)	(0.136)	(0.103)	(0.126)	(0.282)	(0.261)	(0.348)
Observations	3,703	5,914	8,366	3,703	5,914	8,366	3,703	5,914	8,366
R-squared	0.110	0.110	0.064	0.199	0.232	0.156	0.170	0.172	0.128

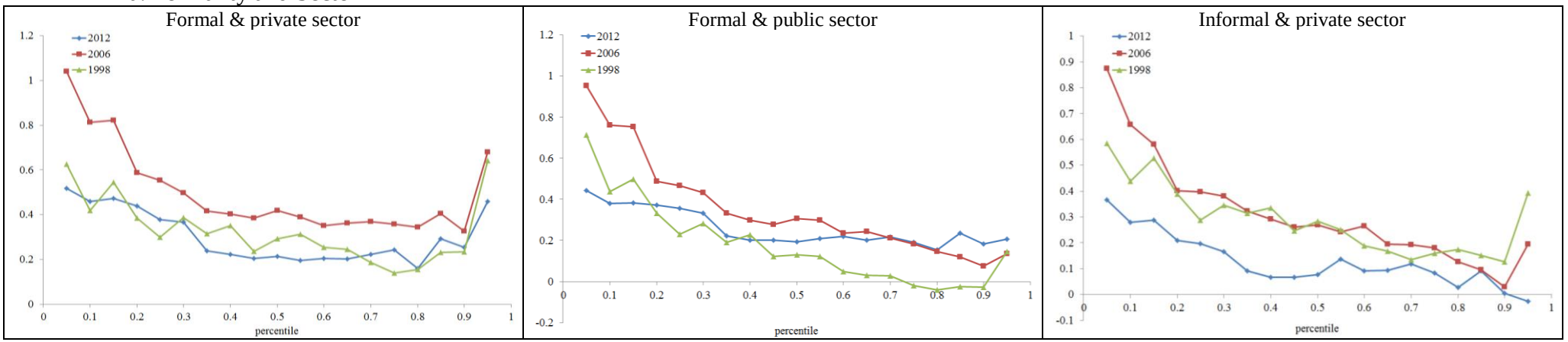
Source: authors' calculations using ELMPS data, 1998, 2006, 2012
Note: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Before getting to the decomposition results, it is interesting to discuss some traits of the estimated RIF-coefficients. First, the effect of most covariates across the different wage quantiles is monotonic. Both being in the formal public sector or in the informal private sector reduce inequality across the distribution (Table 1; Figure 3a.). The effect of being in either of these sectors on wages is declining as you move along the wage distribution in any one year compared to the reference category of informal public. The opposite is true for university and higher education, working in the services, electricity and finance sector as well as working in urban areas (Figure 3b, 3c). The effect of those categories across the different wage quantiles is increasing, that is the coefficient increases as you move from Q10 to Q90 in any one year compared to the reference category (Table 1). Second, the effect of being formally employed in the private sector is non-monotonic, meaning that its impact on wage declines in the lower end of the distribution but increases after approximately the 80th percentile. Therefore, the effect of being formally privately employed follows a U-shaped curve (Figure 3a.). Third, for most covariates with the exception of experience and being at the top end of the distribution of being formally employed in the public sector[20] the effect on the real wage is temporally declining, a reflection of a potential lack of wage indexation or fierce competition in the market place forcing wages down or a bit of both. The effect of university and higher education on the real hourly wage compared to illiterates for instance has declined by 63% at the 10th quantile from 0.56 to just 0.13 points from the year 1998 to 2012 (Table 1).

[20] Which is discussed later at great length.

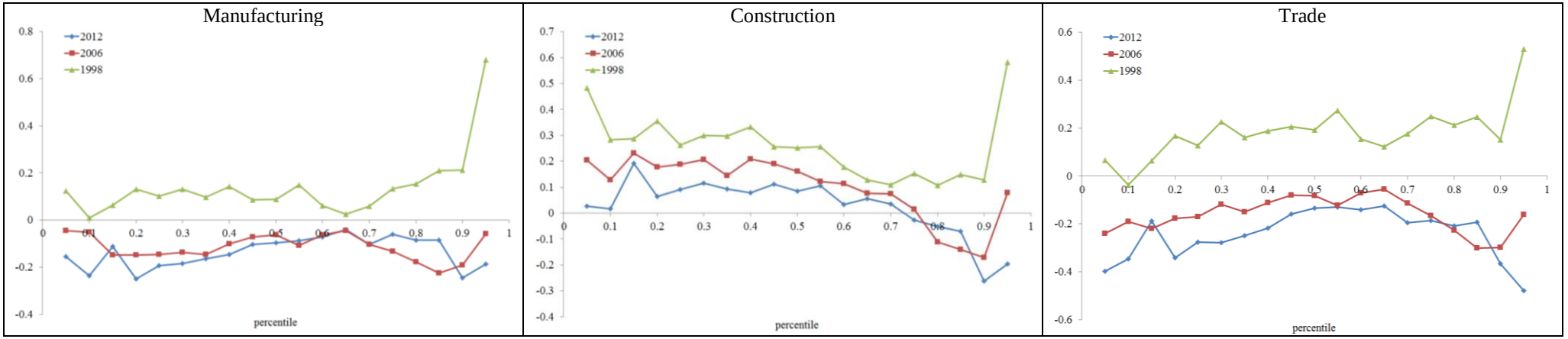
Figure 3a: Unconditional Quantile Regression Coefficients 1998-2012

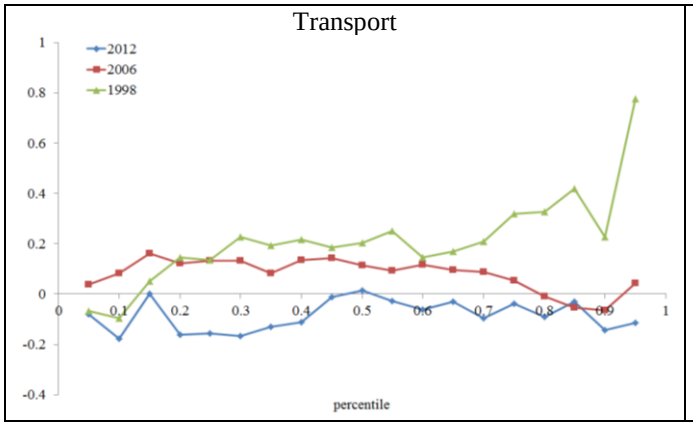
a. Formality and Sector

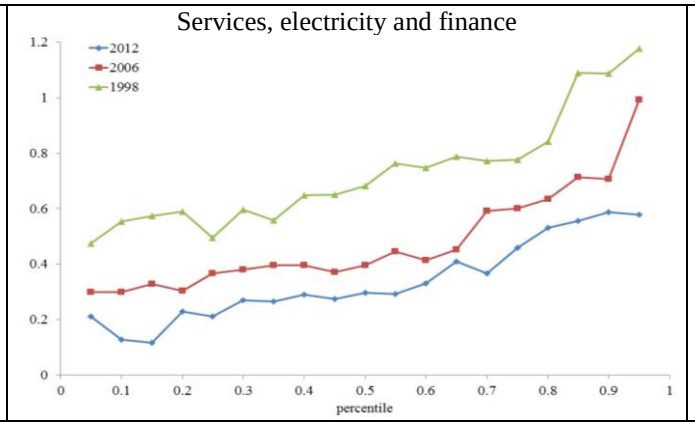


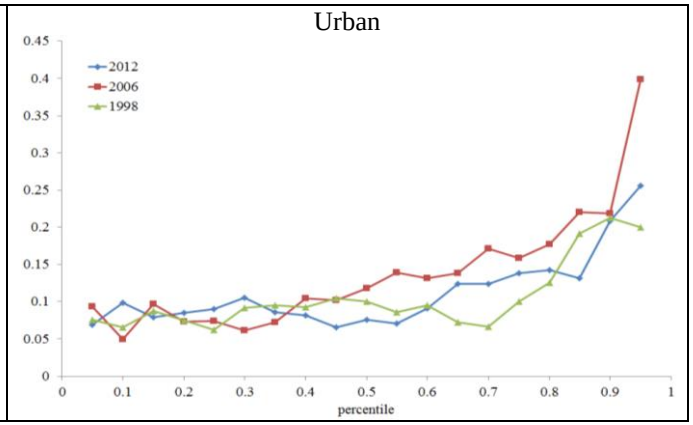
Source: authors' calculations using ELMPS data, 1998, 2006, 2012

