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Abstract

Over the past two decades, Egypt has undergone substantial economic and political transformations that have directly influenced labor market outcomes, particularly in terms of wages and earnings. In this paper, we analyze the patterns and dynamics of wage inequality in Egypt from 2006 to 2021. Our findings show that real wages exhibit an upward trend over the period 2006-16, followed by a decline after the floating of the national currency. They also experience a phase of stagnant inequality prior to 2016 and an overall decline over the entire period. Using an intertemporal decomposition approach based on a generalization of the Oaxaca-Blinder decomposition method, we find evidence that the observed changes in wage inequality are mainly driven by changes in returns to demographic and labor market characteristics (wage structure effect). The detailed decomposition of the Gini coefficient reveals that, only for the pre-Arab Spring period, changes in returns to education significantly contribute to the decline of wage inequality in Egypt. This implies that implementing improved redistributive policies primarily focused on elevating educational levels is crucial to sustaining these trends over an extended period. In other words, policies that specifically target educational advancement can play a key role in ensuring the longevity of these positive trends.

Keywords: Gini coefficient, Wage inequality, OB decomposition, Egypt.

JEL Classifications: D63, I31, J31.

ملخص

على مدى العقدين الماضيين، شهدت مصر تحولات اقتصادية وسياسية كبيرة أثرت بشكل مباشر على نتائج سوق العمل، لا سيما من حيث الأجور والأرباح. في هذه الورقة، نحلل أنماط وديناميات عدم المساواة في الأجور في مصر من عام 2006 إلى عام 2021. تظهر النتائج التي توصلنا إليها أن الأجور الحقيقية تظهر اتجاهًا تصاعديًا خلال الفترة 2006-2016، يليه انخفاض بعد تعويم العملة الوطنية. كما أنهم يعانون من مرحلة من ركود عدم المساواة قبل عام 2016 وانخفاض عام على مدار الفترة بأكملها. باستخدام نهج التحلل الزمني القائم على تعميم طريقة تحلل أوكسكا بليندر، نجد دليلاً على أن التغييرات الملحوظة في عدم المساواة في الأجور مدفوعة بشكل أساسي بالتغيرات في عوائد الخصائص الديموغرافية وسوق العمل (تأثير هيكل الأجور). يكشف التحلل التفصيلي لمعامل جيني أنه، فقط في فترة ما قبل الربيع العربي، تساهم التغييرات في العائدات إلى التعليم بشكل كبير في انخفاض عدم المساواة في الأجور في مصر. وهذا يعني أن تنفيذ سياسات إعادة التوزيع المحسنة التي تركز بشكل أساسي على رفع المستويات التعليمية أمر بالغ الأهمية للحفاظ على هذه الاتجاهات على مدى فترة طويلة. وبعبارة أخرى، يمكن للسياسات التي تستهدف تحديدا النهوض بالتعليم أن تؤدي دورا رئيسيا في ضمان طول عمر هذه الاتجاهات الإيجابية.

1. Introduction

While global inequality has been declining since the 1990s, inequality within countries has been increasing, particularly in advanced economies. The majority of Organisation for Economic Co-operation and Development (OECD) countries have witnessed a rise in inequality since the 1980s (OECD, 2011). Income inequalities in emerging economies show a similar increasing trend, with levels higher for some countries than in the five most unequal OECD countries (Balestra et al., 2018 (Dominican Republic, Ecuador, Panama, Paraguay, Peru, and Uruguay); Lee and Wie, 2015 (Indonesia); Han et al., 2012 (China); Gourdon, 2011; Tridico, 2010; Chao et al., 2006; Kijima, 2006 (India)). This rise in inequality has been attributed to factors such as globalization, commodity price cycles, and domestic economic policies. The increasing disparity has resulted in social discontent, weakened trust in public institutions, and undermined democratic stability in some countries.

Conversely, income inequality in the MENA region, on average, is believed to be relatively low in relation to the region's income per capita (Simson and Savage, 2019). In a recent study using harmonized micro-data from household surveys for 12 countries in the Arab region, Hassine (2015) identifies no generalizable trend across the region, with increases in Syria, Yemen, Djibouti, and Palestine, and decreases in Egypt, Jordan, and Tunisia. In this context, a broad literature has established a connection between income inequality and the Arab Spring uprising (Ianchovichina et al., 2015).

There is fairly compelling evidence from the literature that the predominant and most influential factor driving these trends has been the inequality in wages and salaries. Explicitly, changes in wages (specifically hourly wage rates) and their differentials among people and social groups emerge as key determinants of income inequality in most countries (55-63 percent on average) (OECD, 2011). In this context, Castelló-Climenta and Doménech (2017) use an updated dataset on human capital inequality spanning 146 countries from 1950 to 2010 to find, on average, a statistically significant estimated contribution of wage inequality to income inequality, exhibiting relative stability from 1980 onwards and bearing economic relevance. They find that each unit change in the Gini coefficient of wages contributes to, on average, a half-point change in the Gini coefficient for income.

Focusing on the period 1998-2012, El-Haddad and Gadallah (2021) demonstrate that equality in Egypt has consistently deteriorated, where the wealthier percentiles (top percentiles) have consistently experienced disproportionately larger positive changes in real hourly wages. While overall prosperity has increased, the growth has been disproportionately favorable for high-wage earners, particularly within the top half of income distribution (top 50 percentiles). Throughout this period, the authors find that the Gini coefficient has risen by 21 percentage points, reaching 0.43 in 2012. Similarly, they find that the 90/10 ratio has increased by just under 13 percent, reaching 5.3. However, upon examining the temporal progression more closely, El-Haddad and Gadallah (2021) reveal that the later period from 2006 to 2012 is responsible for the overall increase in wage inequality during the entire span.

In this later period, inequality steadily rises across the wage distribution, contrasting with the preceding period from 1998 to 2006, where wage increases remain stable across the distribution, resulting in a (more or less) stagnant level of inequality. Notably, during the later period, wage inequality exhibits a much higher rate of increase at the top of the distribution compared to the bottom.

Limited literature (Cho and Newhouse, 2013; Roushdy and Gadallah, 2011) has focused on the effects of the global economic crisis in emerging and transition economies. In this context, Said (2015) uses four national labor market surveys to investigate the patterns and dynamics of wage inequality in Egypt throughout 1988-2012, a period marked by economic liberalization, political crises, and some social tensions. The author highlights some important findings. First, despite overall income inequality in Egypt remaining relatively stable, there was a marginal increase over time followed by a decline in 2012. Second, the returns on education experienced a decline over the specified period. Third, moderate increases in real wages were insufficient in reversing the increasing trend of the share of low earners in the labor market. Finally, the prevailing wage and inequality patterns bear out the worsening conditions within the Egyptian labor market, particularly for females employed in the private sector and university graduates in the era of financial crises and social upheaval.

In a second paper, Said et al. (2022) confirm that changes in earnings distribution have been the main contributor to the rise of income inequality in the country, mainly over the period 2012-18. During the last two decades, Egypt experienced a number of political and economic changes that led to changes in labor market conditions and altered the country's macroeconomic stability. In response to these drastic changes, the government recently implemented some policies, such as narrowing the fiscal deficit, cutting subsidies, and floating the national currency, which caused a devaluation of more than 50 percent and a rise in inflation (El-Haddad and Gadallah, 2018). Such policies have left their mark on salaries. Overall, the average real wages have been declining over time, while wage inequality has been on the rise in the last decade, particularly among the low-educated and those employed in the private sector (Said et al., 2022). Individuals' background characteristics are found to contribute to such a rise in wage inequality, though this appears quite stable over the considered period.

