

## INEQUALITY OF OPPORTUNITY IN WAGES AND CONSUMPTION IN EGYPT

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Most explanations of the recent political upheavals in Egypt since 2011 include a reference to rising inequality, but the usual indicators of income inequality in Egypt do not support that inequality was on the rise prior to the uprisings. In this paper we provide measures of inequality of opportunity in wages and consumption for Egypt at different points in time from 1988 to 2012 that shed light on the gap between popular perceptions and measured indices of inequality. Our findings indicate that although measures of inequality of wage income have increased over time in Egypt starting in 1998, the share attributable to circumstances declined steadily throughout the whole period. We attribute this decline to the fact that outcomes for individuals from a middle class background have moved closer to the outcomes of those from a poor background. The outcomes for those from privileged backgrounds remain quite apart from the rest.

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### 1. INTRODUCTION

The Egyptian public's perception of income inequality seems at odds with what the standard measures suggest. The central theme of the mass protests in Egypt in 2011 as reported in the media was economic and social injustice. Other sources confirm the wide perceptions of income inequality are at odds with standard measurements—such as the Gini index—which show only mild and declining levels of income inequality (Belhaj Hassine, 2015, 2011; El Enbaby and Galal, 2015; Hlasny and Verme, 2014; Verme *et al.*, 2014; Bibi and Nabli, 2009). The conflict between perceptions and evidence from available data has given rise to a “MENA inequality puzzle” (World Bank, 2015), which is particularly relevant to Egypt.

Attempts at reconciling perceptions of high inequality with low estimates of the Gini index from cross-sectional data in MENA countries include searching for missing top incomes (Hlasny and Verme, 2014), wealth inequality (World Bank, 2015) and inequality of opportunity, which may help resolve the puzzle. Hlasny and Verme (2014) explore the possibility that missing top incomes may yield a much higher inequality of income than we find in existing data in Egypt and conclude that this is not the case. World Bank (2015) provides evidence of

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high wealth inequality using data on financial assets held abroad by MENA individuals. While a perception of such wealth held abroad no doubt resonates with the public, it is distant from their own experiences since it does not incorporate wealth held by a broad section of the population. Van der Weide *et al.* (2016) attempt to get around missing top incomes by looking at data on house prices. Their method raises the index by 11 Gini points, from 0.36 to 0.47, so they conclude that estimates based on household surveys have a downward bias.

Other studies, staying with the general theme of inequality, have examined inequality of opportunity, which can better capture the notion of unfairness and social injustice that may lie at the root of popular perceptions. There is a growing literature on the Middle East that estimates the level of inequality of opportunity in MENA countries in health, education, wages, wealth, and access to basic services (Krafft and Assaad, 2016; El Enbaby and Galal, 2015; El-Kogali and Krafft, 2015; Assaad *et al.*, 2014; Ersado and Aran, 2014; Salehi-Isfahani *et al.*, 2014; Velez *et al.*, 2012). However, so far this literature does not settle the inequality puzzle for Egypt. While the evidence clearly indicates that Egypt as a society fails to provide equal access to basic opportunities for all its children, except in specific aspects of education, this evidence does not distinguish Egypt as a country with an unusually high level of inequality of opportunity. The most glaring evidence of inequality of opportunity in education is in reaching university education, provided by Assaad (2013), who estimates the probability of a boy from a least advantaged family enrolling in university to be only 9 percent compared to 97 percent for a boy from a most advantaged family. Other estimates of inequality of opportunity vary, depending on the type of outcome being measured. Estimates of inequality of opportunity in educational achievement (TIMSS scores for eighth graders) show considerable inequality in Egypt but place it below half a dozen MENA countries, such as Qatar, Turkey, Iran, and Jordan (Ersado and Aran, 2014; Salehi-Isfahani *et al.*, 2014). Inequality of opportunity in attainment is also an issue in Egypt, as measured by ever attending school and reaching the secondary level if ever attending (Assaad *et al.*, 2014).

There have been other attempts to explain the causes of the Arab uprisings more generally. Campante and Chor (2012, 2014) advance the hypothesis that the rapid expansion of schooling with limited job opportunities led to reduced opportunity costs for educated individuals to engage in political protests. Lack of opportunities for educated youth has been a dominant theme in descriptions of social exclusion of Arab youth from before the uprisings (Dhillon and Yousef, 2009), but little is known about inequality of access to the limited jobs that were created. Diwan (2013) credits the collapse of the authoritarian Arab regimes to the shift of allegiance of a key social actor, the middle class, from a coalition sustaining authoritarian rule to support for democracy. Following the rollback of the welfare state, he notes the decline in the fortunes of the middle class and the poor, while crony capitalists accumulated great fortunes, as instrumental in the collapse of authoritarian regimes. Malik and Awadallah (2013) cast a wider net and blame the general direction of the region's political economy—reliance on natural resource rents, lack of private sector development, and weak regional ties—as the reason for the region's political instability.

In this paper we provide new evidence of inequality of opportunity in Egypt over time that sheds light on this puzzle. We take advantage of survey data between 1988 and 2012 to link individual wages to the individual's parental education and also household consumption to the parental education of the household head. Our findings do not readily explain the gap between perceptions and measurement. Using the standard measures of inequality of opportunity used in the literature that developed based on Roemer (1998), we find little evidence of an increase in inequality of opportunity. However, closer examination reveals shifts in the fortunes of those from a middle class background that partially fit Diwan's (2013) conjectures about middle class discontent. We show that in both wage and consumption the fortunes of those born to middle class families collapsed toward those born to lower class families, while the gap between the latter and those with an upper class background narrowed. These shifts occurred in such a way that the summary statistics measuring inequality of opportunity did not show any increase.

The rest of the paper proceeds as follows. Section 2 presents our conceptual framework and the methodology for the estimation of inequality of opportunity. Section 3 describes the data sets we employ and the specification of our outcome variables and circumstances. Section 4 presents the results on inequality of opportunity measures in Egypt over time. Section 5 concludes.

## 2. CONCEPTUAL FRAMEWORK

Our study follows the now standard framework proposed by Roemer (1998), which has been applied in a number of empirical studies of inequality of opportunity (Ferreira and Gignoux, 2011; Bourguignon *et al.*, 2007, see also Roemer and Trannoy, 2014, for a survey, among others). In this framework, outcomes are the result of luck, individual effort, and circumstances beyond individual control. Survey or census data that links inequality in a particular outcome to a subset of these circumstances then allows a decomposition of total inequality into that part due to the observed circumstances (inequality of opportunity) and the rest due to effort and luck.

### 2.1. *Approaches to Measuring Inequality of Opportunity*

It is generally acknowledged in the inequality of opportunity literature that circumstances beyond an individual's control are easier to measure than effort, which is typically private information that is difficult to capture in survey data (Roemer and Trannoy, 2014). Thus, the first issue that arises in empirical work is whether one can account for effort explicitly. In the absence of reliable information on effort, the effect of effort on the distribution of outcomes is treated as a residual lumped together with luck. Because our data do not contain information on effort, we pursue this residual approach. However, because all relevant circumstances cannot be fully captured by the circumstance variables available in our data, the residual inequality may also include some inequality due to unobserved circumstances. It is therefore important to note that all we can estimate is a lower bound on inequality of opportunity. Not only are some circumstances

unobserved, the contributions of which are likely to be substantial (Hufe *et al.*, 2015), but also luck could be considered a circumstance.

A second issue with regard to the empirical estimation is whether to pursue an inequality decomposition based on types or tranches, approaches that are sometimes referred to as the ex-ante and ex-post approaches, respectively (Fleurbaey and Peragine, 2013). We define a *type* as the set of persons with the same set of circumstances. *Tranches* are defined as a set of individuals who expend the same degree of effort (Roemer and Trannoy, 2014). The degree of effort is measured as the individual's rank in the effort distribution of their own type (Roemer, 1998). In the absence of information on effort, the types approach is typically deemed more reliable (Roemer and Trannoy, 2014). Moreover with finite data sets, it is often not advisable to further break up types into even smaller cell sizes that represent tranches. Thus, we use a types approach in our analyses.

A third issue for empirical work is whether to use parametric or non-parametric estimation techniques. While non-parametric techniques involve fewer assumptions, the number of circumstances we are able to consider non-parametrically and the level of detail with which these circumstances can be specified are limited by the number of observations in each type. We thus begin by undertaking non-parametric analysis using a parsimonious specification of just four types and then a more detailed specification of 36 types. We repeat the analysis parametrically using these specifications and then undertake further parametric analyses with an even more elaborated set of circumstances. The details of the parametric specification and the related estimation of partial effects are discussed below.