b. Economic Activity and Urban



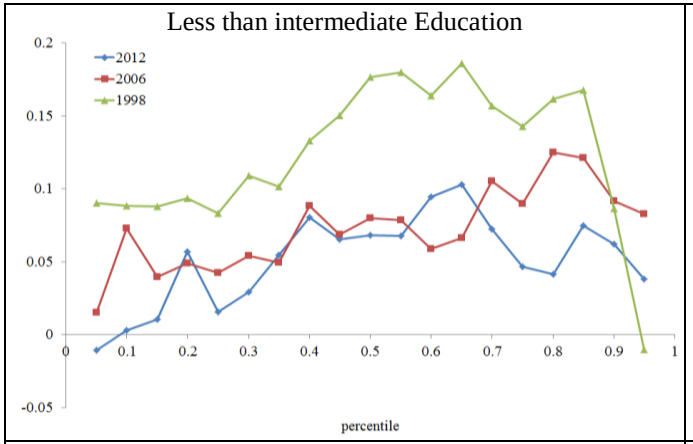


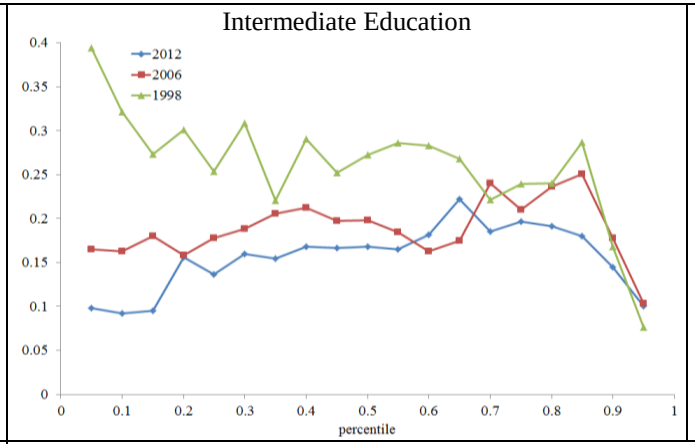


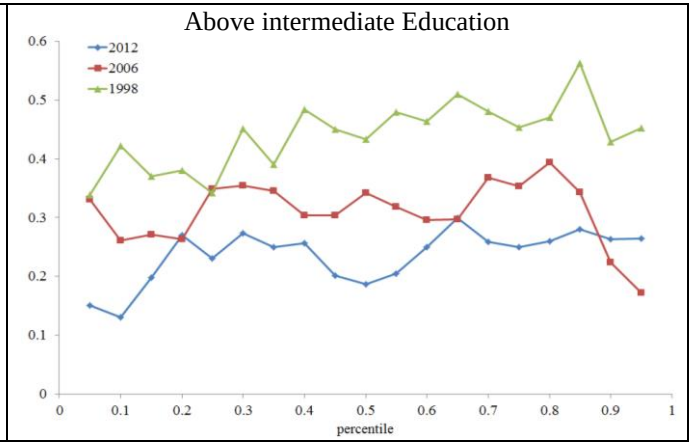


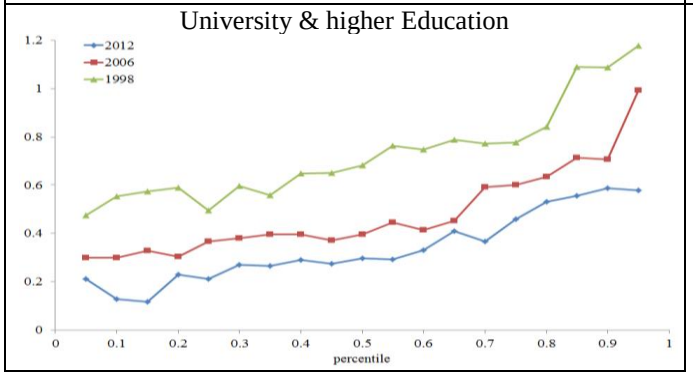
Source: authors' calculations using ELMPS data, 1998, 2006, 2012