The literature extensively discusses the factors contributing to the increasing wage inequality with a special focus on education as a prominent determinant (cf. Wahba, 1996; Lopez-Acevedo, 2006; OECD, 2011; Tansel and Bodur, 2012). Studies indicate a positive correlation between higher educational attainment and corresponding remuneration. In 2012, 20 percent of male wage workers were university graduates, while an equivalent proportion were illiterate. There was a significant disparity in the median real monthly wages between these two groups, with illiterates earning EGP 780 compared to EGP 1,200 for university graduates (El-Haddad and Gadallah, 2018; Said, 2015). Despite a recognized wage premium for higher education in Egypt, the trajectory of educational wage premiums has witnessed a discernible decline across all groups over time (Said, 2002), extending into 2012 as shown by

El-Haddad and Gadallah (2021). Recognizing the importance of education as an explanatory variable, it is crucial to consider the economic sector in investigating the wage inequality in the Egyptian labor market. Within Egypt's state-led development model, the guarantee system in the public sector created more incentives for higher education graduates to concentrate in that particular sector (Assaad, 1997; El Ghamrawy and Amer, 2011). This specific concentration has the potential to mitigate the impact of education on wages in the private sector.

In this study, we attempt to explore trends in wage inequality in Egypt over the period 2006-21 by asking two main questions. First, what are the main features of the changes in wage inequality in Egypt? Second, which are the most influencing factors including gender- and sector-based wage differentials that may explain such changes in labor income inequality? To answer these questions, the paper employs an intertemporal decomposition approach based on the generalization of the Oaxaca-Blinder decomposition proposed by Firpo et al. (2007) and a comprehensive series of datasets collected in Egypt over the period 2006-21.⁴ The data, drawn from the 16 waves of the Labor Force Survey (LFS), enable us to provide a descriptive analysis of the levels of wage inequality over time. Building on this, and maintaining the equality of opportunity paradigm, the paper explores the extent to which changes in demographic and labor market characteristics can explain the observed wage inequality changes in Egypt during the recent two decades.

The Egyptian case is unique and illustrative for several reasons related to the significant political and economic changes that began in 2011 with the fall of Hosni Mubarak's regime and the floatation of the national currency in 2016. To the best of our knowledge, this is the first paper that investigates the changes in some wage inequality statistics such as the Gini coefficient and inter-quintile differences in Egypt over the period 2006-21 using an intertemporal decomposition approach to better identify the factors driving the observed changes in both the wage structure and composition effects.

The rest of the paper is structured as follows. Section 2 presents a brief analysis of the main trends in wage inequality in Egypt. Section 3 outlines the data and methods used in this study. Section 4 summarizes the main results, and section 5 presents the conclusions along with some policy recommendations.

2. Key overall trends in wage inequality in Egypt

Over the past decades, Egypt has implemented substantial economic policy changes in response to major global and domestic events, such as the global financial crisis in 2008, the Arab Spring in 2011, and the COVID-19 pandemic in 2020. To address these challenges, certain economic reforms were introduced as part of an International Monetary Fund (IMF) package beginning in 2014. These reforms, which included subsidy reductions, tax adjustments, and the decision to

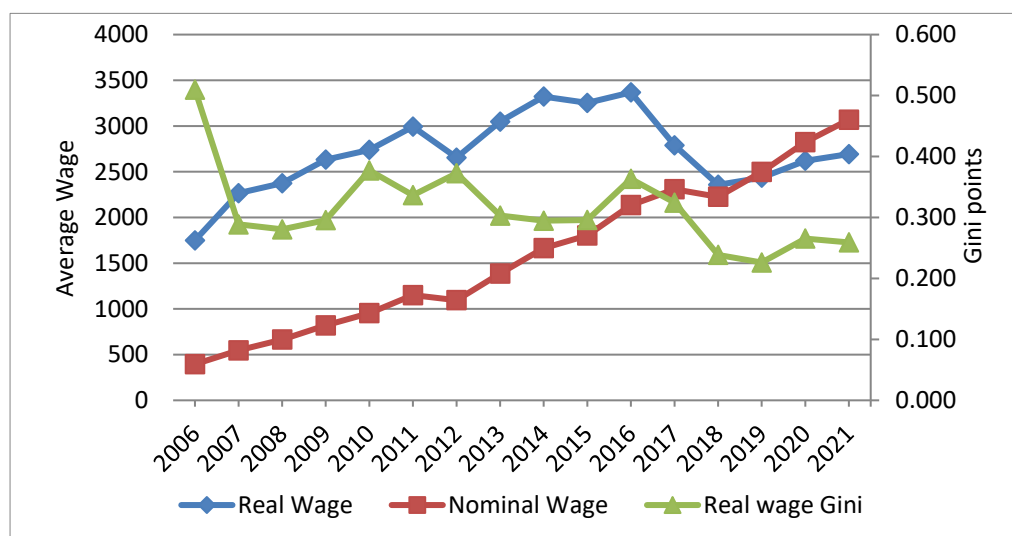
⁴ The data are publicly available on the Economic Research Forum Open Access Micro Data Initiative (OAMDI): www.erfdataportal.com. See Krafft, Assaad, and Rahman (2019) for more information on the different Egyptian Labor Market Panel Surveys (ELMPSs).

float the Egyptian pound in 2016, aimed to tackle fiscal imbalances and promote a more equitable economic environment by enhancing competitiveness. However, these reforms, along with concurrent political and economic changes, have led to considerable alterations to the country's labor market conditions and macroeconomic stability. This is notably evidenced by a substantial increase in the inflation rate, reaching 23.3 percent in 2016/17 and 21.6 percent in 2017/18 (El-Haddad and Gadallah, 2021). Given these prevailing conditions, it is useful to understand the principal trends in Egypt's labor market over the considered period.

Throughout the entire 2006-21 period, a notable upward trend in average nominal wages is observed, with slight and brief decreases occurring in 2011/12 and 2017/18. Due to a relatively stable inflation rate of around 10 percent from 2006 to 2016—except for 2008 when it rises to approximately 18 percent—real wages consistently follow a comparable increasing trend (see Figure 1). Following the floatation of the national currency in 2016, a sharp increase in the inflation rate occurs, reaching its peak at about 30 percent. Consequently, average real wages experience a significant decline until 2018, followed by a slight increase during the subsequent period, albeit at a slower pace compared to the changes in nominal wages. This deceleration can be attributed to the rising trend in the inflation rate from 2019 to the end of the period.

Figure 1 further reveals that the period of rapid wage growth, both in nominal and real terms, extends until 2016. This coincides with a relatively stable Gini coefficient, ranging between approximately 0.3 and 0.4, except for the year 2006 when the wage Gini coefficient for salaried workers reaches its highest value at 0.50. A period of stable wage inequality is depicted then until 2016. After this year, with the rapid decline in real wages and a sharp increase in the inflation rate, the Gini coefficient drops below 0.3 and remains low throughout the remaining period. This decrease in the Gini coefficient may be interpreted as a reduction in wage inequality during this period.

