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Ragui Assaad[2], Caroline Krafft[3] and Shaimaa Yassin[4]

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Send correspondence to:
Ragui Assaad
University of Minnesota
assaad@umn.edu

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[2] University of Minnesota and ERF, assaad@umn.edu
[3] St. Catherine University, cgkrafft@stkate.edu
[4] University of Lausanne, yassin.shaimaa@gmail.com

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Abstract

Creating jobs, especially good jobs, is one of the greatest challenges facing Egypt. This paper investigates the nature of job growth in Egypt, including the firm, industry, and worker characteristics that are related to job growth. Using data from Egypt's establishment censuses linked to various firm and labor surveys, we examine job growth in private sector establishments over 1996-2017. We find that job growth has primarily followed a labor absorption paradigm, with job growth unrelated to productivity and highest for firms with more informal employment.

Keywords: Employment, Job Creation, Job growth, Egypt

JEL Classifications: J21, J23, D22, N35

ملخص

يشكل خلق فرص العمل ، وخاصة الوظائف الجيدة ، أحد أكبر التحديات التي تواجه مصر. تبحث هذه الورقة في طبيعة نمو الوظائف في مصر ، بما في ذلك خصائص الشركات والصناعة والعمالة المرتبطة بنمو الوظائف. باستخدام بيانات من تعدادات امؤسسات مصر المرتبطة بمختلف مسوح الشركات والعمل ، ندرس نمو الوظائف في مؤسسات القطاع الخاص خلال الفترة من عام 1996 إلى عام 2017. ونجد أن نمو الوظائف اتبع في المقام الأول نموذج استيعاب العمالة ، حيث لم يكن نمو الوظائف مرتبطًا بالإنتاجية وبلغ أعلى نسبة في الشركات ذات الوظائف غير الرسمية .

1. Introduction

Creating jobs, especially good jobs, is one of the greatest challenges facing economies in the Middle East and North Africa (MENA) and Egypt in particular (Assaad & Krafft, 2015a; World Bank, 2013a). A number of economic and demographic forces have aligned to create large increases in labor supply in Egypt (Assaad & Krafft, 2015b). The youth bulge phenomenon in particular created major demographic pressures. While the bulge has largely been absorbed into the labor force, the "echo" of this generation, powered by both the youth bulge's demographics and rising fertility rates, presents a renewed demographic challenge. This young generation is already pressuring health and education systems and will soon present a renewed challenge for the labor market (Krafft & Assaad, 2014a). A major shift has also occurred in the skill composition of the labor force, with rapid expansions in education and rising levels of attainment, requiring higher quality jobs to satisfy the rising aspirations of educated job seekers (Assaad & Krafft, 2015b; Elbadawy, 2015).

Labor demand has not been of sufficient quantity or quality to fully absorb this increasing, and increasingly educated additional labor supply. High unemployment rates among the educated (particularly educated women) as well as low female labor force participation (Assaad & Krafft, 2015b) are, in part, the result of weak labor demand. Weak labor demand also takes the form of under-employment, with workers working fewer days and hours than they would like, as well as working at jobs well below their educational qualifications (Assaad & Krafft, 2015c; Krafft, 2018). The increasing informality of jobs for new entrants and the very slow growth of the formal private sector are further symptoms of weak labor demand (Assaad & Krafft, 2015a). Even historically, workers (especially women and children) tended to gradually adapt themselves to the available labor-absorbing employment opportunities, such as those in agriculture. This absorption occurs even if opportunities have low pay levels and a great deal of employment instability (B. Hansen, 1969). Until the 1960s, agriculture played the buffer role in the Egyptian economy, absorbing excess labor in slack times and releasing it in times of increased economic activity. The informal economy is increasingly filling this labor-absorbing role (B. Hansen & Radwan, 1982).

While much has been written on the evolution of labor supply, there has been limited research on labor demand, primarily due to limited publicly available data on firms. Data that allow for investigation of job growth have been particularly scarce. This paper uses newly available data on establishments in Egypt to examine job growth in Egypt over the period 1996 to 2017 in terms of location, firm size and industry, and also assess the quality of these jobs in terms of productivity, level of education and skill required, and formality. The specific research questions addressed by the paper include: (1) Where (geographically) are jobs being created? (2) What industries are experiencing net job growth and what industries are net job losers? (3) At what skill levels are jobs being created and what is the quality of these jobs by formality of employment? and (4) What are the predominant characteristics of firms in fast growing industries in terms of characteristics such as size, age, formality, ownership, capital intensity, and productivity?

While the analysis we carry out in this paper is primarily descriptive, in that it attempts to characterize where and what kind of net job growth occurred in Egypt over the 1996-2017 period, it is a necessary first step for more in-depth analyses of labor demand. With the virtual absence of publicly available microdata on firms in Egypt up to this point, such analyses have hitherto been impossible.

Because firm-level microdata had been virtually absent in Egypt until recently, little is known about the pattern of net job growth in the Egyptian economy in the past two decades at any meaningful level of either geographic or industrial detail. The first contribution of this paper is to link data, for the first time, from a series of establishment censuses to assess the pattern of job growth from 1996 to 2017 by industry and governorate. The second contribution is to use additional data on firm characteristics from the 2012/13 Economic Census to assess the firm-level as well as industry-level correlates of job growth, such as firm size, age, legal form, formality status, and industry concentration ratios. Such analysis has not been previously done at an economy-wide scale in Egypt. The third contribution is to use data from other sources, such as the Egypt Labor Market Panel Survey, to investigate additional correlates of job growth, such as worker skills and employment formality.

Because of the increasing availability of micro-level household survey data in recent years, a great deal of progress has been made in our understanding of the composition and dynamics of labor supply in Egypt. Further understanding of the functioning of the Egyptian labor market and of labor market outcomes, such as the growth, composition and quality of employment, hinges on a more complete understanding of the demand side of the market. The recent availability of microdata from establishment and economic censuses finally makes such research possible. By laying out the features of job growth and its correlates, this paper provides an important basis for understanding labor demand in Egypt.

The main findings of this paper are that, as a response to the growing pressures of the labor supply, jobs in Egypt are mainly being created in the form of informal employment in industries with small firms, regardless of productivity, confirming the role of the informal economy as the buffer that absorbs excess labor in the Egyptian economy. Indeed, in times of economic slowdown, open unemployment, which is mostly structural, does not respond all that much to the economic cycle, but visible underemployment and the irregularity of employment increase substantially (Krafft & Assaad, 2014b). Since most Egyptian workers cannot afford to remain openly unemployed, certain employment opportunities would have to materialize to accommodate this excess labor. By examining the labor demand side, these findings provide, for the first time, evidence to the inadequacy and insufficiency of job growth in large private formal firms to absorb the available labor supply.

The rest of the paper is organized as follows. In section 2, we survey the theoretical and empirical literature discussing labor demand in both the MENA region and elsewhere. Section 3 includes a discussion of our data sources and structure. Section 4 describes the methods of analysis adopted in our study. Section 5 lays out all our descriptive and regression findings and, lastly, section 6 concludes.

2. Literature Review

Since labor market outcomes are the result of the equilibrium determined by labor supply and labor demand, a number of features of labor demand in the Egyptian economy can be inferred from the structure and evolution of employment. First and foremost is that employment growth has largely tracked working-age population growth over time, with the exception of the 2009-10 period, characterized by the global financial crisis, and the post-revolutionary period, when employment growth has flagged (Assaad & Krafft, 2015a). The sorts of jobs that were being created may not be of high quality; they may consist in part of survival self-employment or working in a marginal family business or farm, working irregularly for fewer hours than desired, or work requiring lower qualifications than those of the jobholder. However, at least for men, who lack the option of leaving the labor force entirely, employment is ultimately attained (Assaad & Krafft, 2015a).

Unemployment, the typical measure of labor market health in advanced economies, may potentially be a misleading measure in the Egyptian context (Krafft & Assaad, 2014b). As of 2012, the unemployment rate in Egypt was 8.7% with higher rates for women, the young, and the educated.[5] While unemployment tends to be symptomatic of weak labor demand for the educated, under-employment is more common among the less educated. As of 2012 the (visible) under-employment rate was 8.5%, meaning 8.5% of those in the labor force were working less than 40 hours per week due to insufficient employment opportunities. This rate was a substantial increase from the 2.6% under-employment rate in 2006 (Assaad & Krafft, 2015b). Another form of under-employment is being over-educated for one's position; as of 2012, 51% of employed males were working at a job that requires an education below what they attained and 55% of employed males were working in jobs that required no formal schooling whatsoever (Krafft, 2018). Thus, overall, labor market outcomes suggest that labor demand is weak (relative to supply) for both educated and uneducated workers in Egypt.