c. Education level



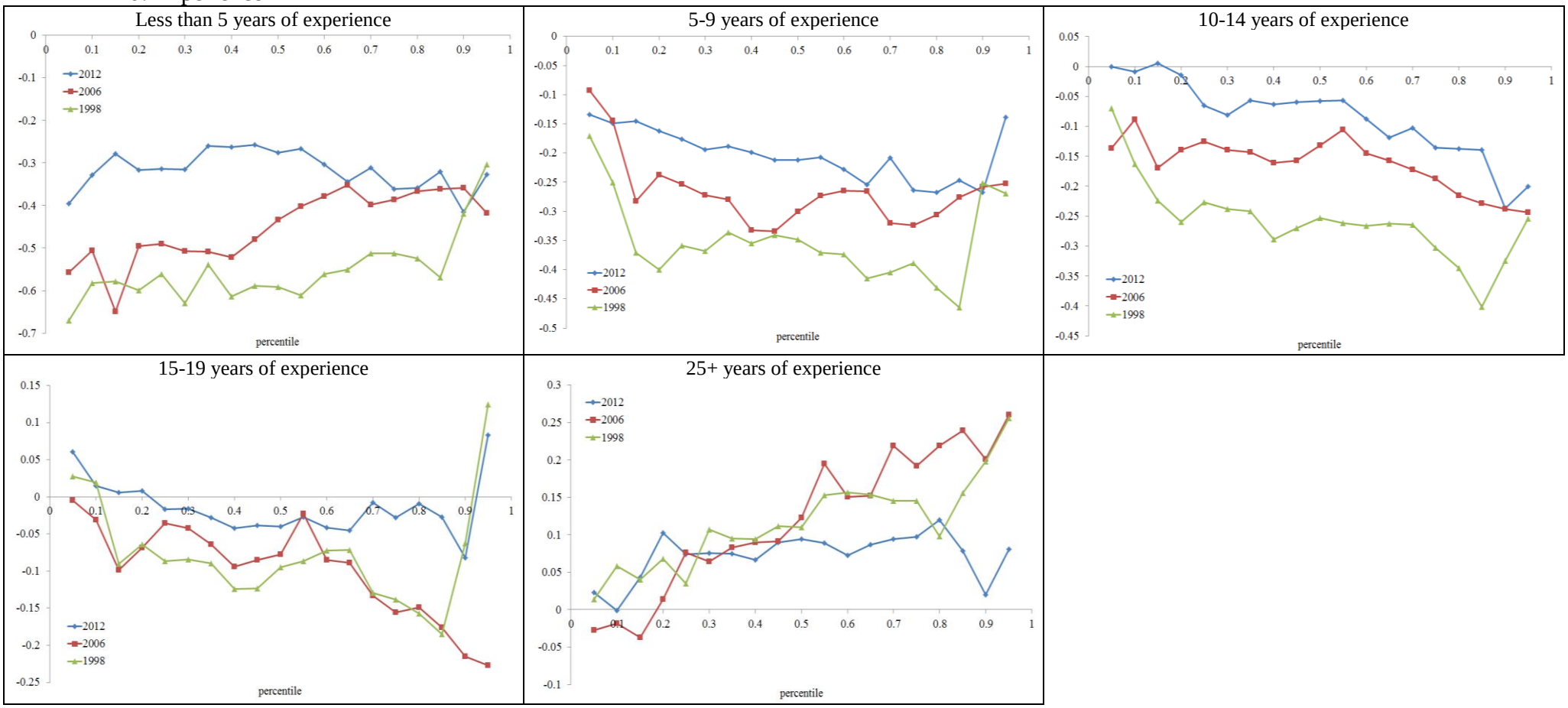






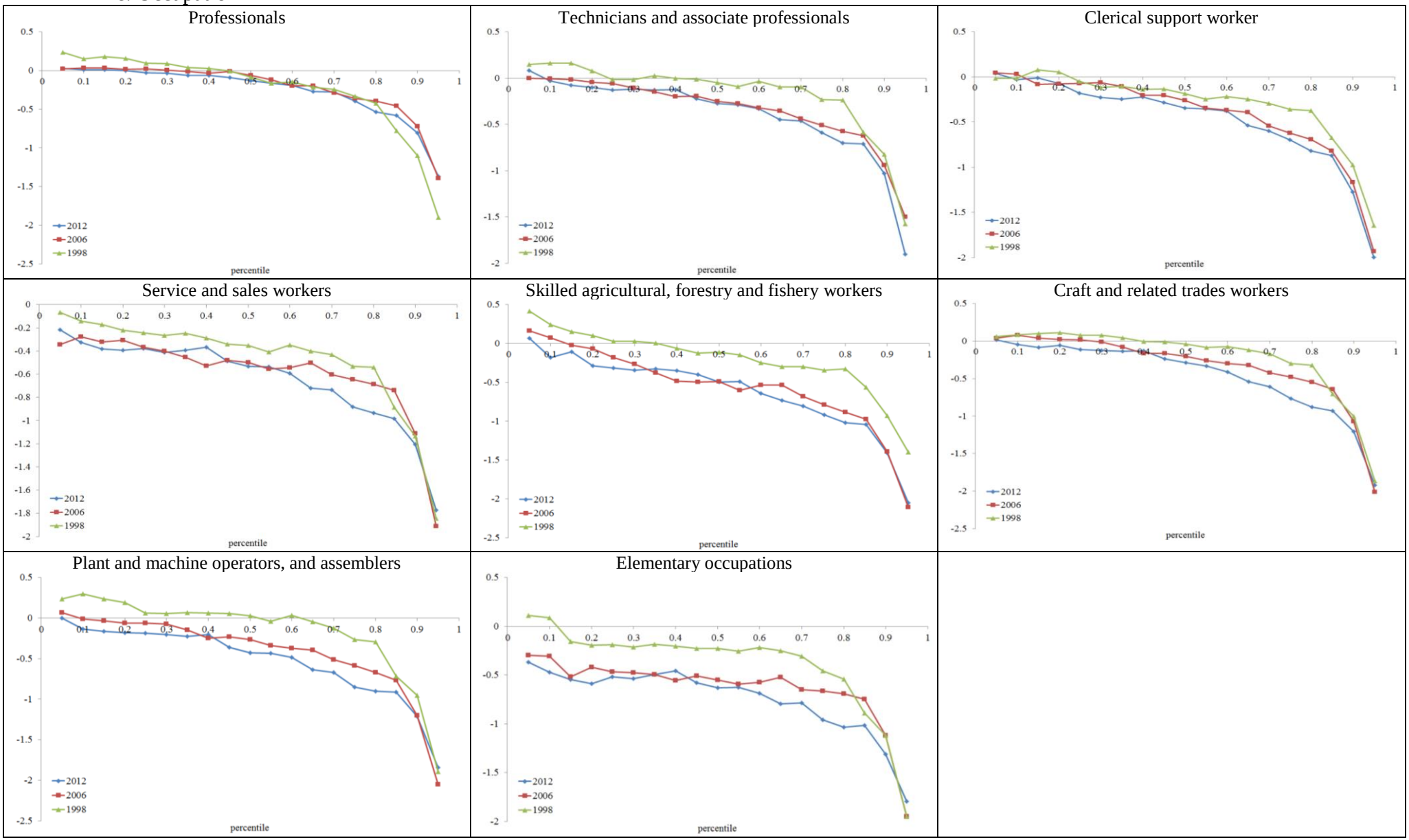
Source: authors' calculations using ELMPS data, 1998, 2006, 2012

d. Experience



Source: authors' calculations using ELMPS data, 1998, 2006, 2012

e. Occupation



Source: authors' calculations using ELMPS data, 1998, 2006, 2012

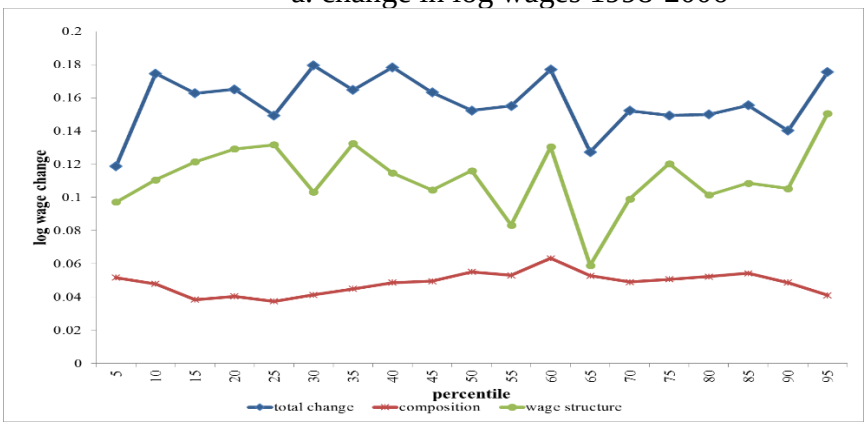
4.2 Decomposition Results

Aggregate Decomposition

Figure 4 shows the overall change in real log hourly wages between any two periods at each percentile and decomposes this overall change into a composition and a wage structure effect. Figure 4a shows that the wage structure effect has contributed substantially to the stable variations along the wage distribution during 1998-2006 (Figure 4a) as well as to the increased wage dispersion that took place for all points of the distribution during 2006-2012 (Figure 4b)[21]. The composition effect is nearly negligible for the later period and quite small for 1998-2006. We will focus predominately on the changes in the second more dynamic period which is almost solely responsible for the observed trend throughout the entire extended period 1998-2012.

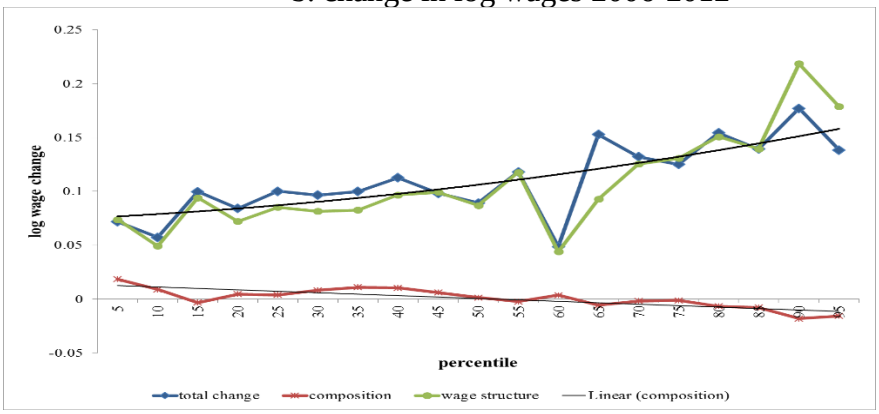
Figure 4: Decomposition of Total Change into Composition and Wage Structure Effects

a. change in log wages 1998-2006



Source: authors' calculations using ELMPS data, 1998, 2006

b. change in log wages 2006-2012



Source: authors' calculations using ELMPS data, 2006, 2012

[21] As the curve is positively sloped for all quantiles.