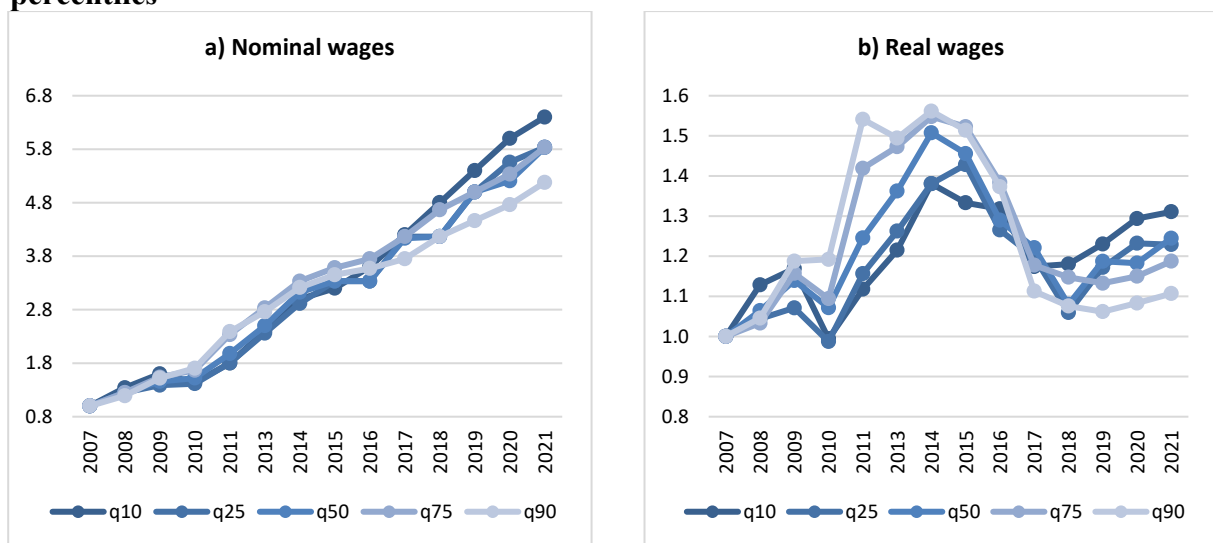
Figure 1. Nominal and real wage and Gini inequality trends



Notes: Real wages are deflated using 2018/19 as the base year.
Source: Authors' own calculations based on the 2007-21 LFSs.

Figures 2a and 2b depict the dynamics of nominal and real wage percentiles in the Egyptian labor market from 2007 to 2021, with 2007 serving as the base year. A thorough analysis of these trends offers a nuanced perspective on the changing wage landscape in Egypt. Notably, Figure 1a illustrates a general uptrend in wages across all percentiles over the considered period. However, distinct variations emerge in the pace of wage growth among different percentiles, particularly becoming pronounced after 2016. The figure indicates that the bottom 75 percent of wages experience a similar upward trajectory in wage growth. In contrast, wages at the upper end of the distribution demonstrate comparatively lower growth over the same period.

Figure 2. Trend of nominal and real wages, cumulative growth since 2007, for selected percentiles



Notes: Real wages are deflated using 2018/19 as the base year.
 Source: Authors' own calculations based on the 2007-21 LFSs.

Figure 2b shows fluctuating patterns in real wage growth over the specified period. Initially, from 2007 to 2009, there is a general increase in real wages across percentiles. However, in the subsequent years, a diverse pattern emerges as most percentiles experience fluctuations, occasionally undergoing declines and increases in real wages, reaching their peak between 2011 and 2016 (the post-revolution period), primarily influenced by the fluctuating inflation pattern. Starting 2018, the figure shows an overall increase in wage levels, with the most significant growth seen in the lower half of wage distribution, especially the bottom percentile, while the top percentiles tend to experience a smaller increase. Notably, the 90th percentile shows the least change during this period. The two figures reveal that while nominal wages consistently increase (as seen in Figure 2a), the real wage growth depicted in Figure 2b provides a more nuanced perspective, considering inflation and changes in the cost of living. Together, these figures facilitate a comprehensive understanding of wages in both nominal and real terms, offering valuable insights into the distributional shifts within the labor market.

3. Data and methodology

3.1 Data

This paper makes use of publicly accessible and nationally representative LFSs⁵ conducted annually by the Central Agency for Public Mobilization and Statistics (CAPMAS) for the years 2007-21. Despite variations in sample design, sample size, and survey structure over the years, the available information remains applicable for making inferences at the national level. To ensure a representative sample of the national labor force and enhance comparability across years, we refine the sample by including adults aged 15 to 64 classified as wage or salary workers in their primary jobs. Individuals who are self-employed or employers are not included in our analysis, and income from capital, land, and entrepreneurship is not considered.

Following several studies on labor market dynamics in Egypt (Said et al., 2022; El-Haddad and Gadallah, 2021; Said, 2012, among others), we focus specifically on log hourly wages rather than overall income or total earnings due to their significant contribution to overall earning inequality (Haddad and Gadallah, 2021). Notably, variations in hourly wage rates emerge as the predominant factor influencing the magnitude of inequality in gross earnings among workers in numerous countries. On average, these fluctuations explain between 55 percent and 63 percent of the observed inequality in earnings (OECD, 2011).

Table 1 presents a statistical summary of demographic and labor market characteristics across different year groups. The analysis reveals notable changes in the composition of the labor force. Female labor force participation increases over time, rising from 16.7 percent in the early years to 23 percent in the middle period, then slightly declining to 19.4 percent in the latest period. Although the age structure of the labor force shows minor changes, there is a discernible trend indicating a slight aging compared to the first period. Furthermore, the average education level, as proxied by years of schooling, witnesses a clear upward trend, particularly in the last period, where the average reaches 11.21 years.

On average, approximately 61.4 percent of the labor force is initially enrolled in social security, with an increase to 75.1 percent in 2013-16, followed by a decrease to around 60 percent in the latest period. A similar pattern is observed in the share of workers in the public sector, which increases from about 6.3 percent to 8.6 percent in the middle period and decreases to approximately five percent in the latest period. Another significant consideration is the rising percentage of full-time workers, exhibiting an upward trend from about 71.2 percent in the first period to approximately 90 percent in the latest period.

⁵ LFSs were conducted from 2006 to 2022 to analyze employment outcomes. The surveys in Egypt have been ongoing since 1957 and were initially conducted quarterly, biannually, and annually by CAPMAS. In 2006, improvements were made, focusing on using panel samples to monitor dynamic labor market changes and enhancing the questionnaire to better characterize household members' relationships to the labor force. The survey's primary goals include measuring the size of the Egyptian labor force, assessing national employment rates, and understanding the distribution of employed and unemployed individuals based on various characteristics such as gender, age, education, occupation, economic activity, and sector. The data has been cleaned and harmonized by the ERF as part of a project that started in 2009.