Besides the various measures of participation that indicate weak labor demand, the structure of employment itself suggests that job creation is anemic. Although the composition of the economy has shifted away from the dominant role of government and public enterprises in employment, there has been little growth in formal private sector wage work. The share of such work in overall employment grew from just 8% in 1998 to 11% in 2012. New entrants are increasingly employed in informal wage work, even educated new entrants (Assaad & Krafft, 2015a). In addition to limited labor dynamism (Yassine, 2015), there is little evidence of structural change across industries; agriculture has remained around 20% of employment from 1998 to 2012, manufacturing has contracted, and growth sectors, such as construction, have been highly volatile (Assaad & Krafft, 2015a). Likewise, the distribution of employment by firm size in the private sector continues to be dominated by microenterprises.

Although labor demand has, for some time, been recognized as a constraint on economic growth, limited firm-level data had precluded detailed analysis of correlates of labor demand (much less

[5] This figure is based in the ELMPS 2012. Figures from the official labor force survey are somewhat higher. Krafft and Assaad (2014b) discusses the difference in the unemployment estimates.

determinants). A number of small, cross-sectional surveys have taken place to ask individuals about their attitudes towards entrepreneurship, plans to start businesses, past experience with businesses, and current enterprises. For instance, the Global Entrepreneurship Monitor (GEM) has identified a number of key constraints to entrepreneurship, including poor infrastructure and training, poor R&D, insufficient and ineffective government support, weak financial services, and corruption (Hattab, 2013). Likewise, the World Bank has undertaken several cross-sectional enterprise surveys, targeting formal manufacturing and services firms with five or more employees. As of 2013, political instability was identified as a key constraint on businesses, along with lengthy licensing, high rates of corruption ("gifts"), and low financial services penetration (World Bank, 2013b). Others have also identified corruption and political connections as major drags on job creation in Egypt (Diwan, Keefer, & Schiffbauer, 2014).

Because they provide most of the employment in developing countries, in general, (Ayyagari, Demirguc-Kunt, & Maksimovic, 2014) and in Egypt, in particular, micro and small enterprises (MSEs) have received particular attention in past research (El Mahdi & Osman, 2003; El Mahdi & Rashed, 2007; Hampel-Milagrosa, Loewe, & Reeg, 2015; Krafft, 2016; Mahdi, 2016; Rashed & Sieverding, 2015). The potential of MSEs to fuel job growth is substantial, but such firms may also be particularly likely to destroy jobs depending on the macroeconomic environment. The labor demand of non-farm household enterprises dramatically contracted during the global financial crisis and the post-revolution period, substantially reducing employment of non-household members between 2006 and 2012, especially compared to the 1998 to 2006 period. At the same time slightly more household members were employed, likely due to the lack of alternative opportunities (Krafft, 2016). Whether household enterprises created jobs, destroyed jobs, or closed down entirely was only weakly related to the entrepreneur and enterprise characteristics that, theoretically, determine job creation. This finding presents further evidence on the importance of using additional firm-level data to better understand labor demand.

Turning to the larger regional and global literature on labor demand, a number of important themes emerge. Globally, small, young firms make the greatest contributions to job creation (Ayyagari, Demirguc-Kunt, & Maksimovic, 2011). At least among non-farm enterprises, this result does not seem to hold in Egypt (Krafft, 2016). Weak connections between dynamics and productivity have been recognized in Tunisia, suggesting that the churning and reallocation that might raise productivity, and thus labor demand, are relatively absent (Rijkers, Arouri, Freund, & Nucifora, 2014). The global evidence also indicates that reducing the costs of firm formality can increase employment (Abidoye, Orazem, & Vodopivec, 2014; Besley & Burgess, 2004; Fajnzylber, Maloney, & Montes-Rojas, 2011), a result that has parallels in Jordan and Egypt in terms of reducing the burdens on employers of employing workers formally (Assaad, 2014; Assaad & Wahba, 2015). Small and micro firms (which employ the vast majority of private sector workers in Egypt) are particularly affected by financial and legal constraints to growth (Beck, Demirguc-Kunt, & Maksimovic, 2005). In addition to the potential effects of legal regulations, illegal dealings and the burden of corruption can reduce job creation. Political connections have repeatedly been identified as advantageous to the firms that have them, with

negative consequences for employment creation (Diwan & Haidar, 2016; Rijkers, Baghdadi, & Roballand, 2015).

While government policies often have negative effects, well-designed government programs and policies can increase job growth. Policies that improve the business environment, as well as tailored subsidies, tax-exemptions, and financial support can help infant firms perform better (H. Hansen, Rand, & Tarp, 2009; Quatraro & Vivarelli, 2015). Besides governments, non-governmental organizations (NGOs) can also provide supportive programs for job growth. When small manufacturing firms in Egypt received NGO support, exposing them to greater access to foreign markets, they experienced 15-25% higher profits (Atkin, Khandelwal, & Osman, 2014). Financial support from government or NGOs can be important. Although the impacts of microfinance are modest internationally (Angelucci, Karlan, & Zinman, 2015; Attanasio, Augsburg, de Haas, Fitzsimons, & Harmgart, 2015; Augsburg, De Haas, Harmgart, & Meghir, 2015; Banerjee, Karlan, & Zinman, 2015; Crépon, Devoto, Duflo, & Pariente, 2015; Tarozzi, Desai, & Johnson, 2015), microfinance could potentially have a larger impact in Egypt where access to finance is limited (El Mahdi & Osman, 2003; Rashed & Sieverding, 2015).

Industrial policy does not appear to be the best approach to encouraging job growth in MENA, particularly given the problems of elite capture (Schiffbauer, Sy, Hussain, Sahnoun, & Keefer, 2015). Likewise entrepreneurship training appears to be an ineffective policy globally and in MENA (Barsoum, Crépon, Michel, & Parienté, 2016; Bausch, Dyer, Gardiner, Kluve, & Kovacevic, 2017; Blattman & Ralston, 2015; Cho & Honorati, 2014; Grimm & Paffhausen, 2014; McKenzie & Woodruff, 2014; Premand, Brodmann, Almeida, Grun, & Barouni, 2012). Moreover, to the extent that they have been evaluated, job growth-promoting policies such as flexible labor regulations have proven to have limited effects in Egypt (Wahba & Assaad, 2017; Yassin & Langot, 2017, 2018). Thus, the evidence suggests that not all government support for enterprises and job growth are equally effective. Such support must be carefully targeted and must carefully take into consideration both international experiences with such interventions and country context. To the extent possible, these varied potential determinants of job growth from the global and regional literature are considered in assessing the correlates of job growth in Egypt.

3. Data

3.1 Sources of data

There are no firm-level longitudinal data sets in Egypt, which presents a substantial barrier to analyzing the firm-level determinants of job growth. There are, however, a number of cross-sectional firm censuses. The establishment censuses of 1996, 2006, and 2017 (EsC 1996, 2006, and 2017), carried out at the same time as the decennial population and housing censuses, are intended to capture data on every establishment in Egypt.[6] The information includes their sector

[6] An establishment is defined as a fixed location in part of a building, a building, or a group of related buildings, which is dedicated to the execution of an economic activity (CAPMAS, 2017).

of ownership, number of workers, industry (up to the 4-digit ISIC code), and governorate.[7] As censuses, the original datasets cover all establishments.[8] We have access to the 100% sample for 2006 and 2017 and a 10% random sample of establishments for 1996.[9] These are the primary data sets we use to measure job growth over time.

Because the EsC datasets contain only a limited number of variables, we complement these datasets with industry characteristics from other firm and household survey data.[10] The first such data set is the 2012/13 Economic Census (EcC 2012/13) (which refers to firm behaviors primarily in 2012). The EcC 2012/13 has much richer data on firms and covers the same frame as EsC 1996, 2006 and 2017. However, it is only a census of large firms and uses a complex sampling procedure for smaller firms across 11 different industry categories.[11] The microdata made available to researchers and used in our analyses consist of a 50% random sub-sample of the original EcC 2012/13 sample. Throughout, we use weights that reflect sampling and sub-sampling to ensure nationally representative statistics. Although the EsC 1996, 2006, 2017 and the EcC 2012/13 datasets are supposed to cover public enterprises as well as private establishments, when we examined the data, it was clear that a consistent sampling frame for public enterprises had not been applied. Likewise, in addition to very little agriculture being in establishments, it was clear that for agriculture as well there was inconsistent sampling. We therefore examine only private sector non-agricultural firms, in addition to being restricted, by the nature of the data we have, to firms and workers that are in establishments. As we show below, the universe we analyze made up approximately 31 percent of total employment in Egypt in 2012.