The detailed decomposition results[22] are presented in Figures 5- 8. Tables 2 and 3 summarize these results for the standard measures of wage inequality: the top-end 90-50 gap; the low-end 50-10 gap and the 90-10 gap, which captures wage changes over the entire distribution or more accurately between the tails.

Inequality increases in all three gaps during 2006-2012 but mostly in the 90-10 gap (0.120 compared to 0.032 and 0.088 (Table 2) indicating increased inequality along the entire distribution, more accurately between the very poor and the ultra-rich.[23] In contrast, during 1998-2006 inequality remains stagnant or at best very slightly declines for all three gaps especially the 90-10 gap (-0.034 largest decline compared to the other gaps).

During 2006-2012 wage structure effects accounted for between 119 percent and 150 percent of the growth in all gaps (Table 2). The composition effect very slightly corrects this result where labor is moved into better paying categories within groups or out of less paying categories or both. As a result, growth of the three gaps diminishes between 22 percent and 24 percent.

Table 2: Aggregate Decomposition Results

	Reweighted Year 1998 -2006			Reweighted Year 2006-2012		
	90-10	50-10	90-50	90-10	50-10	90-50
Prediction_2012				1.664	0.771	0.893
Prediction_2006	1.544	0.739	0.805	1.544	0.739	0.805
Prediction_1998	1.578	0.761	0.817			
Total Change	-0.034	-0.022	-0.012	0.120	0.032	0.088
Explained Composition Effect	0.001	0.007	-0.006	-0.027	-0.008	-0.020
	-2%	-32%	52%	-23%	-24%	-22%
Unexplained Wage Structure Effect	-0.005	0.006	-0.011	0.169	0.038	0.132
	15%	-25%	88%	142%	119%	150%
Constant	0.593	0.214	0.379	-0.140	-0.219	0.079
Reweighting error	-0.002	-0.001	-0.001	0.005	0.002	0.003
Specification error	-0.028	-0.034	0.006	-0.027	0.000	-0.027

Source: authors' calculations using ELMPS data, 1998, 2006, 2012

[22] and variants.
[23] Note that wage data are censored at the top end with the implication that tail inequality is underestimated here.

Table 3: Detailed Decomposition Results

	Reweighted Year 1998 -2006			Reweighted Year 2006-2012		
	90-10	50-10	90-50	90-10	50-10	90-50
Variables						
Prediction_2012				1.6635	0.7709	0.8926
Prediction_2006	1.5439	0.7390	0.8048	1.5439	0.7390	0.8048
Prediction_1998	1.5783	0.7612	0.8170			
Difference	-0.0344	-0.0222	-0.0122	0.1196	0.0318	0.0878
Constant	0.5931	0.2144	0.3787	-0.1404	-0.2189	0.0785
Explained (Composition Effect)						
Informal Private Sector	-0.0098	-0.0054	-0.0044	-0.0644	-0.0404	-0.0240
Formal private sector	-0.0063	-0.0042	-0.0021	-0.0046	-0.0037	-0.0009
Formal public sector	0.0343	0.0228	0.0114	0.0822	0.0550	0.0272
Education	-0.0038	-0.0039	0.0001	0.0028	0.0004	0.0024
Experience	-0.0079	-0.0048	-0.0030	-0.0164	-0.0077	-0.0087
Occupation	-0.0104	-0.0052	-0.0052	-0.0208	-0.0099	-0.0109
Region	0.0028	0.0074	-0.0046	-0.0013	0.0006	-0.0019
Economic activity	0.0020	0.0005	0.0015	-0.0045	-0.0018	-0.0026
Total	0.0008	0.0072	-0.0064	-0.0270	-0.0076	-0.0195
Unexplained (Wage Structure Effect)						
Informal Private Sector	-0.1790	-0.0263	-0.1527	0.3228	0.1705	0.1523
Formal private sector	-0.0215	-0.0159	-0.0057	0.0491	0.0277	0.0213
Formal public sector	-0.0923	-0.0315	-0.0608	0.2075	0.1148	0.0926
Education	0.0387	-0.0568	0.0954	0.1132	0.0602	0.0530
Experience	-0.0899	0.0055	-0.0954	-0.2061	-0.0669	-0.1391
Occupation	0.1446	-0.0638	0.2084	-0.0339	-0.0327	-0.0012
Region	-0.4042	-0.0364	-0.3679	-0.1022	0.0311	-0.1333
Economic activity	0.0054	0.0162	-0.0109	-0.0406	-0.0480	0.0073
Total	-0.0052	0.0055	-0.0107	0.1693	0.0378	0.1315
Reweighting error	-0.0018	-0.0007	-0.0011	0.0049	0.0018	0.0030
Specification error	-0.0282	-0.0342	0.0060	-0.0275	-0.0003	-0.0272

Source: authors' calculations using ELMPS data, 1998, 2006, 2012

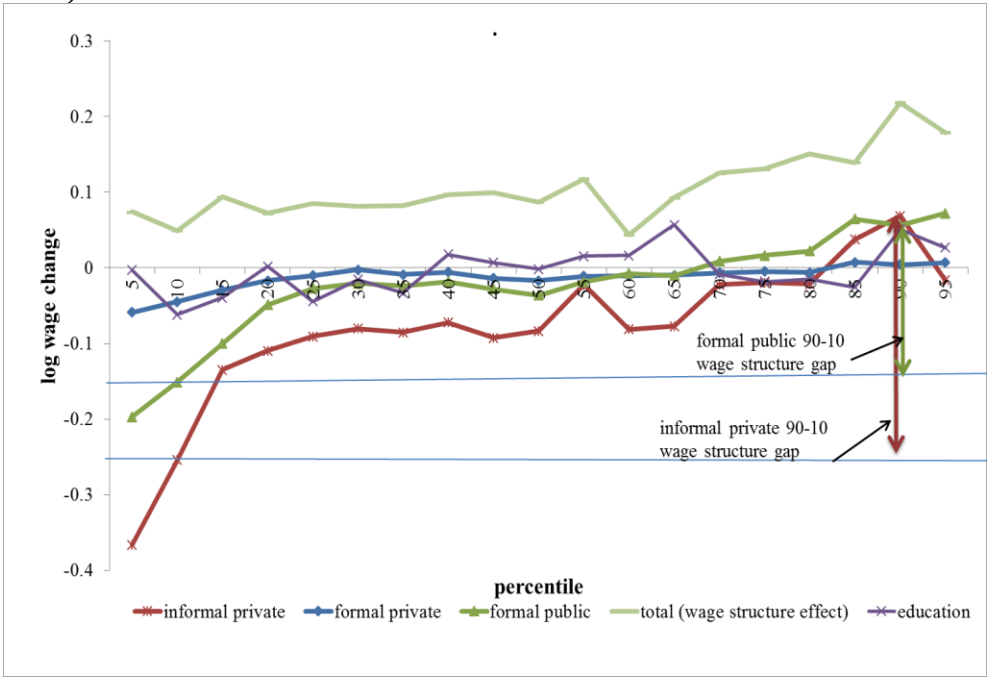
Detailed Decomposition Results

Wage Structure Effects and Wage Setting Dynamics

The wage structure effect (Table 3, Figure 5) for each sector/formality measure interaction can be interpreted as the change over time in the wage impact of a very small change in the measure holding the other covariates constant.[24] Sector and formality status alone are solely responsible for the entire return to characteristics or the *unexplained* wage structure effect on the three wage gaps for the period 2006-2012.[25] For example, the informal private sector accounts for around 270 percent (0.3228) of the total 90-10 wage gap effect, the formal public for 173 percent (0.2075) and formal private for 41% (Table 3, Figure 5). All sectors have an inflating effect on inequality with the informal private being the largest of the three compared to the reference category followed by the formal public.[26] This is consistent with the results in figure 3a where the gap of the RIF coefficients for the informal private sector between the two years (2006 red and 2012 blue) is largest for the lower percentiles and declines as we move across the wage distribution.[27] The same is true for the public formal sector. The returns to all other variables have a favorable effect on our inequality measures (negative signs in Table 3) with just a couple of exceptions.[28] The unexplained wage structure effect also known as the price effect provides insights as to differing returns to characteristics. Here referring to a different hourly wage for a worker with exactly the same characteristics of all other covariates except to which sector s/he is relegated.