Table 1. Statistical summary

	2007-08	2009-11	2013-16	2017-19	2020-21
Age	36.784	37.930	39.513	40.018	38.615
Gender					
Male	97,079 (83.3%)	115,113 (79.2%)	139,186 (77.0%)	101,617 (78.9%)	64,630 (80.6%)
Female	19,508 (16.7%)	30,215 (20.8%)	41,650 (23.0%)	27,238 (21.1%)	15,527 (19.4%)
Schooling	9.323	10.912	11.138	10.931	11.210
Tenure in Main Job	13.124	13.468	13.710	12.792	11.283
Sector of Employment					
Government	47,731 (40.9%)	71,991 (49.5%)	85,123 (47.1%)	54,593 (42.4%)	29,710 (37.1%)
Public Sector	7,304 (6.3%)	9,822 (6.8%)	15,528 (8.6%)	8,421 (6.5%)	4,001 (5.0%)
Private Sector	61,552 (52.8%)	63,515 (43.7%)	80,185 (44.3%)	65,841 (51.1%)	46,446 (57.9%)
Employment Status					
Part Time	33,519 (28.8%)	15,926 (11.0%)	18,191 (10.1%)	10,962 (8.5%)	7,850 (9.8%)
Full Time	83,068 (71.2%)	129,402 (89.0%)	162,645 (89.9%)	117,893 (91.5%)	72,307 (90.2%)
Social Security					
Enrolled	71,527 (61.4%)	106,916 (73.6%)	135,743 (75.1%)	84,717 (65.7%)	47,940 (59.8%)
Not Enrolled	45,060 (38.6%)	38,412 (26.4%)	45,093 (24.9%)	44,138 (34.3%)	32,217 (40.2%)
Urban/Rural					
Rural	60,944 (52.3%)	67,797 (46.7%)	83,248 (46.0%)	63,010 (48.9%)	40,098 (50.0%)
Urban	55,643 (47.7%)	77,531 (53.3%)	97,588 (54.0%)	65,845 (51.1%)	40,059 (50.0%)
<i>N</i>	116,587	145,328	180,836	128,855	80,157

Source: Authors' own calculations based on 2007-21 LFSs.

3.1 Methodology

In order to assess and decompose changes in wage inequality in Egypt over time, we apply an intertemporal decomposition method following Canavire-Bacarreza and Rios-Avila (2017). This method, based on the generalization of the Oaxaca-Blinder decomposition approach (Blinder, 1973; Oaxaca, 1973) introduced by Firpo et al. (2007), extends the decomposition analysis to statistics beyond the mean, such as the Gini coefficient and inter-quintile differences. It is structured in two consecutive steps. The first one encompasses constructing an appropriate counterfactual distribution, facilitating the comparison of wage distributions across time while mitigating the influence of changes in individual and market characteristics (Canavire-Bacarreza and Rios-Avila, 2017). Afterward, the constructed counterfactual wage distributions are employed to conduct a decomposition of the changes in the specified inequality statistic (q) into two components: one explained by measured differences in individual and market characteristics (denoted a *composition* effect) and the second explained by differences in the coefficients or “returns” on those characteristics (denoted a *wage structure* effect).

Given the inability to directly observe the counterfactual wage distribution, Firpo et al. (2007) illustrate that, under the assumptions of ignorability (conditional on measured covariates) and the overlapping support of the covariates, a counterfactual wage distribution could be constructed. This distribution would be observed if the individual living in period t_0

had experienced the wage structure observed in period t_1 . Upon identifying the counterfactual statistic (q) and the set of explanatory variables (denoted X), the overall wage decomposition can be estimated as follows:

$$\Delta q = q_{t_1} - q_{t_0} = \{q_{t_1} - \hat{q}_{t_0,1}\} + \{\hat{q}_{t_0,1} - q_{t_0}\} \quad (1)$$

where Δq represents the overall intertemporal difference in the distributional statistic q . The terms q_{t_1} and q_{t_0} correspond to the statistics of observed wage distributions at time 1 and time 0, respectively, while $\hat{q}_{t_0,1}$ denotes the estimated statistic of the counterfactual wage distribution, with characteristics fixed to time t_0 , and wage structures observed at time t_1 .

In the second step, we use the newly developed and well-known Recentered Influence Function (RIF) regression⁶ to get an approximation of the contribution of each of the observable covariates to both the composition and wage structure effects as follows:

$$E(RIF(w_i; q)|X) = X'\gamma \quad (2)$$

Where w_i denotes the log real hourly wage of individual i . Three sets of parameters are then estimated as:

$$\hat{\gamma}_t = (\sum_{i \in t} X'_{i,t} X_{i,t})^{-1} \sum_{i \in t} X'_{i,t} \widehat{RIF}(w_{i,t}; q_t) \text{ for } t = t_0, t_1 \quad (3)$$

$$\hat{\gamma}_c = (\sum_{i \in t} \hat{\omega}_c(X_{i,t_1}) \times X'_{i,t_1} X_{i,t_1})^{-1} \sum_{i \in t} \hat{\omega}_c(X_{i,t_1}) \times X'_{i,t_1} \widehat{RIF}(w_{i,t_1}; q_c) \quad (4)$$

Where $\hat{\omega}_c(X_{i,t_1})$ denotes an implicit inverse probability weight estimated using a Probit model.⁷

Similar to the Oaxaca decomposition for any statistic q , we perform a detailed decomposition of the two components (wage structure and composition effects) using the estimated parameters in equations 3 and 4 as follows:

$$\Delta S_q = \bar{X}'_{t_0} (\hat{\gamma}_{t_1} - \hat{\gamma}_{t_0}) \text{ and } \Delta X_q = (\bar{X}'_{t_1} - \bar{X}'_{t_0}) \hat{\gamma}_{t_1} \quad (5)$$

⁶ While the RIF regression is quite similar to a standard OLS regression, it differs by using the recentered influence function of the statistic of interest instead of the traditional dependent variable directly. Conceptually, the RIF can be defined as a first-order approximation of the aggregate contribution that each observation makes to the estimation of the statistic of interest.

⁷ $\hat{\omega}_c(X) = \hat{p}(X) / (1 - \hat{p}(X))$ where $\hat{p}(X)$ denotes the estimated probability (propensity). The propensity score is estimated through a Probit model, where the dependent variable is a binary variable with a value of 0 if the individual was observed in the initial period t_0 and 1 if the individual was observed in a subsequent period t_1 .

Where the left-side term represents the “wage structure” effect, which is attributed to differences in coefficients, and the right-side term represents the “composition” effect, which is attributed to differences in endowments.

4. Results

As mentioned earlier, the RIF regression decomposition method is applicable to the analysis of any statistic describing changes in wage distribution, including the Gini coefficient, quintiles, and inter-quintiles. In line with the focus of this study on examining changes in wage inequality over time, we apply the RIF procedure to investigate changes in different statistics. While the first one, the widely-used Gini coefficient, offers an overview of the changes in wage distribution, the inter-quintiles provide a more detailed understanding of variations in wage inequality throughout the distribution.

4.1 Unconditional quantile regressions

To understand changes in the wage structure in Egypt over time, Table 2 below presents unconditional quintile regressions for the Gini coefficient, along with selected quintiles and inter-quintiles comparing the initial and final periods. The coefficient estimates from the RIF-OLS regressions, explained as the marginal effects of covariates on the corresponding unconditional quantiles of log wages, provide some important insights regarding the trends and patterns of returns on different characteristics.