Although the EcC 2012/13 has rich data on firms, it includes limited information on the characteristics of workers and their jobs. We therefore merge in additional data from two other sources based on household surveys. First, we merge in worker characteristics at the industry level from the 2012 wave of the Egypt Labor Market Panel Survey (ELMPS). Second, we merge in some additional worker characteristics from the 2011-13 rounds of the official Labor Force Survey (LFS). We discuss what variables we source from which survey and year below.

3.2 Data structure

In order to study job growth in the absence of panel data on firms, we have to aggregate our data to create pseudo-panels. Since all our data sources have information down to the 4-digit industry level and governorate, we can aggregate the data into industry-region cells. In implementing this aggregation, we first had to harmonize the industry coding. While the coding systems used in

[7] Other characteristics in the data included whether the establishment was an independent entity or branch and its legal status, but these were not measured consistently over time and are therefore excluded from our analyses. Other variables, such as district, exist in the original data but were not provided to researchers in the microdata.

[8] We received only the 10% sample for Suez in 2006 and therefore give each establishment there a weight of 10.

[9] The 10% random sample in 1996 is a simple random sample of establishments, which may create random variation in total employment, particularly in industries where larger firms are more common. To account for receiving a 10% random sample, we used the tabulated results from the 100% data to create worker counts in governorate and 3-digit industry cells, which are used to create expansion factors for our 10% sample.

[10] The way in which the linking is done is described in more detail below.

[11] See Ismail and Abd El-Kader (2014) for a detailed description of the 2012/2013 EcC sampling methodology.

datasets in 2006 and 2017 were fairly similar, and close to the international ISIC rev. 4 coding system, the data from the EsC 1996 used a different coding system. The names of industries were used to align the codes from 1996 and the two other years at the four-digit level, where possible. Some sub-industries had to be aggregated in order for them to be consistently identified across the three sources.

In order to assess net job growth, and ultimately the correlates of job growth, it was necessary for an industry-region combination to exist in multiple waves with sufficient sample size in all three waves for analysis. It was therefore necessary to aggregate along two dimensions. First, we aggregated governorates into four regions: (1) Greater Cairo (Cairo, Qalyoubia, and Giza), (2) Alexandria & the Suez Canal region (including Port Said, Ismalia, Matruh, and the Sinai governorates) (3) Lower Egypt and (4) Upper Egypt (including the Red Sea and Wadi El Gadid governorates). Then, within each region, we identified those four-digit industries that had at least three observations in all three rounds of the census and kept them at the four-digit level of detail. If any industry-region combination had less than three observations, it was merged with any other four-digit counterparts with less than three observations to obtain a three-digit level "other" category. Again, the resulting three-digit industry-region cells were retained if they had at least three observations in each of the three waves. If not, they were merged with similarly sparse cells to the two-digit level. This process was repeated once more at the two-digit level. Any industry/region cells that still had not achieved sufficient sample size when aggregated with other sparse cells at the one digit level were then assigned to the most common four-digit industry within their one-digit industry-region combination. The resulting data structure was thus an industry-region combination, where industry level of detail (digits) varied depending on the region. However, the same classifications are consistently used over time. This data aggregation approach yields 686 industry-region observations in each round.

Unlike conventional firm-level data, our datasets do not provide information on the number of job vacancies nor the number of jobs destroyed, but only the number of jobs at a point in time. With such data, we can only calculate our key dependent variable, growth in the number of jobs, over time (between one wave and the next). Specifically, we calculate an annual (percentage) net job growth rate, *g*, for region *r*, in industry *s*, and time *t1* to *t2* based on employment, *E*, as follows:

$$g_{r,s,t1,t2} = \frac{ln\left(\frac{E_{r,s,t2}}{E_{r,s,t1}}\right)}{t2 - t1} * 100 \quad (1)$$

Because we have employment data from three waves (1996, 2006, 2017), we calculate net job growth rates for two periods: 1996-2006 and 2006-2017.

3.3 Job growth correlates

Our main objective in this paper is to explore a wide range of job growth correlates, using the best out of the available databases. From the EsC 1996, 2006, and 2017, we have information on industry, region, and firm size (which we classify into six categories). We therefore assess job growth by these characteristics in terms of the number of jobs in these categories over time

before aggregating our data in industry-region cells. When aggregating our data to model job growth, firm size ultimately becomes the percentage of firms within an industry-region cell that are of a particular size. Additionally, as a measure of labor market concentration, we estimate the Herfindahl–Hirschman index in each round (ranging from 1, perfect competition, to 10,000, perfect monopoly) at the two-digit industry level, using total employment.[12]

Because some firm characteristics are only available from EcC 2012/13, we assign such characteristics to their same industry-region cell across the three establishment censuses. This approach assumes that the characteristics are unchanging over time within an industry-region cell. One of these characteristics is average firm age in years. Another is the proportion of formal firms in the cell. Firm formality is determined by whether the firm has a commercial registration, keeps accounting books, or pays social insurance contributions. We also calculate from EcC 2012/13 average capital per worker, the percentage of workers who are female, and the percentage of workers who are foreign. Using a translog production function, we estimate Total Factor Productivity (TFP) as a residual.[13] We also capture the percentage of firms exporting. All of these are estimated from the 2012/13 data at the industry-region level and mapped backward and forward in time.

From the LFS 2011-2013 data, we calculate several job characteristics for the same region-industry cells we defined previously, to the extent possible,[14] among the sub-sample of wage workers employed in non-agricultural private establishments.[15] We calculated average years of schooling completed. We also categorized occupations as one of three types: blue collar, white collar, or professional/managerial.[16] We categorized workers as being employed either informally (with neither social insurance nor contract) or formally (with social insurance and/or a contract). In our analysis, these enter as the percentage of jobs with these characteristics in a particular industry-region cell.

Although the LFS has the larger sample size, it has a limited number of characteristics available. Therefore, we also used the ELMPS 2012 to add some additional worker characteristics. Given the ELMPS's smaller sample size, we enter these characteristics at only the industry and not region level.[17] From the ELMPS we mapped the percentage of jobs that require a technical skill,

[12] The two digit industry level was selected as the level at which firms were likely to compete.

[13] The translog production function, estimated at the establishment level, has as its dependent variable log value added. The explanatory variables are the log value of capital and log number of workers. These are included as main effects, squares, and interacted between capital and labor. The predicted value of log value added from this model is subtracted from the actual log value added to calculate TFP as a residual.

[14] When an industry was missing from the LFS or had fewer than three observations we used the next highest level of economic activity available as a proxy.

[15] This sampling strategy is adopted to be compatible with the EsC and the EcC data sets. The establishment and economic censuses cover employment only inside fixed establishments in public enterprises and in the private sector. Our sample excludes the public enterprises leaving us with only fixed establishments in the private sector.

[16] Professional/managerial includes: Managers and Professionals. White collar includes: Technicians and associate professionals, clerical support workers, and service and sales workers. Blue collar includes: Skilled agricultural, forestry, and fishery workers, Craft and related trades workers, Plant and machine operators and assemblers, and elementary occupations.

[17] When an industry was missing from the ELMPS 2012 or had fewer than three observations we used the next highest level of economic activity available as a proxy.

the percentage of jobs with various education or skill requirements, including the percentage requiring computer skills, the percentage requiring physical skills, and the percentage requiring various education levels (basic, secondary, or higher education). For all of our correlates of job growth, we present results in terms of standardized variables (measured in units of standard deviations, with the mean set at zero).[18]

4. Methods

The analysis first gives a descriptive overview of the magnitude and the evolution of net job growth in Egypt. Where job growth took place—both in terms of geographic location and industry—is a key focus of the work. We then estimate OLS models with the annual rate of net job growth as the dependent variable. Models are presented first for differences over time, by region, and by industry. We then turn to models that explore the association between job growth and the characteristics of firms, followed by models that add the characteristics of the jobs themselves. We do not include industry controls in these models because then we would be identifying only the effects of intra-industry variation. We then estimate a model with industry fixed effects to understand intra-industry variation. Lastly, we estimate a model that omits industry fixed effects but includes interactions with time (1996-2006, the reference, versus 2006-2017) to examine the evolution of the correlates of job growth over time.

5. Results

5.1 Context of private sector establishments

To place the analysis of job growth based on the establishment census data in context, we need to first locate the universe of these censuses within the larger landscape of employment in Egypt. The establishment censuses cover employment inside fixed establishments in public enterprises and in the private sector. This excludes employment in government establishments as well as employment outside of establishments in the private sector. Because so little of agricultural employment is in establishments, the censuses are not representative of this sector; we therefore exclude employment in agriculture from our analysis altogether. We focus in this paper on job growth in non-agricultural enterprises in the private sector, which is what we refer to as the "covered" sector below.