Two final issues are the path of decomposition and the choice of inequality measure. In the types approach, the direct path to measuring inequality of opportunity (also referred to as the direct unfairness or DU path) is to compute the share of total inequality contributed by between-type inequality, i.e. the inequality of a counterfactual *smoothed* distribution in which all within-type inequality is neutralized. The indirect path (also called the fairness gap or FG) consists of calculating the share of inequality that remains after subtracting the share of within-type inequality, or the inequality from a counterfactual *standardized* distribution where differences across types are neutralized (Pistoiesi, 2009). In general these two paths of decomposition provide different measures of inequality of opportunity. However, in the case of the mean log deviation or general entropy index of degree zero (GE(0)), the results of the decomposition are path invariant (Ferreira and Gignoux, 2011). To simplify the presentation of the results, we use GE(0) as our inequality measure.<sup>1</sup>

## 2.2. *Decomposition of Inequality into Components due to Circumstances and Effort Using Types*

When we examine inequality of opportunity using types, we define circumstances as those aspects of a person's environment that are generally believed to

<sup>1</sup>We conducted sensitivity analyses using GE(1) and GE(2) and found that the results are qualitatively robust across outcome variables, survey years, and different specifications of circumstances.

be beyond individual control: the socio-economic status of the family in which a person is raised and the birth region of the child. Family background is mainly defined on the basis of parental education and fathers' occupation, and the region of birth consists of metropolitan, provincial urban, and provincial rural areas.

We partition parental education into four categories, the lowest is one where both parents are illiterate, the highest is one where at least one parent has university education or both parents have upper secondary education. The two middle types have various other combinations of parents' education, as described below. We refer to these types as lower class, middle class, upper middle class, and upper class. This division hides important differences within each education category, including the fact that the *quality* of the parents' education varies. For example, it matters if the father attended an elite secondary school in Cairo or a public school in a poor area (both are coded the same way in our data). Among other unobserved circumstances are other aspects of the home environment, including parental time investment in the child.

To illustrate this approach, consider Figure 1, which plots the cumulative distribution functions of four classes of workers in Egypt, where classes are defined based on levels of parental education. The distributions of the four classes (types) exhibit first-order stochastic dominance. The distribution of wages for workers from the upper class (at least one parent with university education or both parents with upper secondary education) lies entirely to the right of the rest, and the distribution of workers from the lower class (both parents illiterate) lies all the way to the left. The *horizontal distance* between these CDFs indicates inequality of opportunity. For instance, the median worker in the upper class (most advantaged type) has a wage approximately triple that of the median worker of the lower class (with illiterate parents).

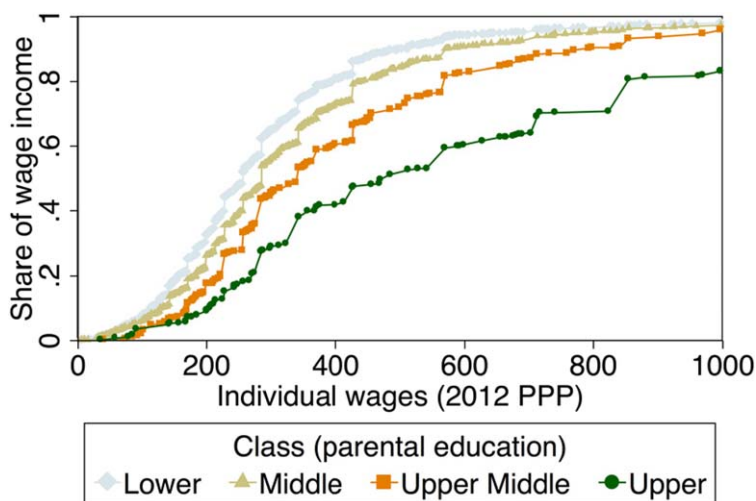


Figure 1. Cumulative distribution functions of individual wages, male wage earners 30–49, Egypt 2012 [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on ELMPS 2012.

Another way to describe the inequality of opportunity depicted in this graph is to note that the distribution of wages within a type or class represents the wage opportunities accessible to members of that class, and the fact that these distributions differ comprises inequality of opportunity. Although we consider the graphic approach to inequality of opportunity compelling, much of our empirical work is done using statistical decompositions. Interestingly, the seemingly large amount of inequality of opportunity observed in Figure 1 turns out to be small when compared to inequality in other countries measured using common statistical techniques (Assaad, *et al.*, 2016). Throughout this study we remind ourselves that the typology we use ignores many important circumstances, and that the inequality of opportunity we measure is only a lower bound on the true degree of opportunity inequality. Having said that, the comparison of inequalities over time is valid to the extent that the influence of the unobserved circumstance remains constant over time.

### 2.3. General Entropy Measures of Inequality and their Decomposition

We measure inequality using the general entropy class of inequality measures, which are decomposable and are therefore the most commonly used for estimating inequality of opportunity (Ferreira and Gignoux, 2011). Our decomposition of inequality into circumstances and effort follows standard analysis and uses the standard notation. Let  $F(y)$  be the distribution of an outcome  $y$  (such as wages) with mean  $\mu$ . The inverse of the distribution function  $F$  is the quantile function,  $Q(p)$ , which denotes the outcome level below which we find  $p$  proportion of the population, for  $p \in [0, 1]$ . Thus  $F(Q(p)) = p$ . We employ the general entropy index  $GE(0)$ , also known as Theil's-L or the mean log deviation (MLD), which is the most suitable for the purpose at hand. This index is defined as (Duclos and Araar, 2006):

$$GE(0) = \int_0^1 \ln\left(\frac{\mu}{Q(p)}\right) dp$$

This measure weights the lower end of the distribution more heavily in measuring inequality.

In order to decompose inequality into the part due to circumstances and that due to effort and luck, we assign individuals to types (which we often refer to as classes),  $k$ , where each type consists of those individuals with the same circumstances. We then decompose inequality into within- and between-type inequality (Duclos and Araar, 2006):

$$GE(\theta, F) = \sum_{k=1}^K \phi(k) \left(\frac{\mu_k}{\mu}\right)^{\theta} \underset{\text{Within}}{GE(\theta, k)} + \underset{\text{Between}}{GE(\theta, \tilde{F})},$$

where  $\phi(k)$  is the fraction of the population in type  $k$ ,  $\mu_k$  is the mean outcome of type  $k$ , and  $GE(\theta, k)$  is the GE index of type  $k$ .  $GE(\theta, \tilde{F})$  is the measure of within

group inequality.  $GE(\theta, \tilde{F})$  is the GE index of a counterfactual distribution  $\tilde{F}$  where each member of type  $k$  is assigned  $\mu_k$ , their type's mean. In the hypothetical counterfactual there is no inequality within types, thus,  $GE(\theta, \tilde{F})$  is a measure of between group inequality (Duclos and Araar, 2006). The hypothetical distribution function  $\tilde{F}$  is a step function, with one step for each type. One important feature of this decomposition into within-type inequality, which is attributed to effort, and between-type inequality, which is attributed to circumstances, is that only with  $\theta=0$  will the two kinds of inequality add to exactly  $GE(\theta)$ . That is, for  $\theta=0$ ,  $GE(\theta, F)$  reduces to:

$$GE(0, F) = \sum \phi(k) GE(0, k) + GE(0, \tilde{F}).$$

All of the analyses incorporate bootstrapped standard errors around the estimated  $GE(0)$  statistics (and other statistics for inequality).<sup>2</sup>

#### 2.4. Parametric Estimation

To assess the contribution of more than just a few circumstances using survey data, it is necessary to use parametric assumptions about how outcome  $y$  depends on the vector of circumstances  $C$ . The parametric approach relies on a linear estimate of this relationship:

$$y = C\psi + \varepsilon.$$

With estimated coefficients,  $\hat{\psi}$ , the parametrically smoothed distribution is estimated by replacing  $y_i$  with (Ferreira and Gignoux, 2011):

$$\tilde{z}_i = C_i \hat{\psi}$$

Essentially, predicted values are used as estimates of type (class) means. The inequality among these type means is a measure of between-type inequality. If the linear relationship holds and there are no missing interaction terms, the results would be the same as with a non-parametric estimate. This smoothed distribution allows for a direct, parametric estimate of inequality of opportunity as:

$$\theta_d = \frac{GE(0, \{\tilde{z}_i\})}{GE(0, \{y_i\})}$$

Alternatively, with estimated residuals,  $\hat{\varepsilon}_i$ , the parametrically standardized distribution can be estimated as (Ferreira and Gignoux, 2011):

<sup>2</sup>Standard errors are clustered for all estimates, both bootstrapped inequality statistics and regressions.



$$\tilde{y}_i = \bar{C}_i \hat{\psi} + \hat{\varepsilon}_i,$$

where  $\bar{C}$  is the vector of sample mean circumstances. Only within-type inequality remains, and thus we may calculate inequality of opportunity residually as:

$$\theta_r = 1 - \frac{GE(0, \{\tilde{y}_i\})}{GE(0, \{y_i\})}$$

### 2.5. Partial Effects in Parametric Estimation

We are often interested in measuring the contribution of individual elements, or groups of elements, in  $C$  to total inequality. For example, we might ask if most of inequality of opportunity is driven by regional differences, which would have substantially different policy implications than if inequality of opportunity were driven by, say, parents' education. Estimating the "partial effects" of different circumstances in total inequality requires a counterfactual standardized distribution, removing the effects of some circumstances, and estimating partial effects residually. It is not possible to predict outcomes (generate a smoothed distribution) for just some circumstances without making assumptions about the distributions of the others.