[24] Equivalent to marginal effects.
[25] It is unexplained because it reflects the changes in the return to the same characterstics.
[2626] Note the bigger 90-10 wage structure gap of informal private compared to formal public.
[27] Note that the coefficients are declining between 2006 and 2012 throughout the entire distribution. That decline between the coefficients is largest at the lower end of the wage distribution.
[28] The exceptions are region where the wage structure effect is positive at the low-end gap (50-10) and economic activity where it is positive at the top-end (0.0073, Table 3).

Figure 5: Detailed Decomposition of Wage Structure Effect into Formality/Sector Status (2006-2012)



Source: authors' calculations using ELMPS data, 1998, 2006, 2012

Public Sector Wage Setting Dynamics

The explanation for the increasing wage gap along the distribution between the two years in the public formal sector is simple, wage raises are normally in percentage terms. For example, there have been 10% yearly wage increases through 2007-2009, a 20% increase in 2010 and a 15% yearly increase in both 2011 and 2012 (Abdelhamid and El Baradei 2010). There has also been other haphazard wage raises in the wake of the Arab spring in response to the loud voices of public sector employees. Since a percentage increase produces a larger absolute increase at the higher ends of the distribution (since the base wage is already larger than at the bottoms of the distribution) these percentage increases explain the large wage structure effect that causes the wage inequality we see at the lower-end, top-end and tails (90-10) wage gaps.

However, in the public sector these raises had a minimum cap to the increase at 30 Egyptian pounds for the 2010 raise and 36 pounds in the 2011 raise (*ibid.*) which should somewhat reduce these large inequality effects along the wage gaps. Nevertheless, these caps are still unable to counteract the whole effect. The following elaborates more on the private sector wage structure and wage setting dynamics.

The Informal and Formal Private Sector Wage Setting Dynamics

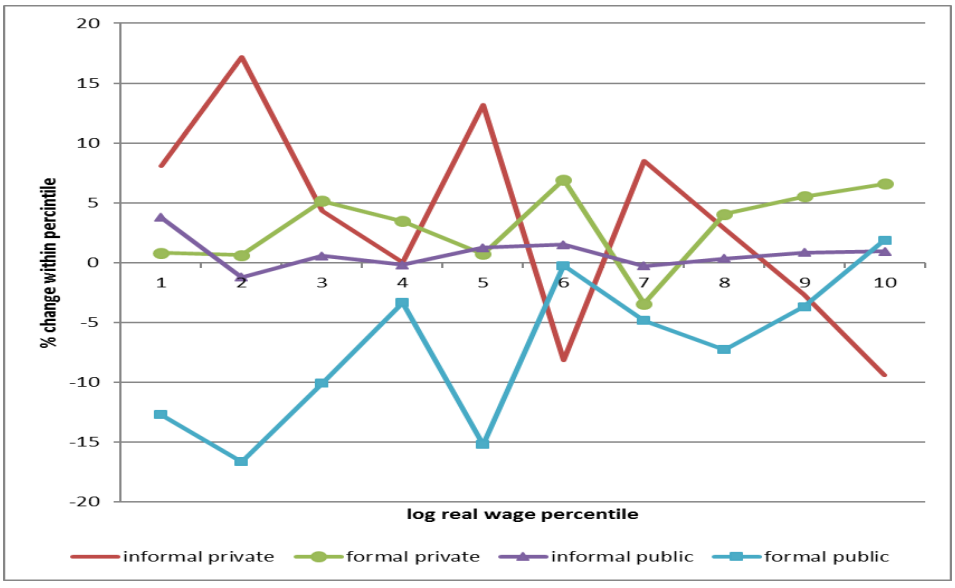
The informal private sector has a life of its own. Its wage setting dynamic adhere to free market principles which are inherently inequality-enhancing despite significantly lower wages compared to formal sectors (Figure A1 in the Annex).

Egypt's Structural Adjustment Program of 1991 (ERSAP) reversed the state-led development strategy and initiated a liberalization process. By 2003 Egypt froze all public sector hiring which caused the share of the public sector to shrink. Between 1998 to 2012 the formal public sector shrank by 16%.[29] Nevertheless, the formal private sector was only able to absorb 4% of those and the majority of created employment landed in the informal private sector. Together the formal public and the informal private capture more than 87% (92%) of the labor force in 2012 (1998) (Table 4, Table A1).

These changes reflect and are particularly relevant to the composition or share effect which is discussed in the following section, nevertheless they also impact the wage structure effect. The impact can be clearly seen when looking at the changed distribution formality/sector status within each wage percentile between 2006 and 2012 (Figure 6b). This change in the structure of each wage percentile can provide insights as to: 1) where along the distribution did the liberalization process induce competitive pressures; and 2) how did each labor market segment respond to these pressures according to its inherent wage setting behavior.

Figure 6: Sector/Formality Status Changes within each wage percentile

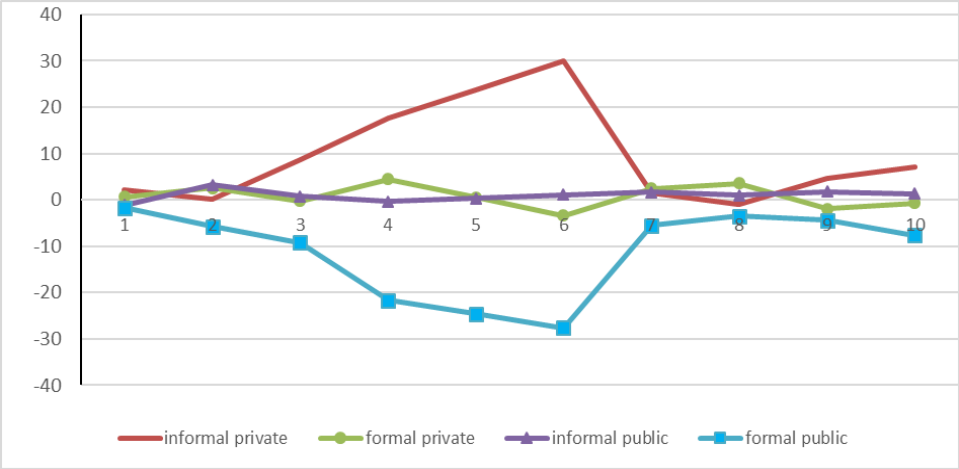
a. 1998-2006



Source: authors' calculations using ELMPS data, 1998, 2006.