As shown Table 1, employment in private non-agricultural establishments makes up 31% of total employment in 2012, suggesting that our analysis covers just under a third of total employment in Egypt. About a fourth of employment in 2012 is in government and about a fifth each in agriculture or outside establishments in non-agricultural activities. Only 4% is in public enterprises. The proportion covered has changed very little overall over time, going from 29% in 1998, to 30% in 2006, to 31% in 2012. However, it has increased from 30 to 34% for males and declined from 24 to 20% for females from 1998 to 2012.

The reason the proportion covered is lower for women than for men is that women are more likely than men to be employed in the government (48% of women versus 20% of men in 2012), but they are also less likely to be employed outside establishments in private non-agricultural

[18] Standardized across the region-industry cells and pooled over the three years.

activities (9% of women versus 24% of men in 2012). They are also half as likely to be employed in a public enterprise (2% of women versus 4% of men in 2012).

The proportion of covered workers (i.e. those in private non-agricultural establishments) also varies widely by location, economic activity, education level, formality of employment and occupation. The proportions we discuss below should be compared to the overall proportion of 31%, in 2012 to determine if a specific category of workers is over or under-represented in the covered sector. As shown in Table 2, workers in Greater Cairo are over-represented in our analysis with 45% of them in the covered sector in 2012. Conversely, workers in Upper Egypt are under-represented, with only 16% in the covered sector. Workers in manufacturing, wholesale and retail trade, accommodation and food services, information and communication activities, professional, scientific and technical services, and administrative and support activities are highly over-represented in the covered sector. Conversely, the covered sector under-represents agriculture (by design, zero and not shown), utilities (which are primarily in the public sector), and construction and transportation services (whose employment is primarily outside establishments). It also under-represents employment in public administration, education, and health and social services, because that employment is primarily in the government. It somewhat under-represents employment in finance and insurance, because much of it is in public enterprises.

More educated workers are more likely to be in the covered sector. As shown in Table 2, those with secondary education and above have levels of representation of 32-43%, whereas the illiterates are only covered at 20%. Because much of formal employment in Egypt is in the public sector, only 28% of formal workers are in the covered sector, compared to 33% of informal workers. Finally, white collar workers are twice as likely to be in the covered sector compared to blue collar workers (45% versus 22%). Professional and managerial workers, because they tend to be concentrated in the government, have a somewhat lower representation than white-collar workers, at 37%.

As shown in Table 3, among private sector wage workers, representation in the covered sector increases steadily with firm size, going from 35% in firms of 1-4 workers to 93% in firms of 100 workers and above in 2012. Female private sector wage workers are much more likely to be in the covered sector than their male counterparts, even in the smallest firm size category (61% women versus 33% men in 2012). This is because women in Egypt avoid jobs that involve working in exposed spaces like the street or construction sites, where they are less protected from harassment and other forms of gender-based violence. The representation of the covered sector has declined among private wage workers in all firm size categories, particularly in small firms from 2006 to 2012. This decline is probably because of the expansion of the construction sector in that period, a sector that involves a lot employment outside fixed establishments (Assaad & Krafft, 2015a).

In conclusion, the sector covered by this analysis, private non-agricultural employment within establishments, consists of just under a third of total employment in Egypt in 2012. It tends to have an over-representation of men, because women are much more likely to be found in the

government, although women are less likely to be outside of fixed establishments within the private sector. Metropolitan regions, such as Greater Cairo and Alexandria and the Suez Canal cities are over-represented in the covered sector. Certain industries, such as manufacturing, retail and wholesale trade, accommodation and food service, and information and communication activities, are also over-represented among establishments. Understandably, public sector dominated services, such as administration, health and education are under-represented here. The workers included in the covered sector tend to be more educated than average and more likely to be white-collar workers, as opposed to either blue collar or professionals and managers. Finally, employment in larger private sector firms is much more likely to be included in the covered sector than employment in very small firms.

5.2 Patterns of job growth in private, non-agricultural establishments

We now turn to examining patterns of job growth in the covered sector using the establishment census data of 1996, 2006, and 2017. Our analyses refer therefore to the net growth of jobs in private sector, non-agricultural establishments—even when we refer to them by the shorthand of job growth. In this section, we present descriptive patterns of job growth and job composition as captured by the EsC data, thus, composition within private sector, non-agricultural jobs in fixed establishments. The employment composition figures add up to 100% within each year. In terms of job growth over time, there was a 3.8% annual growth rate over 1996-2006 and a 4.9% annual growth rate over 2006-2017. Hereafter we refer to annual growth rates as per annum or p.a.

Figure 1 examines job growth and composition by industry. Industries are observed directly in all three waves, so these results are based on the non-aggregated data. The wholesale and retail sector, which is by far the largest (around 40% of covered sector employment), grew faster than average (4.2% p.a.) in the earlier period, 1996-2006, and at a similar, but below average, rate in the latter period, 2006-2017 (4.4% p.a.). Manufacturing grew slightly faster in the second period (2.6% p.a. 2006-2017 vs. 2.0% p.a. 1996-2006), but since it was growing below average rates, fell from 33.7% of covered employment in 1996 to 21.9% in 2017. Accommodation and food services grew rapidly (6.7% p.a. 1996-2006) before slowing to 3.0% p.a. over 2006-2017. This slowed growth may be due to challenges in Egypt's tourism sector after the 2011 uprising. Two sectors that have consistently grown faster than the average are real estate (which nonetheless remains small at 0.6% of covered employment in 2017) and professional, scientific, and technical activities. Growth in professional, scientific, and technical activities rose from 5.0% p.a. to 5.6% p.a. over the two periods. However, this sector remains moderate in size, only 2.8% of the covered sector's employment in 2017.

Figure 2 examines job growth and composition by governorate. It is important to keep in mind that changes on the governorate level may be due to changing geographic differences in the prevalence of private sector establishments. Cairo (by far the largest governorate) grew slower in the first period than the second, as did Alexandria. The Suez Canal region (Port Said and Suez governorates) grew faster over 1996-2006. Lower Egypt (which includes Damietta, Dakhaliya, Sharqiya, Kafr as-Sheikh, Gharbiya, Menufiya, and Buhaira) had a mix of faster growth over 1996-2006 versus 2006-2007. Upper Egypt (Beni Sueif, Fayyoum, Minya, Assuit, Sohag, Qina,

Aswan, Luxor, Red Sea, and Wadi Al Gadid) growth rates were generally faster in the latter, 2006-2017 period.

Turning to firm size, in Figure 3 we examine job growth in six firm size categories. Since we do not have a panel, this is not representing how many jobs firms that were a certain number of employees created, but rather how employment in this category of establishment size changed over time. Mixed patterns are observed over time. Growth was weak in medium-sized firms from 1996-2006 (growing at 1.3% p.a. for both 8-10 employees and 1.9% for 11-100 employees). Large firms grew relatively slower over 2006-2017, with rates of 4.0% p.a. among those with over 1,000 employees and -0.4% p.a. for those with 101-1000 employees. Small and mid-size firms grew more rapidly over 2006-2017, from 6.1% p.a. among those with 4-7 employees up to 9.2% p.a. for 8-10 and 9.0% p.a. for those with 11-100 employees. As shown in Table 3, the evolution of the share of private wage employment that is in establishments by firm size is a key driver of these patterns. While the share of private wage employment in establishments rose among those in small firms from 1996 to 2006, it fell from 2006 to 2017, particularly in micro firms. The higher rates of growth in 4-100 worker firm categories compared to 1-3 worker firms over 2006-2017 are likely due to micro firm growth being disproportionately outside of establishments.

All the preceding analyses have exploited variables available directly in all the EsC rounds. We now turn to characteristics only available in the EcC 2012/13, which have been mapped backwards and forwards at the region-industry cell level, as discussed in the data section. Figure 4 shows the relationship between job growth rates and average industry-region TFP. Higher TFPs indicate an industry-region cell is more productive than its capital or labor would predict in the translog production function estimation. Job growth is not occurring in the higher TFP or more productive industry-region cells. Both in 1996-2006 and 2006-2017, there is, if anything, slightly less job growth in high TFP industries, suggesting that jobs are being created primarily in low productivity activities.

Figure 5 examines the relationship between job growth and capital per worker. Job growth is higher in activities that are less capital intensive. Job growth is particularly low in high capital per worker activities. Capital-intensive activities are not creating jobs; labor is being added by already labor-intensive activities. Taking together the capital and TFP results, jobs are not being created in high-capital or high-productivity activities, but rather in less productive, labor-intensive activities.

Ideally, jobs in Egypt would require increasing levels of schooling in order to absorb an increasingly educated labor supply. Currently many Egyptians are under-employed relative to their education (Krafft, 2018). Figure 6 shows that job growth is not occurring in activities that have higher levels of education. The data are based on the mean years of schooling in industry-region cells from the LFS. Job growth from 1996 to 2006 fluctuated with years of schooling with no clear pattern. The relationship was entirely flat over 2006-2017. Job growth in Egypt is not higher in activities with more educated workers.