The counterfactual standardized distribution involves neutralizing a circumstance, or set of circumstances,  $J$  (Ferreira and Gignoux, 2011):

$$\tilde{y}_i^J = \bar{C}^J \hat{\psi}^J + C_i^{j \neq J} \hat{\psi}^{j \neq J} + \hat{\varepsilon}_i$$

Then the share of total inequality due to circumstance set  $J$  is (Ferreira and Gignoux, 2011):

$$\theta_r^J = 1 - \frac{GE(0, \{\tilde{y}_i^J\})}{GE(0, \{y_i\})}$$

It must be kept in mind that the sums of the contributions of all the partial effects of circumstances  $C$  do not add up precisely to total inequality of opportunity. Neutralizing the effect of various sets of circumstances allows us to estimate the contribution of these particular circumstances to inequality of opportunity.

## 3. DATA

### 3.1. The Egypt Labor Market Panel Surveys

Our analyses are based on a series of labor market panel surveys from Egypt. The earliest is the 1988 special round of the Labor Force Sample Survey (LFSS). Additionally, we use the 1998, 2006, and 2012 rounds of the Egypt Labor Market Panel Survey (ELMPS). After the initial 1998 round, households and individuals



were tracked over time, even if they split to form new households. In subsequent rounds, a refresher sample was added, and individuals in the refresher sample were also tracked thereafter.<sup>3</sup> The 1988 special round of the LFSS was carried out by Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) and the ELMPS surveys were carried out by the Economic Research Forum (ERF) in collaboration with CAPMAS.

### 3.2. Outcomes

The focus of this paper is analyzing the evolution of inequality in Egypt over time. Specifically, we examine two individual and household economic outcomes: individual wages and imputed per capita household consumption. All of the outcomes are in monthly 2012 PPP international dollars, after converting into constant 2012 local currency units using the CPI and PPP international dollars from nominal local currency units.

Household consumption (expenditure) data are not collected in the LFSS/ELMPSs themselves. However, we use methods and software (POVMAP2) designed to map consumption from one data source onto another, recovering the original variance (the latter being crucial for inequality measurement purposes). Specifically, we model the predictors and variance of household consumption in contemporaneous household income expenditure and consumption surveys (HIECS) for all the rounds except for 1988.<sup>4</sup> These are used to predict consumption and recover the variance for consumption in the LMPSSs based on the same set of covariates (housing characteristics, durable assets, head education and labor market status, household demographics, and location information). The methods used, models, and validation across surveys (comparing the HIECS observed values and predicted ELMPS values) are presented in Krafft *et al.* (2016). Several points from that paper's results are worth noting. First, the models for consumption (estimated for log consumption) have high explanatory power, with R-squared values in the 65–75 percent range. Second, the observed values (from the HIECS) and predicted values (from the ELMPS) of mean consumption and inequality (as measured by GE(0), the measure used in these analyses) are very similar. The GE(0) value for all individuals in 1998 in the ELMPS is 0.178 and in the HIECS it is 0.189. In 2006 the ELMPS value is 0.180 and the HIECS value is 0.169. In 2012 the ELMPS value is 0.144 and the HIECS value is 0.146. Notably, there is no systematic pattern of higher or lower values across the surveys. Moreover, bootstrapped standard errors indicate that the differences between observed and predicted consumption are not statistically significant.<sup>5</sup> Differences are likely due to natural sampling variability across the surveys.

<sup>3</sup>Reports on ELMPS data collection, sample design, tracking of households, and sample weighting are available (Assaad and Krafft, 2013; Barsoum, 2009; Assaad and Barsoum, 2000). Sample weights, incorporating the panel and refresher dimensions of the data, are used throughout our analyses to make our statistics nationally representative.

<sup>4</sup>No contemporaneous HIECS was available for 1988.

<sup>5</sup>Both in Krafft *et al.* (2016) and in this paper, consumption estimates are bootstrapped not only over 100 variations of the imputed consumption, but also we redraw the ELMPS sample five times for each variation of consumption (and different redraws as we move through the different imputed consumptions) in order to incorporate the variability from using a second survey rather than the census. This yields 500 repetitions of the bootstrap, which are redrawn accounting for the sampling structure (PSUs) of the various surveys.

Individual wage data are collected directly in all the LFSS/ELMPSs for wage workers. All elements of wages (basic wages, supplemental wages, bonuses, incentives, overtime, and other wages from across all primary and secondary jobs) are aggregated into a monthly wage. Individuals may originally report wages in units ranging from hourly to annually for each of the different elements of wages. Therefore, as necessary, questions about hours per day, days per week, or hours per week, and weeks per month are used to calculate a monthly wage.

In the 2012 round of the ELMPS, additional questions were added to capture various forms of labor and capital income for non-wage workers. Non-farm household enterprises were asked their net revenues. Agricultural yields and sales values were collected. Sales of livestock as well as other agricultural products (honey, milk, cheese, etc.) were measured. Rents from buildings, equipment and land, along with interest and dividends are also incorporated into these measures. All measures were translated from their various time frames in the survey into monthly terms. See Krafft and Davis (2016) for details on the methods of assigning income to individuals for these household activities. The information on non-wage income was combined with wages to generate a monthly measure of earned income. Because these data are available only in 2012, we present them here only for the panel analyses, which are focused on outcomes in 2012.

### 3.3. *Sample*

The sample for our analyses of per capita consumption is all household heads with data on circumstances. Individual household heads are our unit of analysis for the consumption analyses. The wage outcome is an individual outcome, and we use a sample of men ages 30–49, the age group that can be expected to be earning wages. Women are excluded from our analyses due to their low and selective labor force participation (Assaad and Krafft, 2015a; Hendy, 2015). Unemployment in Egypt is primarily a privileged, educated, new entrant phenomenon, and job-queuing behavior is common (Amer, 2015; Assaad and Krafft, 2015a, 2014; Krafft and Assaad, 2014; Assaad, 1997). The work by Assaad *et al.* (2016) analyzes income, including non-wage income in the 2012 round, and discusses how selection into wage work might affect analyses of inequality.

### 3.4. *Panel vs. cross-sectional data*

One additional analysis that is undertaken in this paper exploits the panel nature of the ELMPS. With the rounds in 1998 and 2012, we can observe individuals in their natal households in 1998 and assess the impact of circumstances that are not (or cannot) be reported once individuals have left their households. Specifically, we use a sample of males who were aged 26–36 in 2012 (and therefore approximately 12–22 in 1998) and who were observed in their natal households in 1998. This age range trades off selection due to household formation (fewer than 3 percent of individuals meeting the age restrictions were heads of their own household in 1998) and selection due to individuals being unemployed into their mid-20s. While circumstance information incorporates primarily 1998 data,

outcomes are wages and earned income in 2012. Panel weights are used with this sample.

### 3.5. *Circumstances*

This section discusses the different circumstance variables used in estimating inequality of opportunity under various specifications. The main variables included in our set of observed circumstances are parental characteristics, parents' education and fathers' occupation. We code educational attainment for each parent into one of five categories: (1) illiterate (2) reads and writes (3) basic (4) intermediate and above intermediate (upper secondary and two-year higher education programs) or (5) university (four-year higher education programs) and above. To reduce the number of types that five categories for each parent entail, we add these codes to create a single variable representing parental education ranging from two to ten. We then categorize this new variable into four "basic types:" parental education of (1) sum of 2, (2) sum of 3–5, (3) sum of 6–7, or (4) sum of 8–10. We refer to these types as lower class, middle class, upper middle class, and upper class.<sup>6</sup> These types are used in both parametric and non-parametric estimation. In some of our parametric estimates, where we can afford to have more categories, we allow for five different mother's education and father's education levels.

In the non-parametric case, we also define the types based on the region of birth and father's occupation. Region of birth is defined as metropolitan, provincial urban, or provincial rural. Father's occupation (when the respondent was 15 years old) is defined as white-collar, blue-collar, or agricultural worker. If fathers were not working or absent when the child was 15, we coded them as blue-collar. In the non-parametric analysis we thus have a partition of 36 types—the "full partition"—consisting of four parental education categories, three regions, and three father's occupations.

In the parametric models, we first stick with the same set of circumstances defined above as the "basic types." We call this specification 1. Specification 2 corresponds to the "full partition," and includes controls for the four parental education types, birth region, urban versus rural, and the three categories of father's occupation. We also control for work experience and its square, but do not treat work experience as a circumstance (allowing it to contribute to within-group but not between-group inequality). In specification 3 we depart from the non-parametric case by allowing for five categories of mother's and father's education, use six birth regions, and allow for eight categories of father's occupation: (1) white collar wage, (2) white collar non-wage, (3) blue collar regular wage, (4) blue collar irregular wage, (5) blue collar nonwage, (6) agricultural regular wage, (7) agricultural irregular wage, and (8) agricultural non-wage. Irregular work is

<sup>6</sup>Lower class means both parents are illiterate. Middle class means one of the following combinations: Illiterate and Read & Write, both Read & Write, Basic and Illiterate, Basic and Read & Write, Secondary and Illiterate. Upper middle class means one of the following combinations: University and Illiterate, Secondary and Read & Write, Basic and Basic, University and Read & Write, Secondary and Basic. Upper class means one of the following combinations: University and Basic, Secondary and Secondary, University and Secondary, or University and University.

much more precarious than regular work, and non-wage work varies across occupations. White-collar non-wage work (owning a company, for example) is very different than blue-collar or agricultural non-wage work (unpaid family work, for instance). Work experience is also included as in specification 2.