The parameters associated with *age* indicate a decline in returns over time in each regression, especially for individuals in the top wage distribution. Notably, returns have decreased, such as from 0.019 to 0.007 among high-paid workers. The *tenure* returns, serving as a proxy for experience, demonstrate a negative and significant impact on the considered explained variables, particularly in the Gini, top quantile, and inter-quantile regressions, primarily during the initial period. Conversely, for the first and second quantiles, the returns are positive and relatively stable.

In terms of gender, the Gini regressions reveal a small and decreasing contribution of the gender variable over time. Looking at different wage levels in the quantile regressions, the gender pay gap, although still large, has decreased a bit across the wage distribution and over time. Specifically, for lower wages, the estimates from the first quantile indicate a meaningful and significant decrease in the gender pay gap over time. However, this decrease is not as much for wages in the middle and upper parts of the wage distribution. Overall, there's been a notable improvement in the gender pay gap, especially for lower earners, though challenges remain for those earning more. This implies that the narrowing gender wage gaps may be attributed to the proactive measures the government has taken to combat discrimination, especially gender-based discrimination among low-paid earners.

Table 2 highlights some significant changes in the magnitudes of coefficient estimates for education. While the Gini regression indicates a low return, the quantile and inter-quantile regressions reveal a distinct and significant pattern in education returns over time and across

the wage distribution. These returns increase for individuals at various points in the wage distribution but decrease over the years. The progression through the wage distribution is associated with a rise in the magnitude of education returns, reaching its peak at the top end of the wage distribution (3.1 percent during the initial period). This implies a substantial earning advantage for individuals with higher education, particularly among high-wage earners in the Egyptian labor market. However, examining changes in this educational premium over time and across wage levels reveals a decline, particularly in the middle and high parts of the distribution. The most significant decrease in education returns over time are observed for those at the top wages, dropping from 3.1 percent to 1.7 percent at the 90th quantile.

In terms of labor market characteristics, a similar pattern is almost observed for the returns of working in the public sector, decreasing considerably over time and increasing across the wage distribution. The highest wage premium is among the high earners, equal to 24.7 percent, indicating that at the top end of the wage distribution, working in the public sector is highly profitable compared to the government (base category), with substantial returns. However, in the last period, these returns become insignificant. The wage premium associated with full-time employment is more pronounced among high-paid workers; it is 2.4 percent during the first period and becomes in favor of part-time employment to reach 5.4 percent during the last period. In terms of its impact on wage inequality, the full-time employment covariate shows a nuanced effect. While it contributes to narrowing wage inequality over time in the lower part of the wage distribution, it has a controversial impact among high-paid earners. During the first period, it contributes to widening the wage gap by 5.8 percent, whereas in the last period, it contributes to narrowing the gap by 6.3 percent. This suggests that the relationship between full-time employment and wage inequality varies across different wage levels, highlighting the need for targeted policy measures to address disparities.

The wage premium of being enrolled in social security shows an important and increasing contribution for lower and middle wages. The estimates reveal that between the two periods, it has practically increased for low and middle wages, while it becomes negative for the first period and not statistically significant for wages at the top of the distribution. This emphasizes the key role of social security coverage in reducing wage inequality mainly among low and middle-wage earners.

Table 2. Unconditional quantile regressions, Gini, and selected quintiles and inter-quintiles

	Gini		Q10		Q50		Q90		IQR1050		IQR5090	
	2007-09	2020-21	2007-09	2020-21	2007-09	2020-21	2007-09	2020-21	2007-09	2020-21	2007-09	2020-21
Age	0.003*** (0.000)	0.001 (0.001)	0.003*** (0.000)	0.001* (0.001)	0.008*** (0.000)	0.003*** (0.000)	0.019*** (0.001)	0.007*** (0.001)	0.005*** (0.000)	0.002** (0.001)	0.011*** (0.001)	0.004*** (0.001)
Tenure	-0.003*** (0.000)	-0.001 (0.001)	0.013*** (0.000)	0.009*** (0.001)	0.007*** (0.000)	0.008*** (0.000)	-0.003*** (0.001)	0.009*** (0.001)	-0.006*** (0.000)	-0.001* (0.001)	-0.010*** (0.001)	0.001 (0.001)
Female	0.049*** (0.004)	0.038*** (0.011)	-0.418*** (0.013)	-0.325*** (0.022)	-0.127*** (0.006)	-0.118*** (0.008)	-0.104*** (0.011)	-0.036* (0.018)	0.291*** (0.013)	0.207*** (0.021)	0.023* (0.010)	0.081*** (0.017)
Schooling	0.005*** (0.000)	-0.000 (0.001)	0.018*** (0.001)	0.018*** (0.001)	0.021*** (0.000)	0.014*** (0.001)	0.031*** (0.001)	0.017*** (0.001)	0.004*** (0.001)	-0.004*** (0.001)	0.010*** (0.001)	0.003*** (0.001)
Relation to HH												
Spouse	-0.070*** (0.005)	-0.030* (0.012)	0.372*** (0.014)	0.125*** (0.023)	0.084*** (0.007)	0.062*** (0.010)	0.014 (0.014)	0.090*** (0.024)	-0.288*** (0.014)	-0.063** (0.023)	-0.070*** (0.013)	0.027 (0.023)
Son/Daughter	0.027*** (0.003)	-0.009 (0.013)	-0.121*** (0.008)	-0.128*** (0.014)	-0.055*** (0.005)	-0.039*** (0.007)	0.055*** (0.008)	-0.007 (0.014)	0.067*** (0.008)	0.089*** (0.014)	0.110*** (0.008)	0.032* (0.013)
Other	0.017** (0.006)	-0.006 (0.037)	-0.055** (0.021)	-0.037 (0.040)	-0.054*** (0.010)	-0.014 (0.018)	0.060*** (0.018)	0.002 (0.037)	0.000 (0.020)	0.023 (0.039)	0.115*** (0.017)	0.016 (0.035)
Sector												
Public Sector	0.065*** (0.006)	0.035*** (0.007)	0.075*** (0.008)	-0.041** (0.015)	0.110*** (0.006)	0.024* (0.010)	0.247*** (0.015)	0.015 (0.026)	0.035*** (0.009)	0.065*** (0.016)	0.137*** (0.014)	-0.009 (0.026)
Private Sector	-0.004 (0.003)	0.060*** (0.011)	0.132*** (0.007)	0.030** (0.011)	0.034*** (0.004)	-0.066*** (0.006)	0.027*** (0.008)	-0.051*** (0.014)	-0.097*** (0.007)	-0.096*** (0.011)	-0.008 (0.008)	0.015 (0.014)
Full Time	-0.001 (0.002)	-0.018 (0.014)	0.007 (0.009)	0.142*** (0.019)	-0.033*** (0.004)	0.009 (0.008)	0.024*** (0.006)	-0.054*** (0.015)	-0.040*** (0.008)	-0.133*** (0.018)	0.058*** (0.006)	-0.063*** (0.014)
Social Security	-0.010*** (0.003)	-0.071*** (0.014)	0.180*** (0.009)	0.318*** (0.011)	0.022*** (0.005)	0.131*** (0.006)	-0.051*** (0.007)	0.003 (0.012)	-0.158*** (0.008)	-0.187*** (0.012)	-0.074*** (0.007)	-0.128*** (0.012)
Urban	0.037*** (0.002)	0.052*** (0.008)	-0.185*** (0.005)	0.016 (0.009)	-0.088*** (0.003)	0.067*** (0.004)	0.019*** (0.006)	0.105*** (0.009)	0.097*** (0.005)	0.051*** (0.009)	0.107*** (0.006)	0.038*** (0.009)
Constant	0.132*** (0.008)	0.228*** (0.027)	2.676*** (0.017)	2.795*** (0.034)	3.286*** (0.010)	3.579*** (0.016)	3.482*** (0.019)	4.074*** (0.035)	0.611*** (0.017)	0.784*** (0.033)	0.195*** (0.019)	0.495*** (0.034)
Observations	163055	52982	163055	52982	163055	52982	163055	52982	163055	52982	163055	52982

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Authors' own calculations based on 2007-21 LFSs.