5.3 Models of job growth

We finally present in this section the results of the OLS regression models where the annual rate of net job growth at the industry-region cell level is the dependent variable. Table 4 presents differences in net job growth across five specifications: (1) across the two periods, (2) by industry and period (3) by industry interacted with period (4) by region and period and (5) by region interacted with period. Specification 1 shows that, at the aggregate level, there is a statistically significant difference in the rate net job growth in the two periods, with the latter being higher by 1.5 percentage points.

As we examine job growth by industry, we turn to Figure 7, which shows predicted annual growth for different periods and industries. The results are similar to Figure 2, but not identical, since the model is averaging growth rates across employment-weighted industry-region cells. The prediction for growth in manufacturing was negative (-1.9% p.a.) in 1996-2006 and just barely positive (0.2% p.a.) over 2006-2017, although the difference was not significant. Mining and utilities grew significantly more rapidly in the latter period, as did construction (from 1.5% p.a. to 8.1% p.a.). The wholesale and retail trade growth was steady but not significantly different over time. Transportation and storage grew significantly faster in the latter period (rising from 1.2% p.a. to 8.9% p.a.). The drop in accommodation and food service growth from 6.4% p.a. to 2.7% p.a. was significant. There was not a significant difference in information and communication services growth over time. Financial and insurance activities, however, grew significantly more rapidly in the latter period at 10.8% p.a. (after negative growth in the earlier period of -3.8% p.a.). Real estate growth was rapid, but significantly higher (18.4% p.a.) in the earlier than latter period (12.7% p.a.). There were not significant differences for professional, administrative, education, health and social work, arts, or other service activities over time.

In Figure 8, we examine job growth by region and how this varied over time. There were significant differences in the growth rate over time in Greater Cairo (increase from 0.8% p.a. to 2.8% p.a.) and Alexandria and the Suez Canal region (from -0.2% p.a. to 3.0% p.a.). There were not significant differences over time for Lower or Upper Egypt. Upper Egypt did have a significantly different (higher) growth rate (3.4% p.a.) than everywhere except Lower Egypt over 1996-2006. Lower Egypt (at 2.4% p.a.) had a significantly different (higher) rate than Alexandria and the Suez Canal region over 1996-2006. Over 2006-2017, only Upper Egypt (at 4.3% p.a.) had a significantly higher growth rate than other regions.

In Table 5, we examine the association between job growth and job and industry characteristics. We begin, in specification 6, by including the characteristics that are observed in the EsC data, namely year, region, and firm size. We then add firm characteristics from the EcC in specification 7, followed by the ELMPS and LFS worker characteristics in specification 8. In all the specifications except specification 9, we do not control for industry to allow us to capture inter-industry as well as intra-industry variation. Specification 9 does include industry fixed effects. Specification 10 incorporates interactions between industry-region cell firm and worker characteristics and time, but omits industry fixed effects.

Table 5 reveals clearly a story about the inadequacy and insufficiency of job growth in large-sized firms in Egypt. Our regression results in specification 6 highlight that job growth in Egypt is mainly driven by small firms. Compared to industry-region cells with a higher share of 1-3 person firms, industry-region cells with a higher share of 4-7 employee firms, 101-1000 employee firms, and above 1000 employees firms have significantly slower job growth, while those with more 8-10 and 11-100 employee firms are not significantly different. This result largely persists after adding firm and worker characteristics, in that cells with a high share of the largest (1000+) firms are significantly slower growing, especially in 1996-2006, whereas in 2006-2017 cells with more large (101-1000) employee firms are significantly slower growing.

Turning to firm characteristics, there is not a significant relationship between mean firm age and job growth; industry-region cells with younger firms, counter to the literature, are not growing jobs faster. In one of the specifications, the percentage of formal firms is negatively associated with job growth. After accounting for other characteristics, a SD increase in ln(mean K/L) in the cell predicts significantly higher (between 0.8 and 1.0 percentage points p.a. higher) job growth. Jobs are being created in more capital-intensive industries after accounting for age, size, TFP, formality, and other factors. However, higher average TFP, percentage of exporting firms, percentage of foreign firms, and concentration (HH-Index) are all insignificant predictors of job growth. Additionally, in the interacted model, there is even a significant negative interaction between the latter period and average TFP, meaning that higher TFP firms had significantly lower job growth in 2006-2017 compared to 1996-2017. Before accounting for worker characteristics, there is faster job growth in cells with a higher percentage of workers who are female, but this effect dissipates in other specifications.

Turning now to worker characteristics from the LFS and ELMPS, only in the interacted model is there a relationship between job educational requirements and job growth. After accounting for other characteristics, there is a significant increase in job growth in industries that require a higher percentage of workers with higher education. The negative (but insignificant) interaction for 2006-2017 means that this was truer in the earlier than latter period. There are no significant differences by skill requirements except a negative significant interaction with jobs requiring computer skills in 2006-2017, indicating diminishing growth in such cells. Even after accounting for *firm* formality, cells where more *employment* is formal are significantly less likely to grow (by -1.3 to -1.4 percentage points p.a. in the models without time interactions). Growth of formal employment was particularly low over 1996-2006; the interaction is significant and positive for 2006-2017 but nonetheless the sum of the main effect and interaction is a negative relationship. There are no significant differences by occupational category.

The model with industry fixed effects suggests that even after accounting for worker and firm characteristics the patterns (such as the growth of construction and real estate) we saw descriptively persist.

To sum up, our regression results highlight that jobs in the Egyptian economy have mainly been created in industry-region cells with relatively small and relatively informal firms or employment. This is consistent with an economy in which the informal sector is playing a labor

absorbing role rather than one in which labor demand is being driven by large, dynamic, formal firms. Traditionally, the agricultural sector used to play such a labor absorbing role. What we show here is that this role has now been assumed by the informal sector, which consists mainly of relatively small firms. We found no significant positive association between job growth and TFP (and even a negative interaction over 2006-2017), suggesting that highly productive firms are not driving job growth in Egypt.

6. Discussion and conclusions

Taking advantage of newly available microdata from establishment censuses for Egypt, this paper provides a first attempt to study the evolution of job growth in the establishment-based private sector over the period 1996-2017. The analysis makes use of the information available in these establishment censuses, as well as firm characteristics from the Economic Census of 2012/13 and job characteristics from the official Labor Force Survey and the Egypt Labor Market Panel Survey, linked at the industry-region level, to elucidate the major correlates of job growth in this sector. Establishment-based private sector employment in Egypt makes up 31 percent of total employment in the Egyptian economy in 2012, up from 29 percent in 1998 and 30 percent in 2006. We created a pseudo-panel of industry-region cells across the three years for which data is available (1996, 2006 and 2017). An industry in each region is kept at the most detailed level of industrial classification that maintains at least three establishments in each industry-region cell in each time period. The industry-region level correlates of job growth we consider in our analysis include mean capital-labor ratio, total factor productivity, the proportion of formal firms and of formal employment, the percentage of firms in various size categories, the average age of firms, the Herfindahl–Hirschman index of market concentration, the proportion of female labor, the proportion of foreign ownership, the proportion of jobs requiring basic, secondary, and higher education, the skill requirement of jobs, and the proportion of jobs in various broad occupational classes. In addition, we interact some of these correlates with the time period dummy to examine whether the association of job growth with these variables, if present, has changed over time.

The key message emerging from our results is that the informal economy has been the main driver of job growth in Egypt over the 1996-2017 period. The informal economy is now playing the main labor absorbing role that the agricultural sector used to play in the past. Our results possibly provide a first step in explaining previous empirical paradoxes in the literature (Wahba & Assaad, 2017; Yassin & Langot, 2018), which showed that the response to changes in labor law, designed to make labor markets more flexible, in terms of job growth and job formalization were meager, at best. Since most Egyptian workers cannot afford to remain openly unemployed, they somehow find employment in the flexible sector of the economy made up of relatively small informal firms. Industry-region cells with a high share of formal firms and formal employment, and with firms of over 1000 employees, have shown particularly anemic net job growth rates. Our results show that higher TFP segments of the private sector have no statistically discernable advantage in job growth, and in fact job growth is shifting to lower TFP activities in the latter period.

The low rate of job growth in the large formal private sector is particularly disappointing given the degree of attention this segment of the private sector receives from policymakers. While the research on the determinants of job growth in the Egyptian private sector is still in its early stages, these results suggest that there is still considerable scope for improving the job growth performance of large formal firms, higher productivity firms and firms that export. The relatively better performance of small and medium, compared to large firms, may merit further investigation to understand the success of this sector and how it might be expanded or its success replicated for firms of other sizes. The stakes are extremely high in getting right the policy framework toward promoting job growth and improving the dynamism of the economy. So far, the evidence base for such policymaking has been virtually absent, and this is a first step in addressing this gap.