In panel estimates we add a number of additional characteristics that were observed in 1998, calling it specification 4. This adds to specification 3 a wealth quintile variable, which is an asset index of the natal household. We also include an interaction term indicating if the father was educated and in the top wealth quintile. Grandfather's characteristics, including his education, with the same categories as for father or mother, and three levels of occupation of the grandfather are also included. In some cases, for example, when the father was not alive to report it, grandfather's education is missing; these are identified by a control term for missing values. Ownership of an enterprise, and the capital of that enterprise, as well as an interaction between being a white-collar nonwage worker and having high capital for the natal household are included in the model as well.<sup>7</sup>

## 4. RESULTS

### 4.1. *Descriptive statistics on sample characteristics*

#### Distribution of Class

We first examine outcomes by class (the basic type: combinations of parental education). Table 1 presents the distribution of class for each round, as well as for the different samples (outcomes) we examine. The distribution of classes is quite important for understanding both how large and how select a class is within a country, as well as demonstrating the relevance of our class labels.

When focusing on household heads in the consumption sample, more than half of individuals were in the lower class (57–58 percent over 1998–2012). This was relatively constant over time, which is unsurprising given that we are focusing on the parental education of older individuals, whose parents would have been young prior to the expansion of education in Egypt (Assaad *et al.*, 2016). The middle class, the share with low educated parents (sum of 3–5) declined from 37 percent in 1998 to 32 percent in 2012, primarily due to the increasing size of the upper class, the share with parents with a sum of 8–10, which rose from 2 percent in 1998 to 5 percent in 2012. The share in the (still relatively elite) upper middle class remained around 4–5 percent. As was the case with household heads, during 1988–2012 there has been little change in the distribution of classes for male wage-workers aged 30–49. About one-half were lower class throughout the period. There has been some shift towards having parents with more education, with the upper class representing only 2 percent of the sample in 1988 but 6 percent in 2012.

<sup>7</sup>We included these in the model as, conceptually, important markers of socio-economic background. We tested inclusion of fuller sets of interaction terms, which did increase the explanatory power of the model, but retained only these key measures in the results we present to avoid over-fitting the model on the finite panel sample.

TABLE 1  
DISTRIBUTION OF CLASSES (PARENTAL-EDUCATION TYPES) BY ROUND (PERCENTAGE)

	1988	1998	2006	2012
<b>Class (heads of household)</b>				
Lower		57	57	58
Middle		37	35	32
Upper Middle		4	5	5
Upper		2	3	5
<b>Class (male wage workers 30–49)</b>				
Lower	54	49	49	51
Middle	38	43	40	37
Upper Middle	6	5	6	6
Upper	2	3	5	6
<b>Total</b>	100	100	100	100
<b>N (heads of household)</b>		4,779	8,340	12,053
<b>N (male wage workers 30–49)</b>	1,521	1,868	2,841	4,092

*Source:* Authors' calculations based on LFSS 1988 and ELMPS 1998–2012.

*Notes:* Lower class means both parents are illiterate. Middle class means one of the following combinations: Illiterate and Read & Write, both Read & Write, Basic and Illiterate, Basic and Read & Write, Secondary and Illiterate. Upper middle class means one of the following combinations: University and Illiterate, Secondary and Read & Write, Basic and Basic, University and Read & Write, Secondary and Basic. Upper class means one of the following combinations: University and Basic, Secondary and Secondary, University and Secondary, or University and University.

## Distribution of Outcomes

The levels of outcomes across time, as well as their inequality, are important measures of well-being. As we see in Table 2, there is substantial variation over time in the typical level of different outcomes. Both mean and median wages in Egypt fell from 1988 to 1998 and then rose again by 2006, with only small further improvements in 2012. Consumption rose slowly over the 1998–2012 period as well, with a larger increase in the mean from 1998 to 2006 than from 2006 to 2012.

### 4.2 Inequality of Opportunity in Egypt Over Time

In this section we examine the evolution of inequality of opportunity over time in Egypt. The first part of the analysis discusses the distribution of outcomes

TABLE 2  
MONTHLY PER CAPITA HOUSEHOLD CONSUMPTION AND INDIVIDUAL WAGES SUMMARY STATISTICS BY ROUND (IN 2012 PPP IS)

		1988	1998	2006	2012
<b>Household consumption</b>	Mean		134	153	166
	Median		109	125	141
	SD		111	114	112
<b>Individual wages</b>	Mean	365	254	353	364
	Median	283	207	273	282
	SD	314	200	384	441

*Source:* Authors' calculations based on LFSS 1988 and ELMPS 1998–2012.

*Notes:* Consumption statistics based on 100 distributions.

(monthly wages or consumption) by class by comparing CDFs across our four classes for different rounds of the survey. This analysis also examines the change in mean outcomes by class and the ratio of the mean outcomes of the lower class to that of the upper class, the ratio of the middle class to the upper class, and the ratio of the lower class to the middle class. All these indicators are compared across the four rounds of the survey to evaluate how inequality of opportunity has changed over time in Egypt. The second part of the analysis focuses on the decomposition of inequality in monthly wages and consumption into the share due to circumstances and that due to other factors including effort. We conduct the decomposition non-parametrically first using the four classes as the only circumstances and then using a set of 36 types made up of four levels of parental education, three categories of birth region and three categories of father's occupation.

One thing to note as we make these comparisons is that, as education levels increase over time, the distribution of individuals in the four classes will change. While the share of individuals in the lower class did not change appreciably, going from 54 percent of male wage workers in 1988 to 51 percent in 2012, the share of the upper class tripled from 2 percent in 1988 to 6 percent in 2012 (see Table 1). The upper class is therefore a less elite group in 2012 than in 1988.

A similar decomposition of monthly wage inequality in Egypt was carried out by Belhaj Hassine (2011) using the same data sets, but only up to 2006, and El Enbasy and Galal (2015) up through 2012. Several differences exist between our analysis and theirs. First, we focus on prime age males aged 30–49 only, whereas the previous studies included all wage earners 15–65 of both sexes. While Belhaj Hassine provides estimates from both non-parametric “types” and “tranches” methods, and El Enbasy and Galal apply only parametric methods, we use both parametric and non-parametric methods, but the only non-parametric estimates we provide are from the non-parametric “types” methodology. Probably most importantly, we eliminated a handful of outliers in the 2006 data that appear to be the result of data collection errors, a step El Enbasy and Galal undertook as well.<sup>8</sup> The outliers' inclusion dramatically and unrealistically increases inequality in 2006, a fact that explains the big jump in inequality in Belhaj Hassine's results for 2006. Despite these differences, we compare the results of past work to our own whenever relevant.

### Distribution and Evolution of Outcomes According to the Four Classes

Turning first to the distribution of per capita consumption in Figure 2, a noteworthy trend is the compression of the distribution over time, and also increasing distinctiveness by class. From 1998 to 2006 and then from 2006 to 2012, the distance between the classes generally decreased, with the exception of the middle class moving away from the upper class. While the entire distribution has shown slight improvements from 1998 to 2006 and to 2012, it has not changed

<sup>8</sup>The errors were almost all people working in government, earning a typical monthly wage, who had that wage reported as daily in the survey data; government wages are not paid daily and we have corrected these back to monthly.



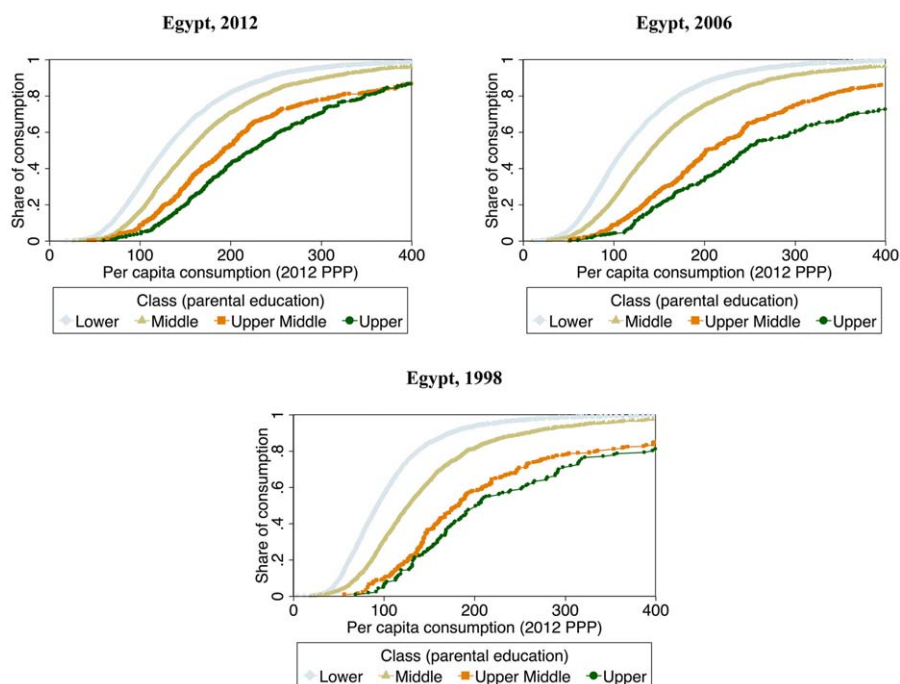


Figure 2. Cumulative distribution functions of monthly per capita consumption by round  
[Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