4.2 Decomposition

Figure 3 provides an initial examination of wage changes decomposition over time. Panel A presents the overall decomposition of wage changes between the two groups of years (2007-09 and 2010-11). An inconsistency in real wage changes across the distribution is illustrated in this panel, showing a decrease of less than 0.15 log points in the wage level at the bottom of the distribution and an increase of 0.05 log points and 0.25 log points, respectively, at the middle and at the top. The aggregate decomposition reveals that changes in the returns to characteristics (unexplained part) have had a considerable impact on wages for most of the distribution, resulting in the consistent pattern of wage disparities across the bottom and top of the wage distribution between 2007-09 and 2010-11. The same trajectory across the wage distribution is illustrated in the figure for both overall differences and returns differences. The change in endowments (explained part), however, has had little (if any) effect on wages throughout most of the distribution.

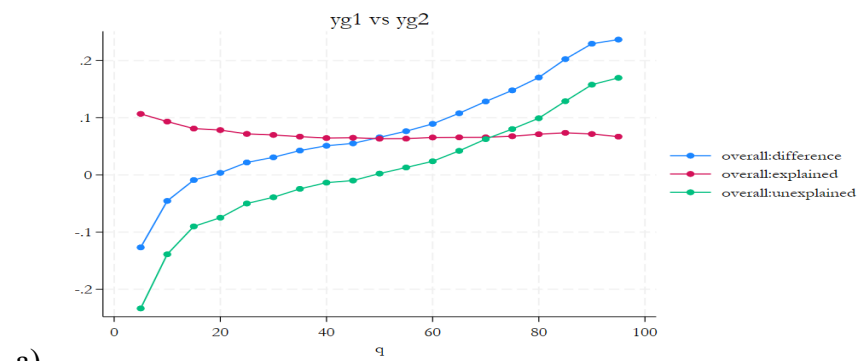
Compared to all other periods, there are only two periods when wage inequality increased throughout the wage distribution: between 2010-11 and 2013-15, and between 2018-19 and 2020-21. Such increases are driven mainly by the wage structure changes (Panels B and E) similarly to all the other changes that occurred between different periods (see Figure 3). Changes in individual characteristics explain only a small part of the overall changes across the distribution. While both Panels B and E show an increasing trend in wage inequality over the considered periods, they reveal different patterns throughout the wage distribution. Panel B indicates that increasing wage inequality is more pronounced among bottom- and middle-wage earners, while Panel E shows that this increasing wage inequality is more pronounced among the bottom and top parts of the wage distribution, following a U-shaped pattern.

Panel C in Figure 3 shows a similar U-shaped pattern, but it notably indicates a persistent decline in wage inequality between the two periods 2013-15 and 2016-17. With the exception of the first quantile, this decline is mainly driven by changes in the wage structure. A close examination of these changes across the wage distribution reveals that Panel C highlights that the most significant decline occurs at the middle part, with a decrease of more than 0.1 log points between the two periods. Toward the tails of the wage distribution, the decline approaches zero, with only a slight increase of 0.1 log points observed at the first quantile. It's evident from the figure that changes in individual characteristics exhibit a slightly increasing trend.

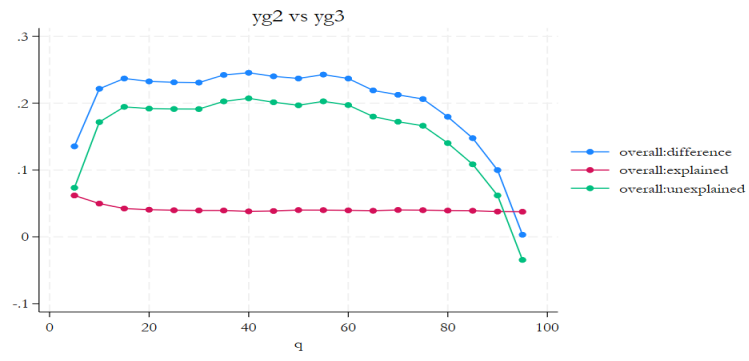
The aggregate decomposition between the 2016-17 and 2018-19 periods (Panel D) indicates that while the wage structure changes have remained the driving factor increasing wage inequality in Egypt, the impact of changes in characteristics, approximately 0 log points, has been less effective than in previous periods in reducing wage inequality. Panel D shows a specific trend of decreasing wage inequality throughout the wage distribution. The decline in wage inequality for the bottom half of the distribution is around 0.1 log points, while it reaches about 0.35 log points at the upper tail of the distribution. This leads to the conclusion

that during the considered period, there was a significant decrease in wage inequality among high-paid workers over time.

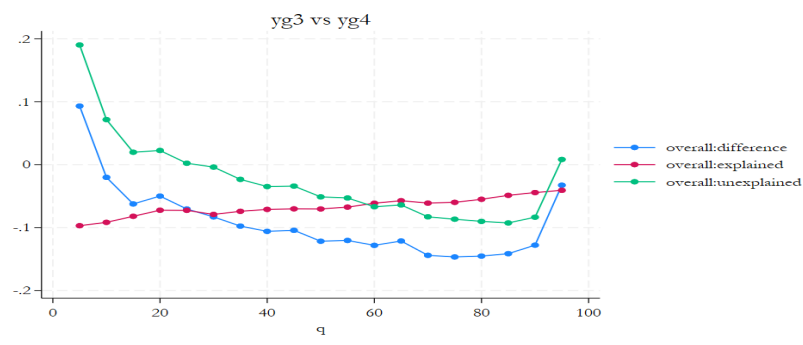
Figure 3. Aggregate quintile wage decomposition



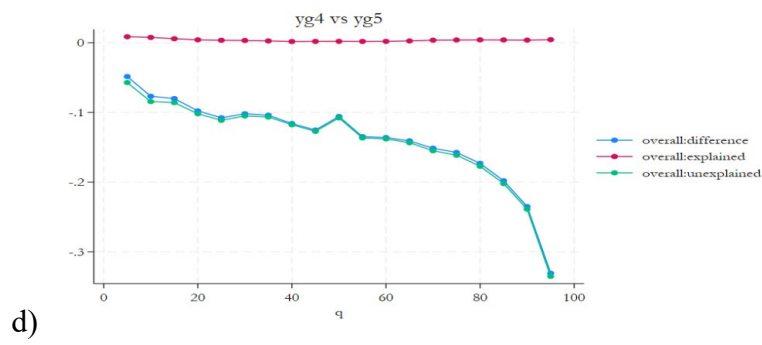
a)