[29] sample calculations

b. 2006-2012



Source: authors' calculations using ELMPS data, 2006, 2012

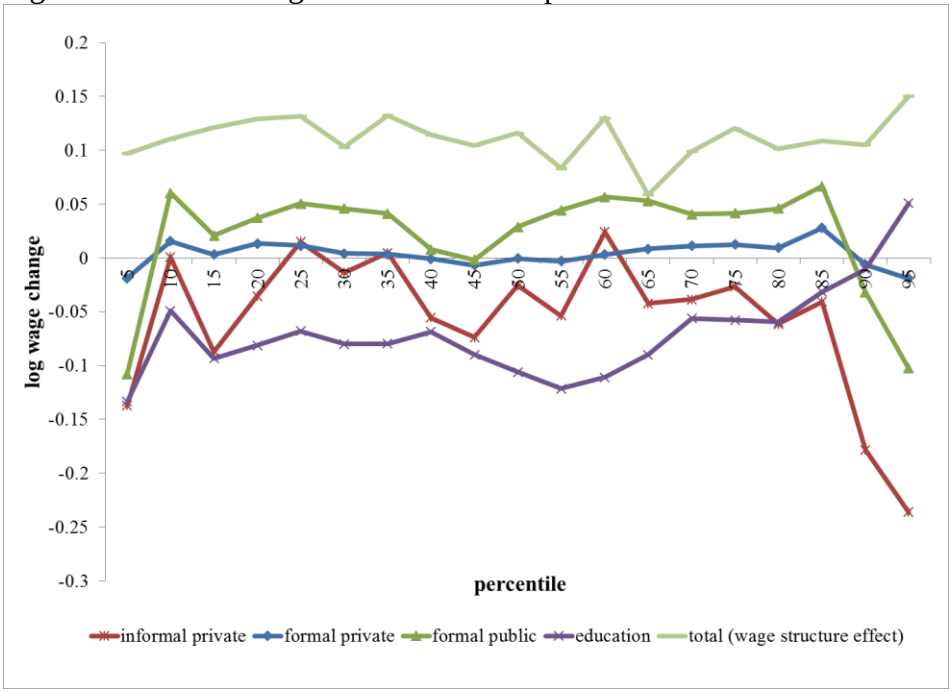
Figure 6a indicates first that during 1998-2006 the reductions in the share of the formal public sector were negatively related to wage percentiles. Thus, the larger reductions are at the lower-end followed by the middle percentiles and very limited reductions at the top-end of the wage distribution resulting in an excessive representation of the formal public sector at this higher end of the wage distribution .[30] Second, the reductions at the lower-end were entirely absorbed by the informal private sector. At the 20th percentile, for instance, there has been a reduction of 16.63 percent of the public sector share almost entirely absorbed by the informal private sector (17.21%, Figure 6a). On the other hand, the formal private shared its informal counterpart in hosting the middle-classes (r)ejected from (by) the formal public sector.[31] But in addition to that, the formal private absorbed the reductions in the top 20 wage percentiles that were shed by both the informal private and the public sector.

On average and abstracting from these specific labour movements along the distribution there has been a drop in the share of the public sector in the male labor force between 1998-2006 of nearly 7 percent from under half (46%) to ~39% (Table 1 in the Annex, Table 4). At the very beginning of the ERSAP this didn't place significant pressure on informal private sector wages, which also explains why the wage structure effect for 1998-2006 is negligible (Table 2[32], Figure 4a, Figure 7). But another 9% were shed by the formal public sector between 2006 and 2012[33] with the Egyptian middle-classes of the formal public sector moving out of the public sector mainly to be concentrated into the informal private (Figure 6b), placing as a result additional competitive pressure on the latter, suppressing mid and low-end wages and effecting the increase in inequality represented by the sharp wage structure effect we observe for that sector during the second period (Figure 5). The increased entrants to the informal sector pushed down its wages particularly for those with limited skills who are likely occupying the lower and middle-end of the informal private wage distribution. In addition to that, since the minimum wage is not enforced within the informal

[30] reductions are exactly from the 1st to the 80th percentiles.
[31] With the larger load of course falling onto the informal private.
[32] Wage structure effect is -0.005, 0.006 and -0.011 for the tails, lower-end and top-end gaps respectively.
[33] From 39% to 30%

private, this sector has significantly larger tails gap (90-10) compared to the formal public and even in contrast to the formal private (Figure 5).

Figure 7: Detailed Wage Structure Decomposition 1998-2006



Source: authors' calculations using ELMPS data, 1998, 2006

Table 4: Employment Evolution by Labour Market Segment

Formality/Round	1998	2006	2012
Formal Public			
number	1822	2357	2485
% in all male waged	45.68	38.56	29.66
Formal Private			
number	258	589	763
% in all male waged	6.72	9.76	10.71
Informal Public			
number	48	125	254
% in all male waged	1.29	2.05	3.04
Informal Private			
number	1614	2874	4878
% in all male waged	46.30	49.62	56.58

Source: authors' calculations using ELMPS data, 1998, 2006, 2012. Note: sampling weights applied. There are 34 missing public hourly wage observations in 1998, 25 in 2006, and 4 in 2012

With respect to the wage structure of the formal private as indicated above it is also inequality enhancing though at a less pronounced rate (Table 3, Figure 5). This is so because its slim entrants were mostly concentrated in the mid to upper distribution segments (Table 3, Figure 6a), thus relatively limiting the increases to their wages, accordingly limiting the wage structure effect for that sector. Additionally, in contrast to the informal private the minimum wage is implemented in this sector thus limiting the dispersion of its distribution. The minimum wage was set before 2010 at LE35 but was raised to LE700 starting 2010.

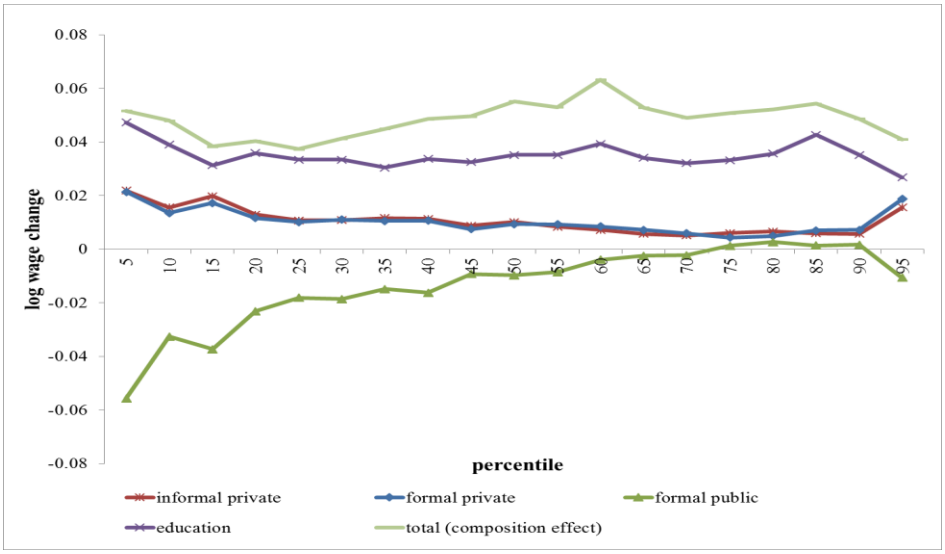
In principle, liberalization introduces additional competition in the market. In a healthy economy, these changes allow more low-paid people to enter the (private) labor market and the highly skilled to reap more benefits from a greater dynamic economy, thus widening wage disparities (OECD 2011). Returns to characteristics or wage effects do show a slightly increasing trend for education and more so as of the 85th percentile (Figure 5) which do complement the increasing informal private wage structure effect and the much smaller formal private one. For the earlier period, 1998-2006, one can clearly recognize the skill or education premium after the 50th percentile. But then again the value is quite modest.