*Source:* Authors' calculations based on LFSS 1988, ELMPS 1998–2012

*Notes:* Lower class means both parents are illiterate. Middle class means one of the following combinations: Illiterate and Read & Write, both Read & Write, Basic and Illiterate, Basic and Read & Write, Secondary and Illiterate. Upper middle class means one of the following combinations: University and Illiterate, Secondary and Read & Write, Basic and Basic, University and Read & Write, Secondary and Basic. Upper class means one of the following combinations: University and Basic, Secondary and Secondary, University and Secondary, or University and University. One iteration of consumption is shown, selected by a random number generator. Data are displayed up to 400 (2012 PPP international dollars) for ease of viewing.

shape particularly dramatically, suggesting that other factors than parental education are increasingly driving inequality.

Figure 3 shows the evolution of the cumulative distributions of wages for prime-age male wage earners over time. A comparison of the four panels reveals that the CDFs of the lower through upper middle classes are becoming less spread out over time, suggesting that inequality across these three classes is falling. At the same time, the gap between the upper middle and upper class becomes larger, reaching a maximum in 2006. This suggests that as education became more common among the parents' generation, it lost some of its salience as a driver of inequality in the wage space, as was the case with consumption. In fact, the overall CDFs in 1988, 2006 and 2012 (not shown) are almost identical, suggesting that the overall wage distribution hardly changed. In 1998, overall real wages had declined and inequality was also lower.

Consumption growth appears to be primarily occurring for the lower class (Table 3). The lower class had 1.9 percent growth from 1998–2006 and 2.1 percent



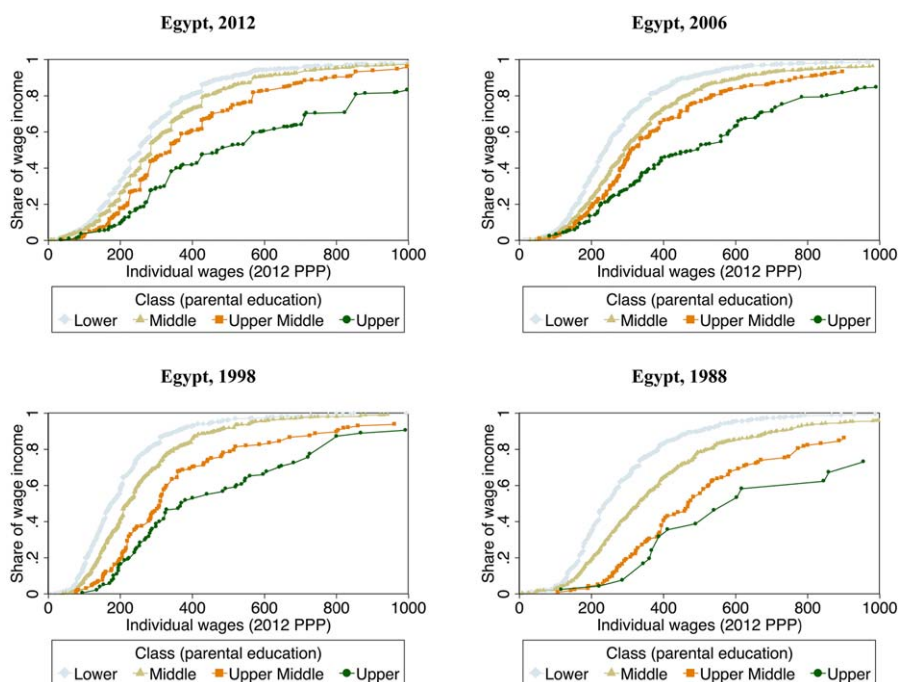


Figure 3. Cumulative distribution functions of monthly individual wages, male wage earners 30–49, by round [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on LFSS 1988, ELMPS 1998–2012

Notes: Lower class means both parents are illiterate. Middle class means one of the following combinations: Illiterate and Read & Write, both Read & Write, Basic and Illiterate, Basic and Read & Write, Secondary and Illiterate. Upper middle class means one of the following combinations: University and Illiterate, Secondary and Read & Write, Basic and Basic, University and Read & Write, Secondary and Basic. Upper class means one of the following combinations: University and Basic, Secondary and Secondary, University and Secondary, or University and University. Data are displayed up to 1000 (2012 PPP international dollars) for ease of viewing.

growth from 2006–12, and the middle class 1.2 percent over the same periods, while the upper middle and upper classes averaged less than 1 percent growth over 1998 to 2012. The decline in overall wages from 1988 to 1998 and the accompanying reduction in inequality is also quite apparent from Table 3, which shows the rate of growth of wages by class across each of the rounds. From 1988 to 1998, all four classes experienced wage declines, but the decline was larger in relative terms for the upper middle and upper classes, leading to overall wage compression. From 1998 to 2006, all four classes experienced an increase in real wages, with the upper middle class experiencing the lowest increase and the other classes experiencing an increase of more or less the same magnitude. From 2006 to 2012, real wages were essentially stagnant, but now the middle class experienced a slight decline, compared to a slight increase among the other three classes.

The general trend of falling inequality across the four classes in Egypt since 1988 is confirmed when we examine the evolution of the ratio of the mean monthly wage or consumption of the lower class to that of the upper class, the mean outcome of the middle class to the upper class, and the lower class to the

TABLE 3  
ANNUALIZED MEAN WAGE AND CONSUMPTION GROWTH (%) BY TYPE AND ROUND

Class	Wages			Consumption	
	1988–1998	1998–2006	2006–2012	1998–2006	2006–2012
Lower	–3.1	4.1	1.0	1.9	2.1
Middle	–4.0	4.2	–0.6	1.2	1.2
Upper Middle	–5.7	0.8	1.2	0.5	–1.3
Upper	–4.8	3.5	0.9	1.2	–2.1
Total	–3.6	4.1	0.5	1.6	1.4

Source: Authors' calculations based on LFSS 1988, ELMPS 1998–2012.

Notes: Consumption statistics based on 100 distributions.

Lower class means both parents are illiterate. Middle class means one of the following combinations: Illiterate and Read & Write, both Read & Write, Basic and Illiterate, Basic and Read & Write, Secondary and Illiterate. Upper middle class means one of the following combinations: University and Illiterate, Secondary and Read & Write, Basic and Basic, University and Read & Write, Secondary and Basic. Upper class means one of the following combinations: University and Basic, Secondary and Secondary, University and Secondary, or University and University.

middle class. A rising ratio reveals lower inequality across types. As shown in Figure 4, the ratio of the consumption of the lower class to the upper class was stable from 1998 to 2006 and then rose in 2012. The ratio of the wages of the lower class to those of the upper class increased substantially from 1988 to 2006 and then stabilized between 2006 and 2012. The ratio of the consumption of the middle class to the upper class was similar in 1998 to 2006 and rose from 2006 to 2012. The ratio of the wages of the middle class to the upper class rose slightly from 1988 to 2006 but actually fell from 2006 to 2012, indicating rising inequality between

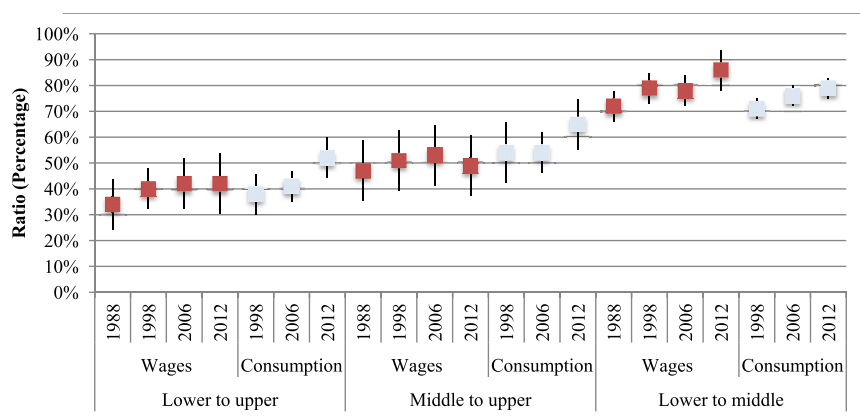


Figure 4. Ratio of mean monthly wages and mean per capita household consumption across various combinations of classes by round [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on LFSS 1988, ELMPS 1998–2012.

Note: See Table A1 for underlying values.

Bars indicate 95% confidence intervals.