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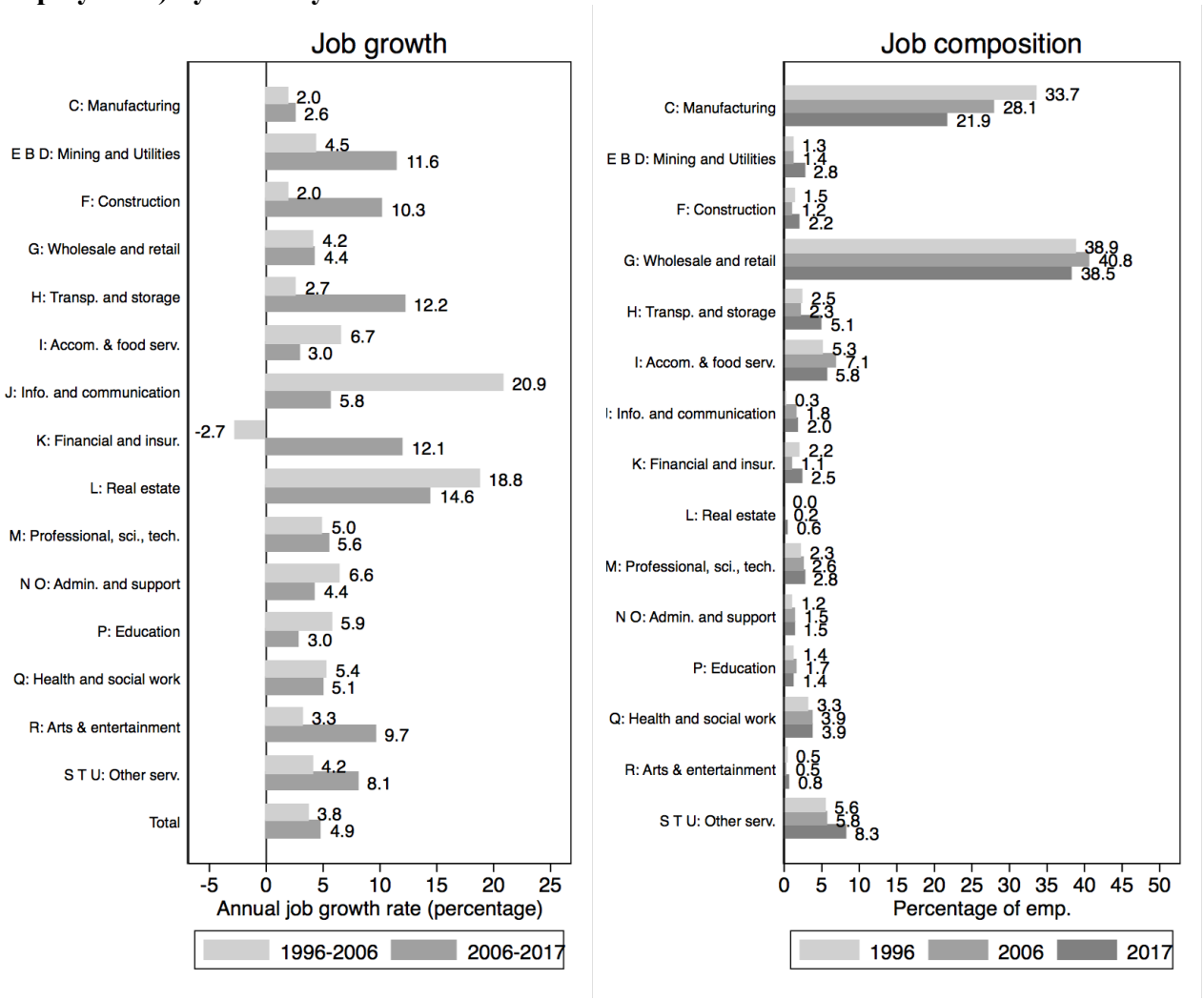
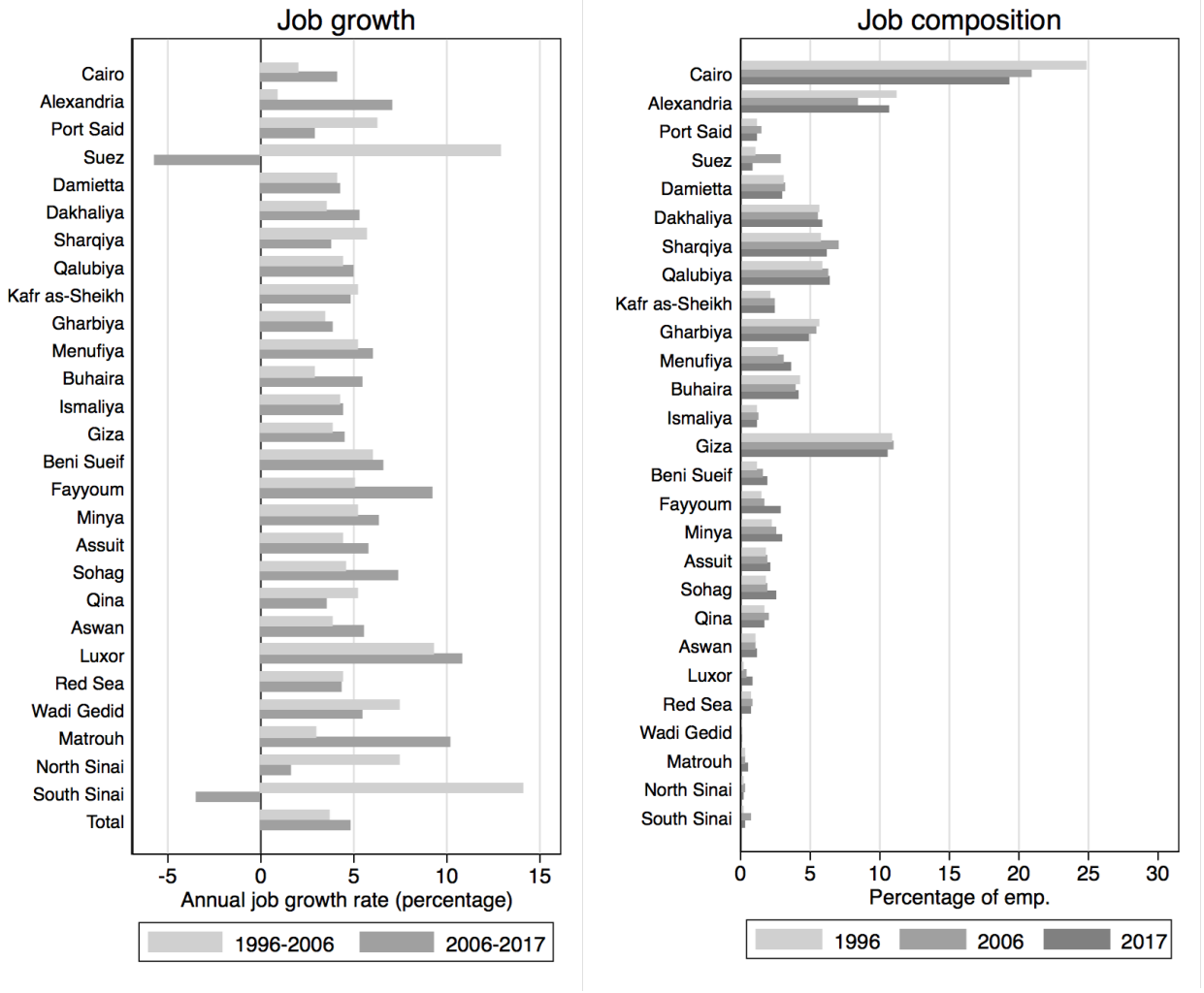
Figure 1. Job growth rate (annual percentage) and composition (percentage of employment) by industry