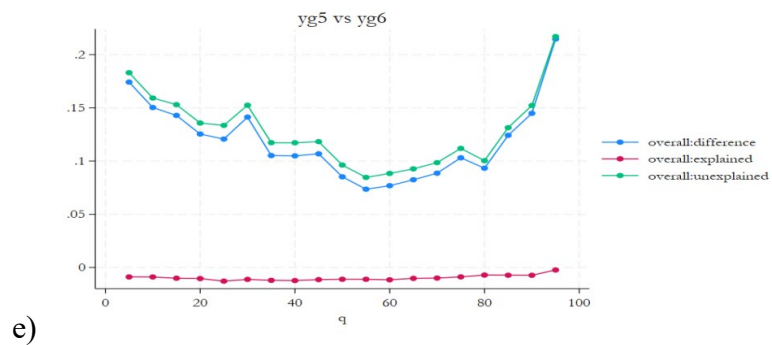
b)



c)



d)



e)

Figure 3 reveals some interesting insights, the most important being the dominance of changes in wage structure changes in explaining the overall wage differences over time. The changes in individual characteristics are found to have a slight effect on such differences. Another notable remark is the heterogeneous pattern of changes in wage inequality over time and throughout the wage distribution. In certain periods, a U-shaped pattern emerges, while in others, panels show both decreasing and increasing trends, which aligns with the patterns in Figure 2.

Instead of examining changes in wage inequality at each individual quintile, it's more informative to implement a decomposition on some inequality statistics such as the Gini coefficient and inter-quintiles differences (Table 3) for a more accurate and in-depth analysis of the driving factors of wage inequality over time, following Canavire-Bacarreza and Rios-Avila (2017). As indicated by the results of the Gini decomposition, there was a varied change in wage inequality during the entire period, revealing an increase in inequality during the first (2007-11), third (2013-17), and last (2018-21) periods. The changes in the Gini coefficient, being positive during these periods, show a decreasing trend over time from 0.07 log points in the first period to about 0.03 log points in the last period. Conversely, for the second (2010-15) and fourth (2016-19) periods, the results indicate a decrease in the Gini coefficient, signaling a decline in wage inequality during these periods. The most significant decline occurs in the fourth period with a decline of about 0.116 log points in the Gini coefficient.

Looking at the estimations of inter-quantile differences for the initial period (2007-09 and 2010-11), the estimates reveal that all the inter-quantile gaps increased, with the most notable rise observed for the 90/50 inter-quantile gap, which increased by 0.275 log points during this period. Subsequent periods commonly show a decline in wage inequality over time. In the last period (between 2018-19 and 2020-21), inter-quantile results indicate an increase in the gap at the bottom of the distribution, with the 50/10 inter-quantile gap increasing by 0.06 log points. In contrast, at the upper end of the distribution, there is a slight and statistically insignificant reduction in gap differences (-0.005 log points). Similarly to the Gini decomposition results, the largest portion of the wage inequality changes, around 90 percent, is explained by the changes in wage structure. In terms of the aggregate decomposition of the Gini coefficient and different inter-quantiles, changes to the wage structure (unexplained part) seem to have a significant impact on changes in wage inequality, while changes in characteristics (the explained part) have played a minor—albeit statistically significant in some periods—role in influencing overall changes in wage inequality over time.

Table 3. Wage Inequality Decomposition, Selected Inequality Statistics

	Gini				
	2007-09 vs 2010-11	2010-11 vs 2013-15	2013-15 vs 2016-17	2016-17 vs 2018-19	2018-19 vs 2020-21
Year 1	0.361*** (0.003)	0.298*** (0.001)	0.349*** (0.013)	0.233*** (0.001)	0.261*** (0.004)
Year 0	0.290*** (0.001)	0.361*** (0.003)	0.298*** (0.001)	0.349*** (0.013)	0.233*** (0.001)
Overall Change	0.071*** (0.003)	-0.062*** (0.003)	0.050*** (0.013)	-0.116*** (0.013)	0.028*** (0.004)
Change in Characteristics	0.001 (0.001)	0.000 (0.000)	0.010 (0.007)	-0.001** (0.000)	0.007*** (0.001)
Change in Wage Structure	0.070*** (0.003)	-0.062*** (0.003)	0.041*** (0.007)	-0.115*** (0.013)	0.021*** (0.004)
q10-q90					
Year 1	0.770*** (0.004)	0.785*** (0.004)	0.684*** (0.005)	0.655*** (0.004)	0.589*** (0.004)
Year 0	0.658*** (0.002)	0.770*** (0.004)	0.785*** (0.004)	0.684*** (0.005)	0.655*** (0.004)
Overall Change	0.111*** (0.004)	0.015** (0.005)	-0.102*** (0.006)	-0.029*** (0.006)	-0.065*** (0.005)
Change in Characteristics	-0.030*** (0.002)	-0.010*** (0.001)	0.021*** (0.002)	-0.006*** (0.001)	-0.002 (0.001)
Change in Wage Structure	0.141*** (0.005)	0.025*** (0.006)	-0.123*** (0.005)	-0.023*** (0.006)	-0.063*** (0.005)
q10-q50					
Year 1	0.827*** (0.004)	0.689*** (0.003)	0.683*** (0.004)	0.554*** (0.003)	0.614*** (0.005)
Year 0	0.663*** (0.003)	0.827*** (0.004)	0.689*** (0.003)	0.683*** (0.004)	0.554*** (0.003)
Overall Change	0.164*** (0.005)	-0.137*** (0.005)	-0.006 (0.005)	-0.129*** (0.005)	0.060*** (0.005)
Change in Characteristics	0.008*** (0.002)	-0.002* (0.001)	0.026*** (0.001)	0.002 (0.001)	0.004*** (0.001)
Change in Wage Structure	0.156*** (0.005)	-0.135*** (0.005)	-0.032*** (0.005)	-0.131*** (0.005)	0.056*** (0.006)
Year 1	1.596*** (0.005)	1.475*** (0.004)	1.367*** (0.006)	1.208*** (0.004)	1.203*** (0.006)
Year 0	1.321*** (0.003)	1.596*** (0.005)	1.475*** (0.004)	1.367*** (0.006)	1.208*** (0.004)
Overall Change	0.275*** (0.006)	-0.122*** (0.007)	-0.108*** (0.007)	-0.158*** (0.007)	-0.005 (0.007)
Change in Characteristics	-0.022*** (0.003)	-0.012*** (0.002)	0.047*** (0.002)	-0.004* (0.002)	0.002 (0.002)
Change in Wage Structure	0.297*** (0.007)	-0.110*** (0.007)	-0.155*** (0.007)	-0.154*** (0.007)	-0.007 (0.007)

Notes: The sample includes wage/salary workers. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: Authors' own calculations based on the 2007-21 LFSs.

For a more comprehensive understanding of the potential factors influencing the observed changes in wage inequality primarily driven by changes in wage structure, Table 4 provides a detailed decomposition of the Gini coefficient with respect to the set of worker and market characteristics. Among other covariates, the systematic decline in returns on education, measured by the years of schooling, has been one of the most important factors contributing to the decline of the Gini coefficient during the first period (2007-09 to 2010-11). Our results for this period show that changes in returns to education have significantly contributed to a decline of wage inequality by 0.035 Gini points.