Bootstrapped standard errors have 500 iterations for wages and 5 iterations each of 100 consumption distributions.

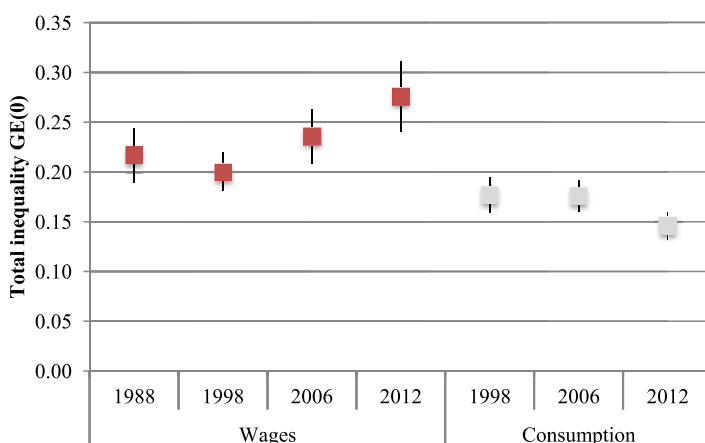


Figure 5. Total inequality in consumption and wages over time  
[Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on LFSS 1988, ELMPS 1998–2012.

Note: See Table A2 and Table A3 for underlying values.

Bars indicate 95% confidence intervals.

Bootstrapped standard errors have 500 iterations for wages and 5 iterations each of 100 consumption distributions.

these two classes. In contrast, the ratio of the lower class to the middle class indicated declining inequality for both outcomes measures throughout the period, with the exception of stagnant wage inequality from 1998 to 2006. These trends confirm the decline in between-class inequality in the period under consideration. The comparisons of the lower class to the middle class and the middle class to the upper class show an important driver of this trend; the steady decrease in the difference between the middle class and the lower class, i.e. the “hollowing out” of the middle class.

### The Evolution of the Share of Circumstances in Total Wage Inequality

We now move to the second part of our analysis of the evolution of inequality of opportunity over time in Egypt, relying on  $GE(0)$  to quantify, first, total inequality, and then inequality of opportunity. The trends in total inequality provide important context for interpreting whether inequality of opportunity is changing in relative or absolute terms. In Figure 5 we examine the evolution of total inequality in consumption and wages over time. We find that, while wage inequality fell from 1988 to 1998, it has been rising since then. In contrast, total consumption inequality declined slightly from 1998 to 2006 and more substantially by 2012. Our results showing rising total inequality in wages in 2006 align with those of El Enbavy and Galal (2015) and Belhaj Hassine (2011). Our finding of a continued rise in inequality in 2012 is, however, at odds with El Enbavy and Galal's finding of inequality dipping again in 2012. One possible explanation is that we focus on prime age males 30–49, whereas their inclusion of the full age range 15–65 includes the youth bulge group of new entrants. Wages early on in first jobs may not be as strongly differentiated as adult wages. However, sensitivity

analysis of our results, first expanding the age range to 18–64 and then adding women did not change the relative patterns of falling then rising inequality in wages.<sup>9</sup>

A puzzle that may require further research to elucidate is why consumption inequality is stable if not falling slightly while wage inequality is rising. It is unlikely to be the result of our imputation methodology. Our imputed consumption distributions closely match those obtained from contemporaneous surveys that actually measure consumption (Krafft *et al.*, 2016). Shifts in self-employment income may play a key role in this puzzle, as workers who were previously non-wage workers, particularly in agriculture, shifted into wage work increasingly over the 2006 to 2012 period compared to 1998 to 2006 (Assaad and Krafft, 2015b). Irregular wage work, which has fewer hours and therefore lower monthly earnings and is likely to continue to be supplemented by non-wage work, may contribute to rising wage inequality even when consumption inequality is more stable.

It is important to keep in mind total inequality trends as we begin our examination of the share of consumption and monthly wage inequality due to circumstances using GE(0). Here we present results from our non-parametric analysis; parametric decomposition results are included in the Appendix, Table A9. As mentioned above, we first present results based on the four classes (types) and then compare them to results using the full partition.

We decompose overall inequality into between-type inequality, which we refer to as inequality due to circumstances, and within-type inequality, which we refer to as residual inequality. Recall that within-type inequality is due to both effort and unobserved circumstances, so that the share of inequality due to circumstances should be interpreted as a lower bound of the contribution of circumstances to overall inequality.

We can immediately see in Figure 6, for consumption and wages, that the share of inequality due to circumstances, when circumstances are captured exclusively by the four types, is falling over time. Looking first at the four types for consumption, the share of inequality due to circumstances fell from 18 percent in 1998 to 13 percent in 2012. A similar pattern is observed for wages; the share of inequality due to circumstances falls from 20 percent in 1988 to 13 percent in 1998 to 10 percent in 2006 and 10 percent in 2012 using the four types. The decline in the share of circumstances from 1988 to 1998 is all the more remarkable because it occurred in the absence of an increase in total inequality. The rise in total inequality combined with a decline in the share of circumstances suggests an increasing role for unobserved circumstances, such as more difficult to observe dimensions of social class.

We now move to the somewhat richer specification of circumstances that define our 36-type partition. For wages, this increase in the number of types raises the share of inequality due to circumstances from 20 percent to 34 percent in 1988 and from 10 percent to 13 percent in 2012 (see Figure 6). The conclusion that the

<sup>9</sup>This result holds for the different partitions of results into four or 36 types, as well as when incorporating formality adjustments into our wage measures, below. Further, the IOp share, in all sample sensitivity analyses, remained lower in 2012 than in previous years.

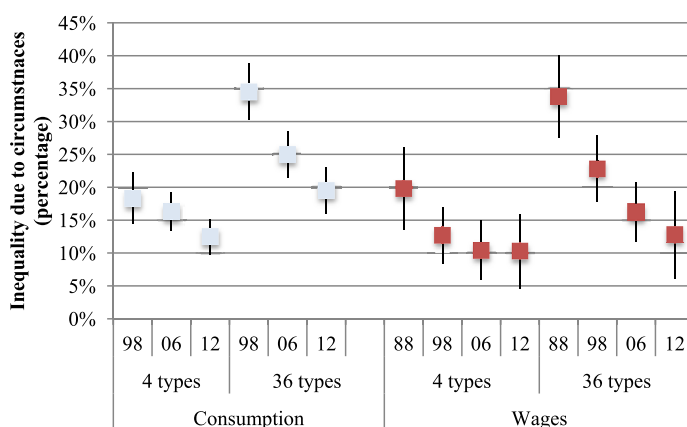


Figure 6. Share of between inequality in total inequality in consumption and wages over time and by specification [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on LFSS 1988, ELMPS 1998–2012.

Note: See Table A2 and Table A4 for underlying values for consumption. See Table A3 and Table A5 for underlying values for wages.

Bars indicate 95% confidence intervals.

share of inequality due to circumstances fell the most from 1988 to 1998 is robust with respect to the inclusion of the new circumstances. However, this specification shows that progress continued to be made through 2012, with the share due to circumstances falling from 23 percent in 1998 to 16 percent in 2006 to 13 percent in 2012. The declining share results from both a decline in the numerator (the inequality due to circumstances) and an increase in the denominator (overall inequality) from 1988 to 2012, although the increase in the denominator plays a more important role in the later part of the period. Using the richer 36 types for consumption shows a similar pattern. It raises the share of inequality due to circumstances from 18 percent to 35 percent in 1998 and from 13 percent to 20 percent in 2012, but maintains and even strengthens the pattern of falling inequality due to circumstances.

It appears that, for wages, inequality of opportunity as measured by the share of circumstances in overall inequality is declining in Egypt, with the largest decline occurring in the 1988–98 decade. The pace of decline appears to have slowed in recent years, especially between 2006 and 2012, and appears to be primarily due to an overall increase in inequality that is not matched by an increase in the inequality due to the measured circumstances. This result is in line with the finding above that the gap between the CDFs of the three lower classes has narrowed. It is also in line with the fact that the ratios of the mean wage of the lower class to that of the upper class and middle class have decreased over time, while the middle class recently has suffered reversals moving it closer to the lower class by some measures. The result also aligns with the results in El Enbasy and Galal (2015) and Belhaj Hassine (2011) showing that inequality due to circumstances has been flat or falling. Belhaj Hassine shows that the opportunity share of inequality (what we refer to as the share of inequality due to circumstances)

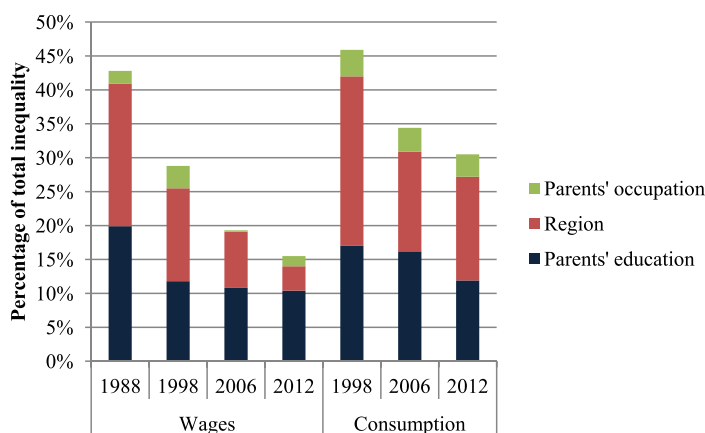


Figure 7. Partial effects, percentage of total inequality in wages and consumption, parametric models over time. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on LFSS 1988, ELMPS 1998–2012.