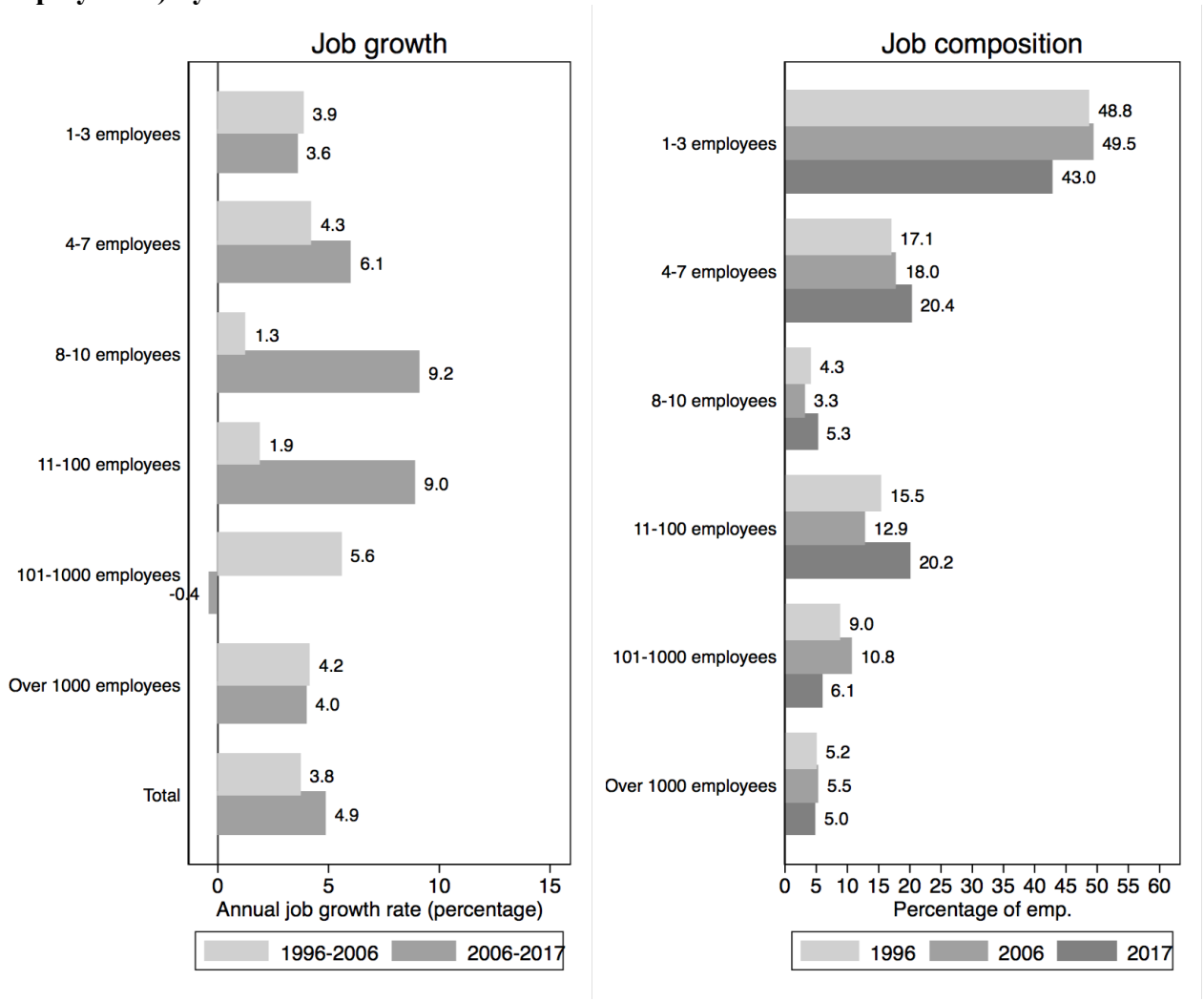
Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017

Figure 2. Job growth rate (annual percentage) and composition (percentage of employment) by governorate



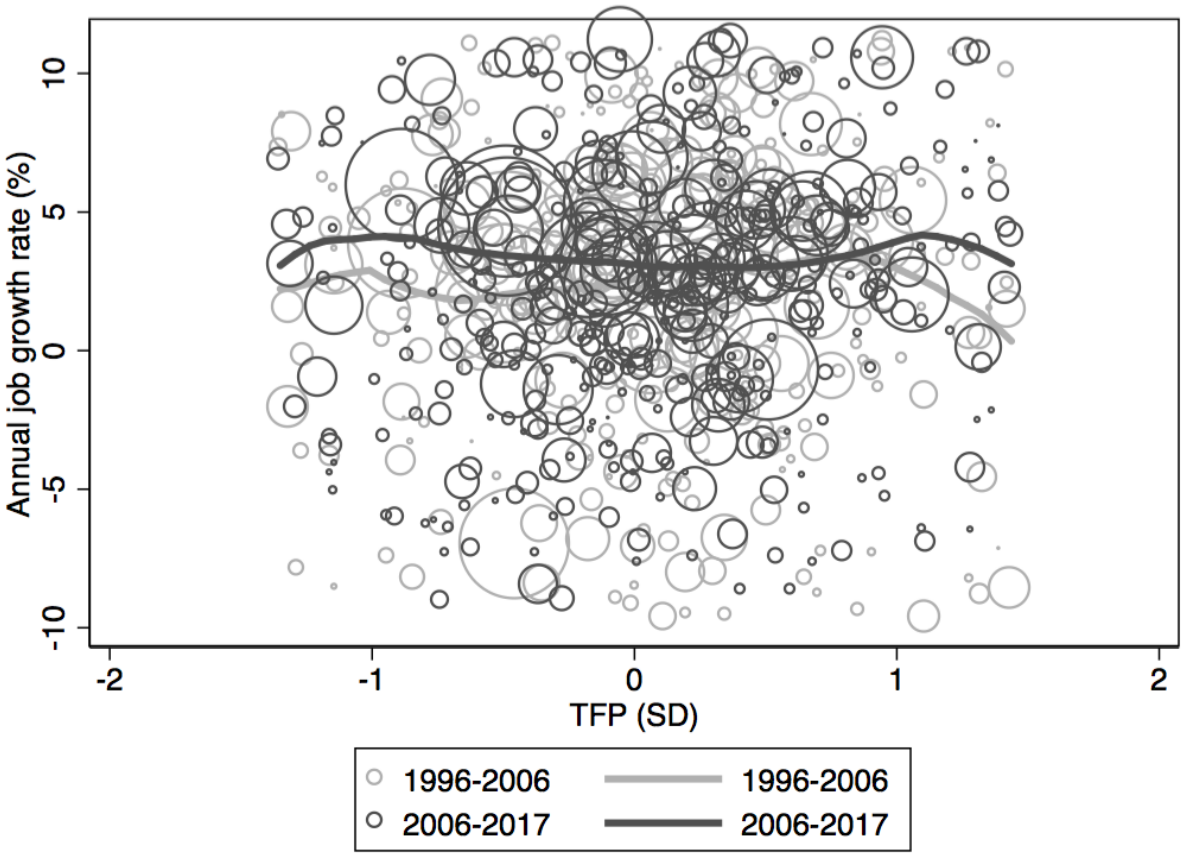
Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017

Figure 3. Job growth rate (annual percentage) and composition (percentage of employment) by firm size



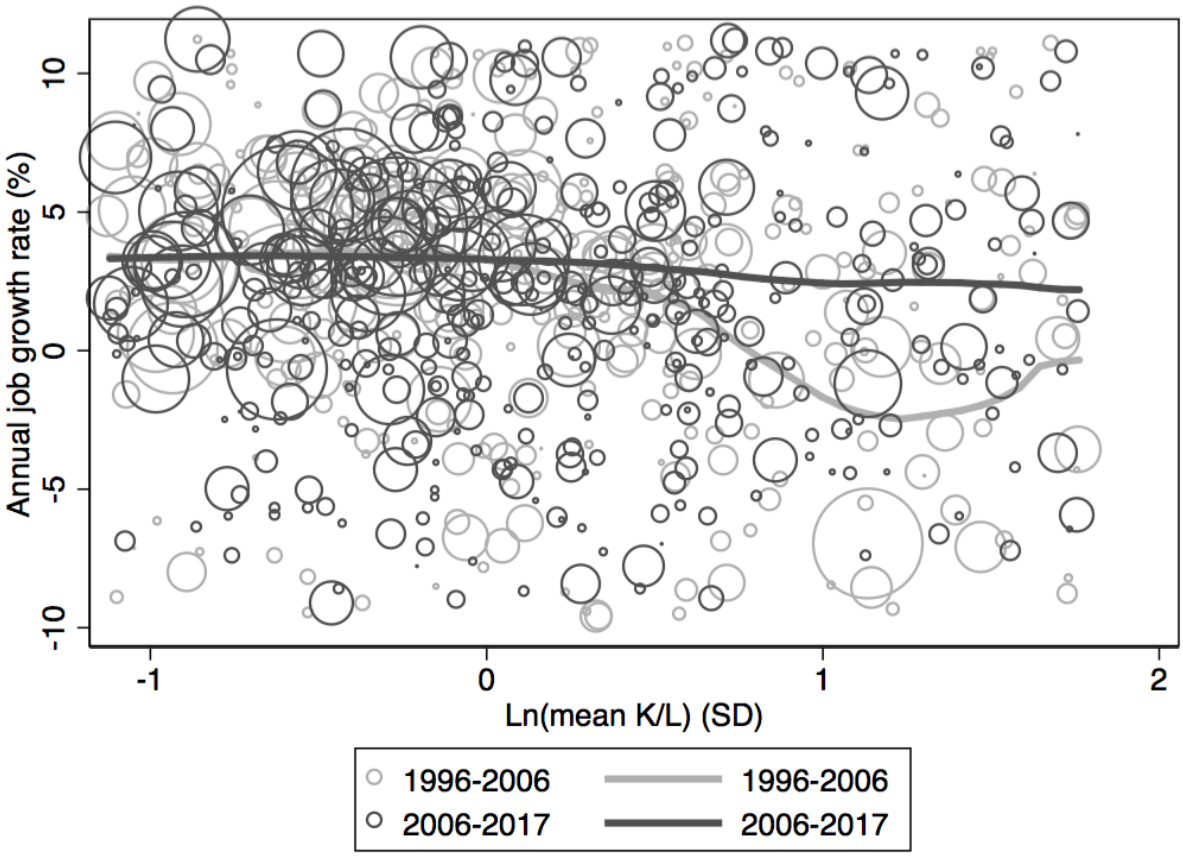
Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017