The detailed Gini decomposition also shows that the increase in wages associated with working in the public sector has the most significant observed contribution in increasing wage inequality over time during the first and last periods with almost 0.018 Gini points, while for the second period, it contributes significantly to the reduction of inequality with 0.018 points (see Table 4). The full/part-time wage gap has been one of the most significant contributors to the decrease in wage inequality for the first and second periods with respective declines of 0.038 and 0.026 Gini points. Regarding the impact of social security on the wage structure in Egypt, the evidence shown from the detailed Gini decomposition indicates that across time, the changes in social security wage premiums have had a small and insignificant effect on wage inequality, except for the second period. The changes observed during this period between 2010-11 and 2013-15 appear to have a considerable and significant impact, decreasing wage inequality by about 0.034 Gini points. Finally, the urban wage premium has had non-statistically significant effects on wage inequality except for the last period when the effect is around 0.018 Gini points of an increase in wage inequality between 2018 and 2021.

Table 4. Wage inequality, detailed decomposition (Gini)

	2007-09 vs 2010-11		2010-11 vs 2013-15		2013-15 vs 2016-17		2016-17 vs 2018-19		2018-19 vs 2020-21	
Overall Changes	0.071*** (0.003)		-0.062*** (0.003)		0.050*** (0.013)		-0.116*** (0.013)		0.028*** (0.004)	
	Composition	Wage Structure	Composition	Wage Structure	Composition	Wage Structure	Composition	Wage Structure	Composition	Wage Structure
Changes	0.001 (0.001)	0.070*** (0.003)	0.000 (0.000)	-0.062*** (0.003)	0.010 (0.007)	0.041*** (0.007)	-0.001** (0.000)	-0.115*** (0.013)	0.007*** (0.001)	0.021*** (0.004)
Age	0.002*** (0.000)	-0.026 (0.024)	0.004*** (0.000)	0.027 (0.025)	-0.007 (0.004)	0.089 (0.131)	0.001*** (0.000)	-0.178 (0.126)	-0.000 (0.000)	0.002 (0.023)
Tenure	0.001*** (0.000)	-0.013 (0.008)	-0.002*** (0.000)	0.005 (0.008)	0.004 (0.002)	0.019 (0.017)	0.001*** (0.000)	-0.002 (0.014)	0.001 (0.000)	0.009 (0.007)
Sex (1=Woman)	0.002*** (0.000)	0.001 (0.002)	0.001*** (0.000)	-0.001 (0.003)	0.000 (0.000)	-0.008 (0.007)	-0.002*** (0.000)	0.011 (0.007)	-0.001** (0.000)	-0.004 (0.002)
Schooling	0.002* (0.001)	-0.035*** (0.006)	0.000** (0.000)	-0.005 (0.007)	0.000 (0.001)	-0.016 (0.022)	-0.000** (0.000)	-0.001 (0.021)	-0.000 (0.000)	0.008 (0.011)
Relation to HH	-0.001*** (0.000)	-0.005 (0.006)	-0.000*** (0.000)	0.003 (0.006)	0.009 (0.005)	-0.011 (0.015)	0.000 (0.000)	0.005 (0.010)	0.000 (0.000)	-0.001 (0.008)
Sector (1=Public)	0.002*** (0.000)	0.018*** (0.003)	0.001*** (0.000)	-0.018*** (0.003)	-0.002 (0.002)	0.003 (0.004)	-0.001*** (0.000)	0.001 (0.005)	0.003*** (0.001)	0.019*** (0.003)
Full-Time Worker	-0.005*** (0.001)	-0.038*** (0.007)	-0.002*** (0.000)	-0.026*** (0.008)	0.001 (0.001)	0.054* (0.023)	-0.001*** (0.000)	-0.003 (0.023)	0.000 (0.000)	0.005 (0.013)
Social Security	-0.001** (0.000)	-0.005 (0.005)	-0.002*** (0.000)	-0.034*** (0.005)	0.007* (0.003)	0.001 (0.023)	0.002*** (0.000)	0.015 (0.020)	0.003*** (0.001)	-0.019* (0.008)
Urban	0.001*** (0.000)	-0.006 (0.003)	0.000 (0.000)	-0.001 (0.004)	-0.000 (0.000)	0.003 (0.010)	-0.000*** (0.000)	-0.007 (0.010)	0.000 (0.000)	0.018*** (0.004)
Constant		0.180*** (0.020)		-0.013 (0.020)		-0.092 (0.085)		0.045 (0.085)		-0.017 (0.025)

Notes: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Authors' own calculations based on 2007-21 LFSs.

5. Conclusion and policy implications

Since the 1980s, cross-country studies have consistently indicated a widening wage gap in many high- and low/middle-income countries, characterized by increased wages for high-skilled workers and slower growth, declines, or stagnant earnings for low-skilled workers. In contrast to this prevailing global trend, Egypt has exhibited, on average, a decline in wage inequality over the past two decades (2006-21), particularly evident before the Arab Spring. Using a RIF regression and an intertemporal decomposition analysis, we are unable to identify a consistent pattern in wage inequality changes over time across the wage distribution. Notably, in the pre-Arab Spring period, the trend in wage inequality reveals a decrease at the bottom, an increase in the middle, and a substantial increase at the top of the distribution. Conversely, results indicate an increase in wage inequality during the most recent period across the entire wage distribution.

Further exploration through the Gini decomposition uncovers fluctuations in wage inequality over the entire period, with increases observed in specific phases and an overall decreasing trend. These findings highlight the complexity of wage inequality dynamics in Egypt, where the patterns appear to deviate from the broader global trends. The decomposition analysis of the Gini Coefficient further shows that most of the earning inequality changes have been driven by changes in the wage structure or returns to characteristics of workers. Among various factors, our findings reveal that both education and full-time employment significantly contribute to the reduction of wage inequality, particularly during the first period. Conversely, employment in the public sector is identified as a positive contributor to the increase in wage inequality, particularly during the first and last periods. These results emphasize the importance of conducting an intertemporal decomposition analysis to pinpoint the primary contributors to the observed changes in wage inequality.

In light of these findings, we propose some key policy implications for Egyptian authorities seeking to mitigate the wage inequality that has persisted over the last two decades. Specifically, there is a need for targeted interventions, such as encouraging individuals to pursue higher education in alignment with employment demands to address the role of education in influencing wage inequality dynamics. To tackle the substantial impact of education on reducing wage inequality over time, Egyptian policymakers should prioritize comprehensive investments in education, with an emphasis on accessibility to quality programs and alignment of curricula with evolving industry needs. Initiatives promoting higher education through scholarships and vocational training, along with tailored skill development programs for high-demand industries, can enhance workforce capabilities and narrow the skills gap. Public awareness campaigns should underscore the integral link between education, skill development, and income improvement, fostering a culture of continuous learning. Collaborative efforts between educational institutions and the private sector, supported by initiatives like internships and apprenticeships, ensure that educational offerings align with employer demands. The implementation of inclusive education policies and the establishment of support mechanisms for lifelong learning contribute to sustained

wage growth and reduced wage inequality, ultimately fostering a more equitable and resilient labor market in Egypt.

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