Note: See Table A9, specification 3 for underlying values.

estimated using the non-parametric types approach declined from 14 percent in 1988 to 11 percent in 2006 for men 15–64 in Egypt. El Enbavy and Galal find that inequality due to circumstances went from 11 percent in 1998 to 9 percent in 2006 and then rose very slightly to 9–10 percent in 2012. Although no other authors have looked at consumption as yet, our results of slight declines in total inequality and declining inequality due to circumstances are consistent with patterns of declining inequality due to circumstances in wages.

In order to understand which aspects of circumstances are driving the declines in the share of circumstances in inequality, in Figure 7 we present the partial effects from the parametric specification 3, including more disaggregated categories but similar variables to the 36-types non-parametric specification. For wages, and to a lesser extent consumption, the reduced share of circumstances in inequality due to regional differences has been a key driver of declines in inequality of opportunity. Parents' occupation has a small and fluctuating partial effect, while parents' education shows small declines in partial effects over time. Essentially, it appears that much of the decline in inequality in opportunity in Egypt has been due to declining regional inequality, perhaps representing more integrated labor and goods markets.

One reason that patterns of declining inequality due to circumstances are at odds with increasing concern with inequality in Egypt may be that wages miss many of the key aspects of jobs that individuals value. Egyptians express strong preferences for the security and benefits inherent to public sector employment. Formal jobs in the private sector are rarer, and not valued as highly as public sector jobs, but their benefits are still valued (Barsoum, 2015; Assaad and Krafft, 2015b). The benefits of formal jobs have substantial monetary value; it has been estimated that total compensation is essentially double wage compensation in the public sector in Egypt (Assaad, 1999). Yet the availability of public sector jobs has declined, private formal jobs have not increased at a rate so as to replace

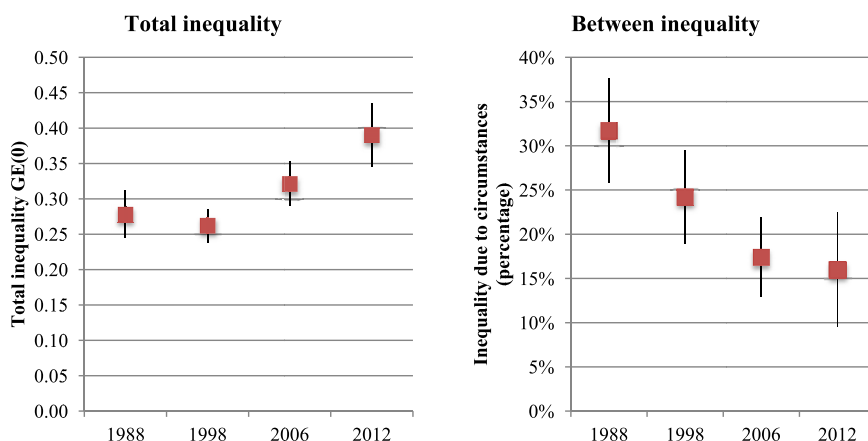


Figure 8. Total inequality and share of between inequality in total inequality in formality adjusted wages over time [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on LFSS 1988, ELMPS 1998–2012.

Note: See Table A6 for underlying values.

Bars indicate 95% confidence intervals.

public sector jobs, and access to such jobs is highly unequal (Assaad and Krafft, 2014, 2015b). We investigate the trends in what we refer to as “formality adjusted wages” in Figure 8, where we double wages to represent compensation for any formal job. Once formality and thus total compensation has been taken into account, total inequality has risen steadily in Egypt from 1998 to 2012, almost doubling over that period, as measured by  $GE(0)$ . The share of inequality due to circumstances, using the 36 types, declined from 1998 to 2006 substantially, and only a little further from 2006 to 2012, such that absolute inequality due to circumstances as measured by  $GE(0)$  actually rose from 2006 to 2012, returning to 1998 levels.

Even after accounting for job formality, levels of inequality and inequality due to circumstances remain modest. However, these results must still be interpreted with caution, for they could simply mean that the circumstances we are capturing by our classification of types are becoming less relevant for capturing the most salient social cleavages in Egyptian society. As educational attainment increases, having more educated parents does not necessarily result in more favorable labor market outcomes, thus reducing the difference in outcomes across types. In fact, other research on Egypt has shown that rising educational attainment has not translated into commensurate improvement in occupational or labor market status (Assaad and Krafft, 2014, Binzel, 2011). The increasing levels of wage and especially formality adjusted wage inequality over time are hard to explain as increasing residual inequality is more likely due to the increasing importance of unobserved circumstances such as *quality* of education and parental wealth. We explore the influence of parental wealth in the next section using panel data that allows parental wealth to be observed when individuals were still living in their natal households.



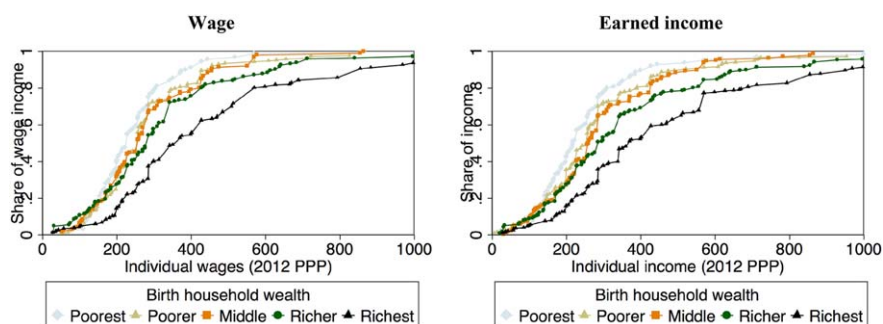


Figure 9. Cumulative distribution functions of individual wages and individual earned incomes, male wage earners or income earners by birth household wealth, panel sample [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on ELMPS 1998–2012.

#### 4.3. Panel Sample Results

A common challenge in estimating inequality of opportunity based on individuals' circumstances using cross-sectional data is that so many circumstances are not observed because individuals are observed only at one point in time. For instance, information on parents' education and occupation looking at wage earners 30–49 gives only a partial picture of children's early circumstances. However, because the ELMPS tracks individuals from 1998 through 2012, we can, for a subsample of the 2012 sample, examine inequality of opportunity in 2012 outcomes incorporating the characteristics of individuals' natal households in 1998. This “panel” sample, described earlier, is young male wage earners (26–36 in 2012). This section first illustrates the distributions of wages and income by birth household wealth, and then performs parametric analyses of inequality of opportunity for a series of specifications incorporating an increasing number of circumstances.

##### Distributions of Wages and Earned Income by Birth Household Wealth<sup>10</sup>

From Figure 9, which presents the cumulative distribution functions for wages and earned income by birth household wealth, it is clear that, while there is a slight gradient in the bottom four quintiles, it is primarily wage earners whose birth households were in the wealthiest 20 percent of the distribution in 1998 who have higher wages in 2012. The difference between the highest wealth quintile and the fourth wealth quintile tends to be several times larger than the difference between the bottom and fourth wealth quintiles. Essentially, individuals from the bottom 80 percent of households face similar wages with only a slight increment by wealth, while individuals from the top 20 percent of households earn substantially higher wages—around 50 percent higher than other groups over most of the distribution. There is a slightly stronger gradient in the bottom 80 percent of the distribution when earned incomes are considered (Figure 9). Although earned

<sup>10</sup>Earned income, which includes income from household enterprises and farms is only available for the 2012 wave of the ELMPS.

incomes are very similar for the two poorest quintiles, the third and fourth quintiles show more of a difference. Individuals in these quintiles with wealthier families may have better opportunities for self-employment and other non-wage work because their families can help provide capital for their enterprises. Individuals from the richest 20 percent of households again have substantially higher earnings than other groups, but while the gap with the poorest is similar, the gap between the fourth and richest quintiles is somewhat smaller with earned income than wages. For individuals with access to capital, there appears to be less inequality of opportunity in earned income than in wages; circumstances may determine the rewards of wage work while effort may pay off more in non-wage work.

### Inequality, Inequality of Opportunity, and Partial Effects from Parametric Estimation

Analyzing inequality of opportunity in the panel sample serves two purposes. First, it allows us to assess the contributions of natal household circumstances that could not otherwise be observed in cross-sectional data, such as parental wealth. Secondly, it allows us to compare the full partition estimate to the basic partition to provide a sense of how much we may be under-estimating inequality of opportunity in Egypt and other countries when these additional circumstances are not observed.