Composition or Share Effect

The very small composition or share effect is very slightly decreasing inequality along the wage distribution of 2006-2012 and along the top-end of the 1998-2006 distribution (the 90-50 gap of that period is -0.0064). On the other hand, it very slightly increases inequality at the lower end (50-10 gap= 0.0072; Table 3, Figure 4, Figure 8).

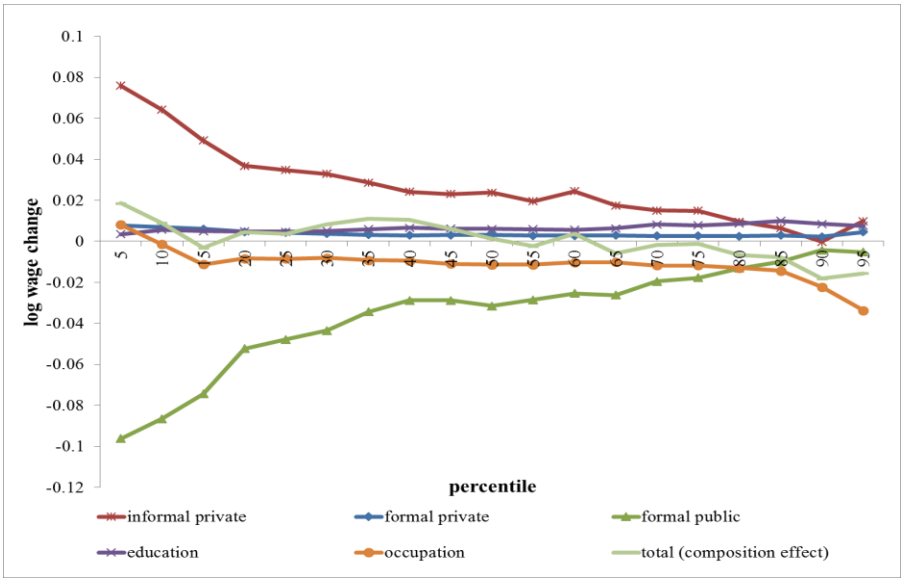
Figure 8: Detailed Decomposition of Composition Effect Selected Covariates

a. 1998-2006



Source: authors' calculations using ELMPS data, 1998, 2006

b. 2006-2012



Source: authors' calculations using ELMPS data, 2006, 2012

Composition effects are linked to changes in the shares of our covariates over time holding the returns to the covariates constant. As described above there have been reasonably large movements in the labor market triggered by the market liberalization process. With nearly 60% of the male labor force, the informal private sector becomes the largest employer followed by the formal public sector. Together they capture more than 87% (92%) of the labor force in 2012 (1998).

The effect of the decline of the share of the public sector increases inequality at all ends of the distribution but more at the lower-end (the 50-10 gap). This is consistent with our earlier results, the unconditional quantile regression coefficients indicated that compared to the reference category the formal public sector reduces inequality along the distribution at any one year [34] (Figure 3a). Since the lower and middle classes were the ones that predominantly moved out of the sector (Figure 6 and Figure 8) they lost this equality enhancing trait. The same is true of the informal private sector whose RIF coefficient is also negatively sloped. But because labor moved towards it particularly in the lower ends of its wage distribution, this movement resulted in an improvement of inequality (note the negative slope in Figure 8). And so the informal private accounts for -54% of the total change of the 90-10 gap and -127% of the 50-10 gap (Table 3). Accordingly, the composition effect of the informal private goes in the other direction to the composition effect of the public sector. As a result, the informal private and formal public composition effects more or less cancel each other out in nearly all three gaps for both samples (Figure 8). Since the composition effect of the informal private is weak, it is unable to counteract its strong positive wage structure effect on inequality.

Note that in the Oaxaca-Blinder decomposition, the effects on the 90-50 gap can be obtained directly by multiplying the 8.9% decline in the formal public sector share between 2006 and 2012

[34] as it was negatively sloped

(Annex Table A1) by the RIF regression estimates of the formal public sector effect for 2006[35] (Table 1), which is the value at the 50th percentile in Figure 8b for the formal public sector for example.

5. DISCUSSION AND CONCLUSION

Wage changes between 1998-2012 were mainly in the direction of increasing inequality. The richer percentiles have persistently enjoyed disproportionately larger positive changes in real hourly wages. The increase in inequality mostly occurred between 2006 and 2012 which saw the greatest period of increasing wage dispersion.

We have analyzed three gaps: the top-end 90-50 gap; the low-end 50-10 gap and the 90-10 gap. Inequality has increased in all three gaps during 2006-2012 but mostly in the 90-10 gap indicating increased inequality along the entire distribution, more accurately between the lowest and highest wage earners. This increasing inequality is primarily driven by the unexplained wage structure effect. The FFL inequality decomposition shows that the formality/sector interaction covariate is first and foremost responsible for the increased inequality trend accruing in this second period.

The direction of intertemporal changes in wages is affected by two broad factors: (1) emerging competitive pressures, and (2) wage setting dynamics within the different labour market segments. The latter not only determines the nature of temporal wage raises but also determines the degree to which each of these segments is able to respond to these pressures, i.e. its flexibility. These two factors mean that the informality of the private sector is the largest contributor to the increase in inequality brought about by the wage structure effect. Employees of the informal private sector are penalized twice over. First, the sector does not apply a minimum wage. And second, all Egyptian low and middle classes who departed from the public sector entered the informal private labour market thus placing severe competitive pressure on the sector. Because this sector is the least regulated, these trends allowed the suppression of mid and low-end informal private sector wages resulting in =the increase in inequality shown in the sharp increase in inequality along the entire distribution resulting in substantial wage gaps, especially at the tails of the distribution.

Formality has a nuanced effect depending on sector. The formal public sector is a major source of wage inequalities partly on account of its more regulated and political nature.[36] Workers in this sector enjoy the greater[37] percentage annual pay raises. Additionally, since liberalization there has been a bias in this sector towards the top segments of its wage distribution as well as a concentration of the formal private's new entrants in its mid to upper distribution segments. The large size of the public formal sector meant that these features and movements resulted in greater public sector wage dispersion compared to the small formal private sector, limiting thus the

[35] 8.9%*0.307= 0.027323

[36] All Egyptian governments have feared the social unrest of the public sector. In addition, because unlike the private sector it is entirely under the purview of government it has always been favoured in terms of wage raises.

[37] We have not found concrete information on actual pay raise systems in the private sector. This statement is induced by the trends we observe in our data here.

strength of the latter's wage structure effect compared to that of the public formal through 2006-2012.

The results point to two important findings. Firstly, in contrast to expectations and contrary to general evidence from around the world (OECD 2011),[38] wage setting dynamics of the Egyptian public sector and the direction of labour movements since liberalization cause the sector to contribute much more to wage inequality than does its formal private counterpart. And, secondly, the unregulated informal private sector is the largest contributor to real wage inequality. So what can we make of these results to contribute positively to policy recommendations?

First, are policy inferences pertaining to the minimum wage. In a setting where the majority of the labour force[39] is outside the formal sector, the minimum wage becomes an instrument that increases inequality not one that reduces it. More than 75% of the informal labour force earn less than the minimum wage. So increasing this minimum wage further, as was done in 2014, and may be repeated again in the near future. Only increases the wages of those who already earn more than about half the wage force. Although not the main focus of this study, it showed that the public sector enjoys the highest wages in the country already (Graph A1). In other words, there is a "public sector wage premium". The second undesirable effect is that a higher minimum wage makes it harder for the formal private to compete. As a result, the sector will respond by de-formalization as it did before after 2003 when the government froze public sector hiring (Devarajan and Vishwanath 2014). The same argument applies to annual wage increases in the public sector.