Table A7 presents the estimates of inequality of opportunity in wages as measured by GE(0) using the panel sample. Recall that outcomes are in 2012, and it is notable that the amount of total inequality (0.25) is similar to that for the full sample (0.28, see Table A3).<sup>11</sup> The inequality share due to circumstances in specification 1 (four-category sum of parental education only) is 13 percent. This is fairly similar to that for Egypt in 2012 in the full sample (10 percent, Table A3). The share of inequality due to circumstances increases only very slightly with the addition of region of birth and family's employment in specification 2. Finer disaggregation of father's occupation, parents' education, and region in specification 3 increases the measured share of inequality of opportunity to 15 percent. In specification 4, variables available only in the panel are added, and at this point the share of inequality due to circumstances increases to 18 percent. Although the partial effects are insignificant, parent's education has a contribution of 12 percent, natal wealth has an 8 percent contribution to total inequality, and grandfather's characteristics a 3 percent contribution. A number of the individual regressors contributing to the other categories are statistically significant in the regressions (Table A10).

Comparing specification 4 to the preceding specifications (Figure 10) offers a number of insights into the estimations in the full sample. First, we are clearly not capturing the full scope of inequality of opportunity with the circumstances available in the full sample (and likely still missing aspects in the panel as well); the share of inequality due to circumstances increases from 15 percent to 18 percent (a 22 percent increase) from specification 3 to specification 4. Secondly, the partial

<sup>11</sup>The slightly lower level of total inequality is likely due to the additional age restriction; while the panel sample is 26–36 the standard sample is 30–49 and thus has a wider range of work experience contributing to total inequality.

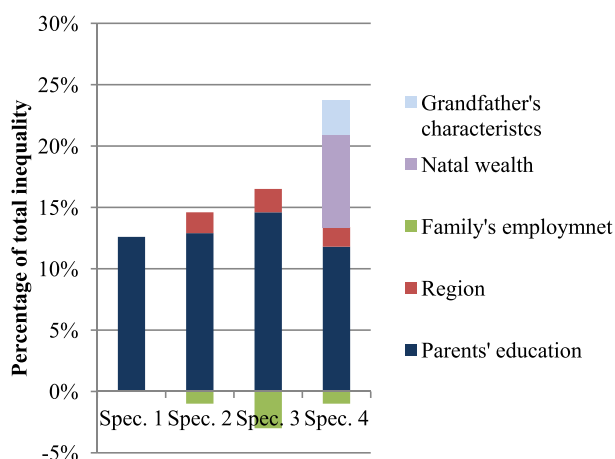


Figure 10. Partial effects, percentage of total inequality in wages, parametric models, panel sample [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

Source: Authors' calculations based on ELMPS 1998–2012.

Notes: See Table A8 for underlying estimates.

effect of parental education decreases from 15 percent to 12 percent over the same span. This suggests that other characteristics (such as other aspects of the socio-economic background) that are correlated with parents' education are contributing to the partial effect. From a perspective of assessing inequality of opportunity overall, this is in fact a boon rather than a problem, but in terms of assessing partial effects and what drives inequality of opportunity, it is problematic.

Turning now to earned income (Table A8), we see that inequality of earned income of 0.33 is again similar but slightly smaller for the panel sample than that for the full sample (Assaad *et al.*, 2016). The share of inequality due to circumstances in specification 1 is 9 percent, and this increases to 14 percent in specification 4. Parent's education is the only statistically significant partial effect, but natal wealth and grandfather's characteristics have moderate inequality shares and also some significant coefficients in the individual regressions (Table A10). Inequality of opportunity is smaller for earned income than for wages across all the specifications. This pattern also occurred for the full sample (Assaad *et al.*, 2016) and is likely due, in part, to the greater volatility of earned income (due to volatility in crop harvests, for instance) than the relatively fixed income from a wage.

## 5. DISCUSSION AND CONCLUSIONS

Our results are fairly conclusive when it comes to the trajectory of inequality of opportunity in Egypt across time. All the measures indicate that inequality in consumption and the share of inequality in consumption due to circumstances have both declined over time. Conversely, wage inequality has been increasing in Egypt since 1998, but the share of wage inequality due to observed circumstances has also been declining steadily based on specifications of circumstances with

various degrees of detail. The largest decline in the share of circumstances in wage inequality occurred between 1988 and 1998 and the decline has slowed considerably since then. The decline in the share due to circumstances between 1988 and 1998 happened in a context of both falling real wages and falling total inequality. However, the subsequent decline in the share of circumstances since 1998 occurred in the context of rising or stagnant real wages, and, more importantly, rising total wage inequality. Further, when job formality is monetized (by doubling wages in formal jobs), there is an even stronger rising trend in total wage inequality as access to formality becomes more restrictive over time due to a contracting public sector. Absolute inequality due to circumstances rises using this specification, but the relative contribution of circumstances to total inequality does not. The estimation of partial effects from parametric specifications indicate that the contribution of parental education to total wage inequality declines from 1988 to 1998, but that most of the remaining decline in the overall contribution of circumstances to wage inequality thereafter is attributable to the decline in the contribution of region of birth. Similar declines in the contribution of region of birth can be observed in the partial decompositions of the role of circumstances in consumption inequality. These reduced regional effects could be attributable to better integrated labor and goods markets over time.

Our results on the evolution of the mean wages by class of parental education point in a similar direction. The ratio of the mean wages of the lower to upper classes shows some limited wage compression between these two classes, but mostly in the early part of the period. There is more compression in mean consumption across these two classes, especially from 2006 to 2012. The ratio of the mean wages of the middle class to the upper class also shows some compression from 1988 to 2006, but reveals a widening of the gap from 2006 to 2012. A similar widening is not observed for consumption. The most notable result, however, is the substantial reduction in the gap in mean wages between the middle class and the lower class. The ratio of mean wages of the lower to the middle has steadily increased from 72 percent in 1988 to 86 percent in 2012. Increases likewise occurred for the ratio of mean consumption. Furthermore, an examination of the changes in mean real wages over time revealed that when wages were falling (1988–98), the most rapid rates of decline were for the upper middle group. When they recovered in 1998–2006, that group had by far the lowest wage growth. When the increase slowed in the 2006–12 period, but was still positive overall, the middle group was the only one to experience a real wage decline. These results suggest that much of the reduction in inequality of opportunity observed in Egypt since 1988 is due to the hollowing out of the middle class. This finding is in line with Diwan's (2013) contention that it is the changing economic fortunes of the middle class that have driven the social unrest that Egypt, and for that matter much of the region, has experienced since 2011.

Our results can also inform the debate around the MENA inequality puzzle, which shows that inequality of consumption appears to be stagnant or even falling contrary to perceptions that see it as rising sharply. It is arguable that perceptions are primarily driven by those in the middle class and those aspiring to join them who have experienced a distinct deterioration in their social and economic positions in recent years. Historically, public sector employment provided a

reliable and equitable route to the middle class for those who could achieve the requisite educational credentials (Assaad and Krafft, 2014). With the long-term contraction of public sector hiring since the early 1980s, those with mid-level education find themselves and their children increasingly undifferentiated from the lower classes. While low and falling measured inequality may be partly the result of the underestimation of top incomes (Alvaredo and Piketty, 2014; Hlasny and Verme, 2014), the hollowing out of the middle class in Egypt could also result in decreased inequality over time, especially for measures that account for inequality across the entire distribution such as the Gini coefficient.

As education loses salience as an avenue to the middle class (Binzel, 2011), other circumstances, which we are unable to observe in our cross-sectional data, may be gaining in importance as drivers of inequality in Egypt. These include parental wealth, the quality of education, and access to favorable social ties and networks. Although we are unable to test the relative importance of these unobserved circumstances over time, we are able to assess whether supplementing our vector of circumstances with some of these previously unobserved circumstances substantially increases the share of inequality that is attributable to circumstances. We make use of a panel dataset that follows individuals from 1998 to 2012 to add additional circumstances that cannot be easily measured in cross-sectional data to estimate the same inequality of opportunity measures. The most important set of circumstances we were able to add in this way is natal household wealth, although we also add grandfather's education and employment in addition to the father's. The addition of these variables increases the measured share of wage inequality due to circumstances from about 15 percent when the previous set of circumstances was used to 18 percent with the augmented set, a relative increase of 22 percent. There is a similar magnitude increase when the dependent variable is earned income rather than wages.

Even the childhood circumstances we add in the panel estimates are likely to capture only a small part of children's early environment. Hufe *et al.* (2015), examining the U.S. and U.K., compare inequality due to a limited set of circumstances, similar to our non-panel estimates, to a richer set of estimates with information on childhood performance and health. As discussed previously, we believe such childhood attributes should be considered circumstances. With their limited set of circumstances, Hufe *et al.* find that 20 percent of income inequality is due to circumstances, while with the fuller set of circumstances, the share rises to 46 percent in the U.S. and 31 percent in the U.K. If in Egypt richer data on children's early experiences were available, we conjecture that the role of circumstances in inequality would likewise increase more than the 22 percent rise of the panel estimates and could even double. This suggests that unobserved circumstances play a substantial role in explaining inequality and that the estimates we provide can only be interpreted as a conservative lower bound.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

**Appendix:** Additional Tables