There are a number of recommendations based on these shortcomings to public sector wage setting dynamics. First, the government could follow the example of the UK in response to discovering the rising inequality gap and the relatively higher public sector wages compared to those in the private sector. Since then most UK public sector workers have been subject to either a pay freeze or only a 1% pay rise per annum in the past 7 years which resulted in an average 12 percent decline in their real wages over the period (Rogers 2012).

Second is to target working on the effective "informal sector minimum wage" by implementing self-targeted public works programs similar to those supported by the National Rural Employment Guarantee Act (NREGA) in India. This law guaranteed at least 100 days of waged work to every rural household whose adult members volunteer to do unskilled manual work with a guaranteed minimum wage to both men and women. If work was not provided within 15 days of application, applicants are entitled to unemployment allowance. Thus employment under the scheme is a legal entitlement. This program enhanced livelihood security in rural areas, built rural infrastructure (e.g. roads, canals, ponds and wells), protected the environment, reduced rural-urban migration (by creating rural employment), empowered women and closed the gender pay gap in rural areas (Dreze and Khera 2009). Most relevant to this paper is the effect on the informal sector's minimum

[38] That show that liberalization effects very large dispersions in the formal private sector and brings about increased inequality with some exceptions like Brazil, Indonesia and Argentina (OECD 2011).
[39] If you were to add to this the self-employed this point will be even more powerful.

wage. Now that this scheme became law the informal private had to compete with this program for low-skill labour thus forcing the unregulated informal private sector to increase its own wage rate.

In the longer term, as programs like NREGA thus remove some of the observed wage inequality and are able to eliminate part of the instability feature of informal jobs and reduce their wage penalty, they may also lead to the ability of informal labour to accumulate human capital. This in turn will enable wage progression thereby breaking the current low skill-low wage trap inertia or informality trap. Perhaps they may also strengthen the "tunnel effect" allowing some inequality to be tolerated until development and growth trickle down.

The other policy direction is formalization of the informal sector, thus bringing it within minimum wage legislation. Yet businesses will only take this step if the benefits outweigh costs. That is currently partly not the case for many of them precisely because the low skills of labour cannot support high wages. Hence, a transformation of labour skills, supported by stronger educational underpinnings, become long run policies to reduce inequality.

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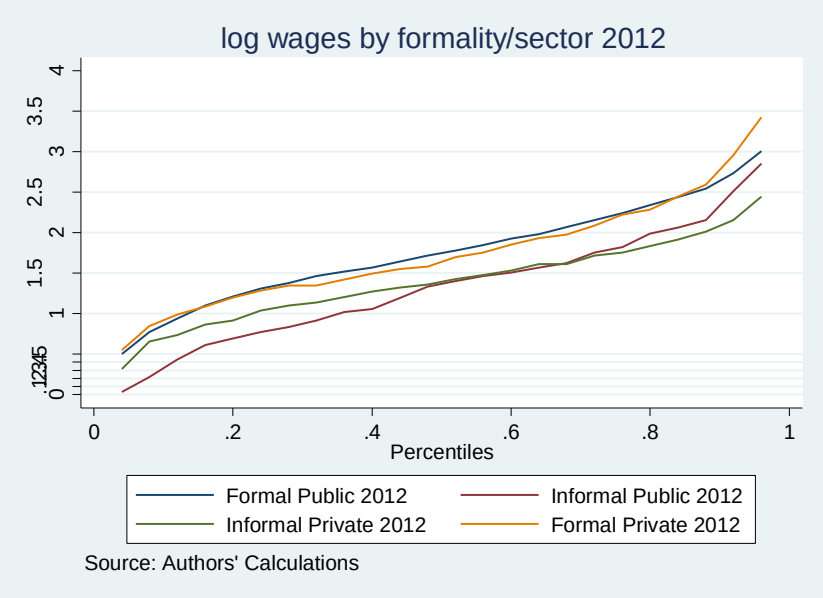
Annex:

Table A1: Descriptives

	1998		2006		Difference in Means (2006-1998)	2012		Difference in Means (2012-2006)
	Mean	Standard Deviation	Mean	Standard Deviation		Mean	Standard Deviation	
Log wages	1.256	0.635	1.426	0.668	0.170	1.543	0.707	0.116
Age	35.757	12.023	35.306	11.655	-0.451	35.486	11.072	0.180
Formality and Sector								
Informal & private sector	0.463	0.499	0.496	0.500	0.033	0.566	0.496	0.070
Formal & private sector	0.067	0.250	0.098	0.297	0.030	0.107	0.309	0.010
Informal & public sector	0.013	0.113	0.021	0.142	0.008	0.030	0.172	0.010
Formal & public sector	0.457	0.498	0.386	0.487	-0.071	0.297	0.457	-0.089
Education								
Illiterate	0.325	0.468	0.237	0.425	-0.088	0.197	0.398	-0.040
Less than intermediate	0.202	0.402	0.179	0.383	-0.024	0.188	0.391	0.010
Intermediate	0.250	0.433	0.343	0.475	0.092	0.371	0.483	0.029
Above intermediate	0.062	0.241	0.051	0.221	-0.011	0.040	0.197	-0.011
University & higher	0.161	0.368	0.191	0.393	0.029	0.203	0.402	0.012
Years of experience								
less than 5years	0.163	0.370	0.143	0.350	-0.020	0.116	0.321	-0.027
5-9	0.146	0.353	0.173	0.378	0.027	0.168	0.374	-0.005
10-14	0.147	0.354	0.157	0.364	0.010	0.172	0.377	0.015
15-19	0.123	0.328	0.129	0.335	0.006	0.151	0.358	0.022
20-24	0.111	0.314	0.109	0.312	-0.002	0.124	0.329	0.015
25+	0.310	0.463	0.289	0.453	-0.022	0.269	0.443	-0.020
Occupations								
Managers	0.048	0.214	0.040	0.197	-0.008	0.036	0.185	-0.005
Professionals	0.159	0.366	0.155	0.362	-0.004	0.139	0.346	-0.015
Technicians and associate professionals	0.066	0.249	0.103	0.304	0.036	0.097	0.296	-0.006
Clerical support workers	0.073	0.260	0.046	0.210	-0.026	0.031	0.174	-0.015
Service and sales workers	0.169	0.374	0.186	0.389	0.018	0.125	0.331	-0.061
Skilled agricultural, forestry and fishery workers	0.113	0.317	0.091	0.287	-0.022	0.106	0.307	0.015
Craft and related trades workers	0.265	0.441	0.236	0.424	-0.029	0.238	0.426	0.002
Plant and machine operators, and assemblers	0.078	0.269	0.103	0.303	0.024	0.136	0.343	0.033
Elementary occupations	0.029	0.168	0.041	0.197	0.011	0.092	0.289	0.052
Economic activity								
Agriculture & Mining	0.129	0.335	0.107	0.309	-0.022	0.112	0.315	0.005
Manufacturing	0.203	0.403	0.181	0.385	-0.022	0.171	0.376	-0.011
Construction	0.115	0.319	0.127	0.333	0.012	0.161	0.368	0.034
Trade	0.088	0.283	0.101	0.302	0.013	0.106	0.308	0.005
Transport	0.080	0.271	0.102	0.303	0.022	0.093	0.290	-0.009
Services, electricity and finance	0.385	0.487	0.382	0.486	-0.003	0.357	0.479	-0.025
Region								
Urban	0.473	0.499	0.473	0.499	0.0004	0.445	0.497	-0.029

Source: authors' calculations using ELMPS data, 1998, 2006, 2012.

Graph A1: Wages per formality/sector status 2012



Source: authors' calculations using ELMPS data, 2012.