Figure 4. Job growth rate (annual percentage) by industry and region TFP



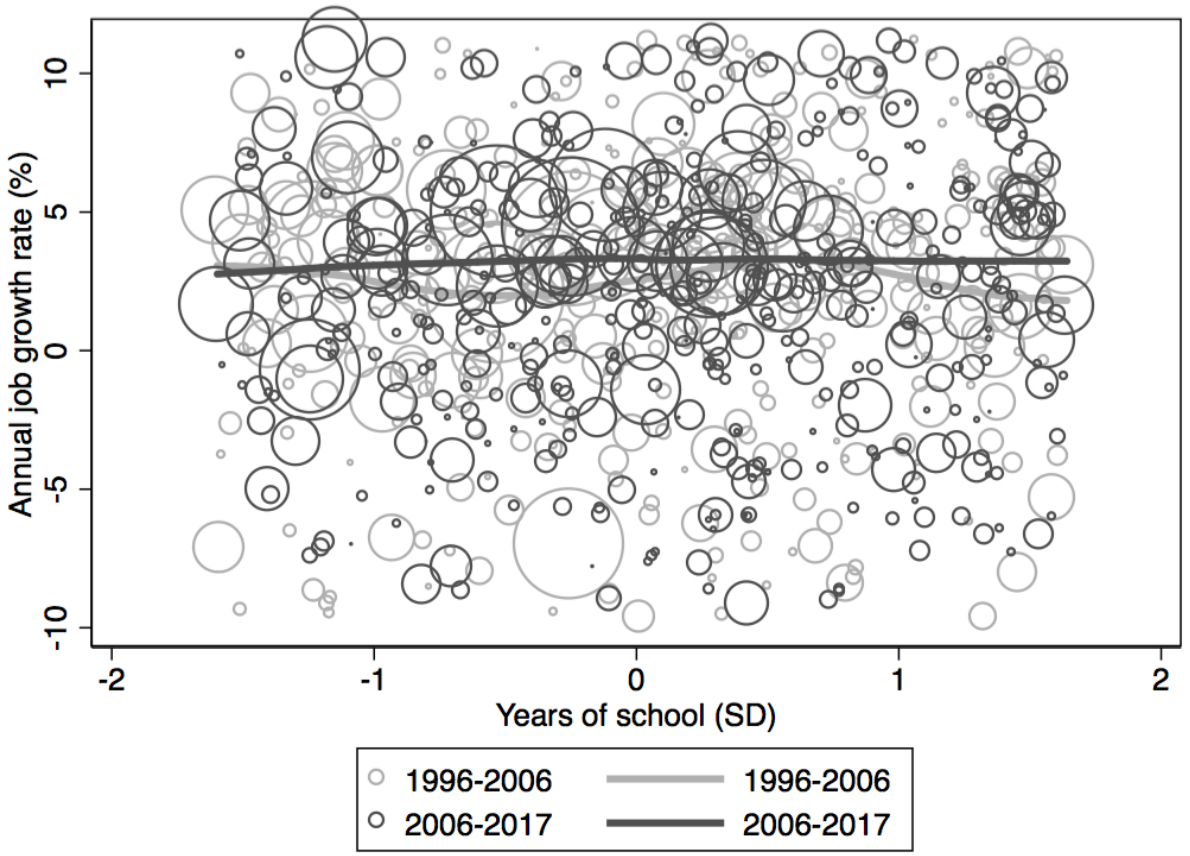
Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017 with TFP from EcC 2012/13
Notes: Graph display restricted to 5th to 95th percentiles of TFP
TFP residual based on translog production equation
Size of points represents size of industry-region cells
Fit line is Epanechnikov kernel-weighted local polynomial smoothing with a rule-of-thumb (mean square error minimizing) bandwidth.

Figure 5. Job growth rate (annual percentage) by industry and region ln(mean K/L)



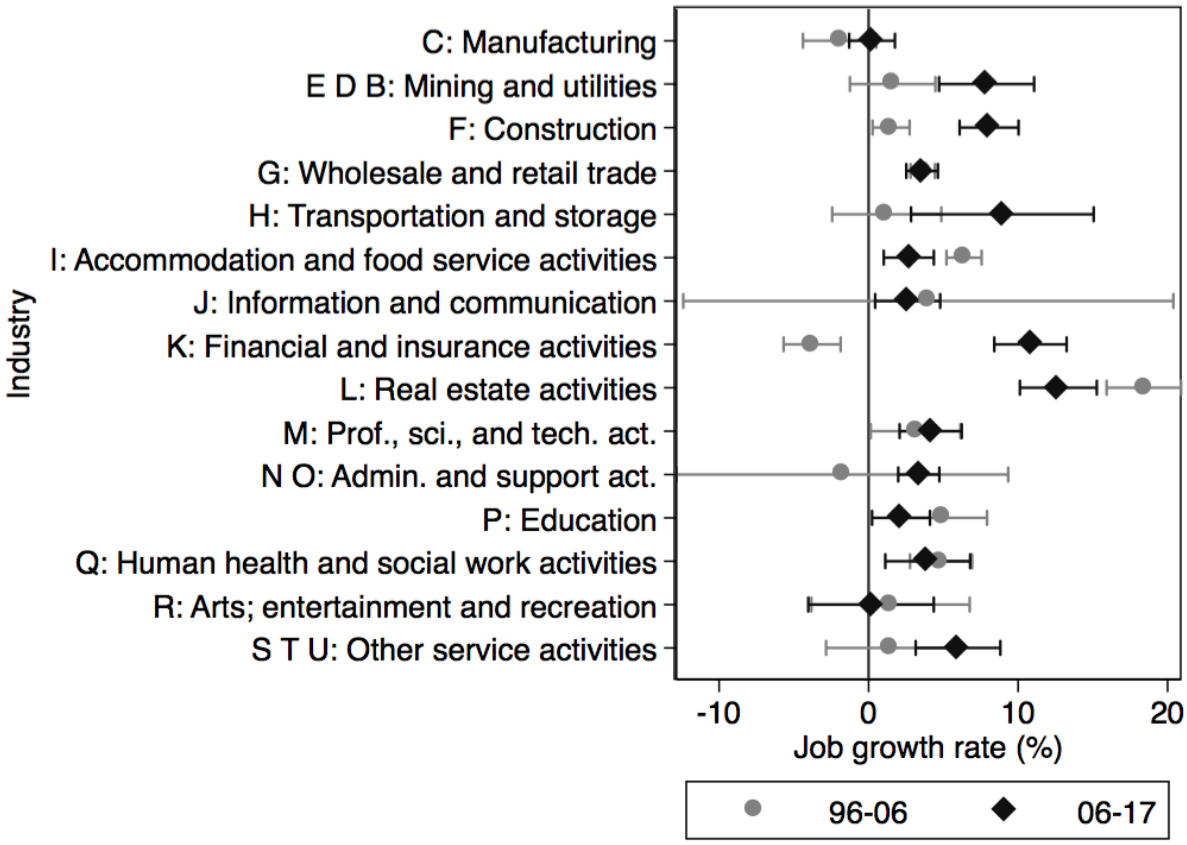
Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017 with K/L from EcC 2012/13
Notes: Graph display restricted to 5th to 95th percentiles of ln(mean K/L)
Size of points represents size of industry-region cells
Fit line is Epanechnikov kernel-weighted local polynomial smoothing with a rule-of-thumb (mean square error minimizing) bandwidth.

Figure 6. Job growth rate (annual percentage) by industry and region years of schooling



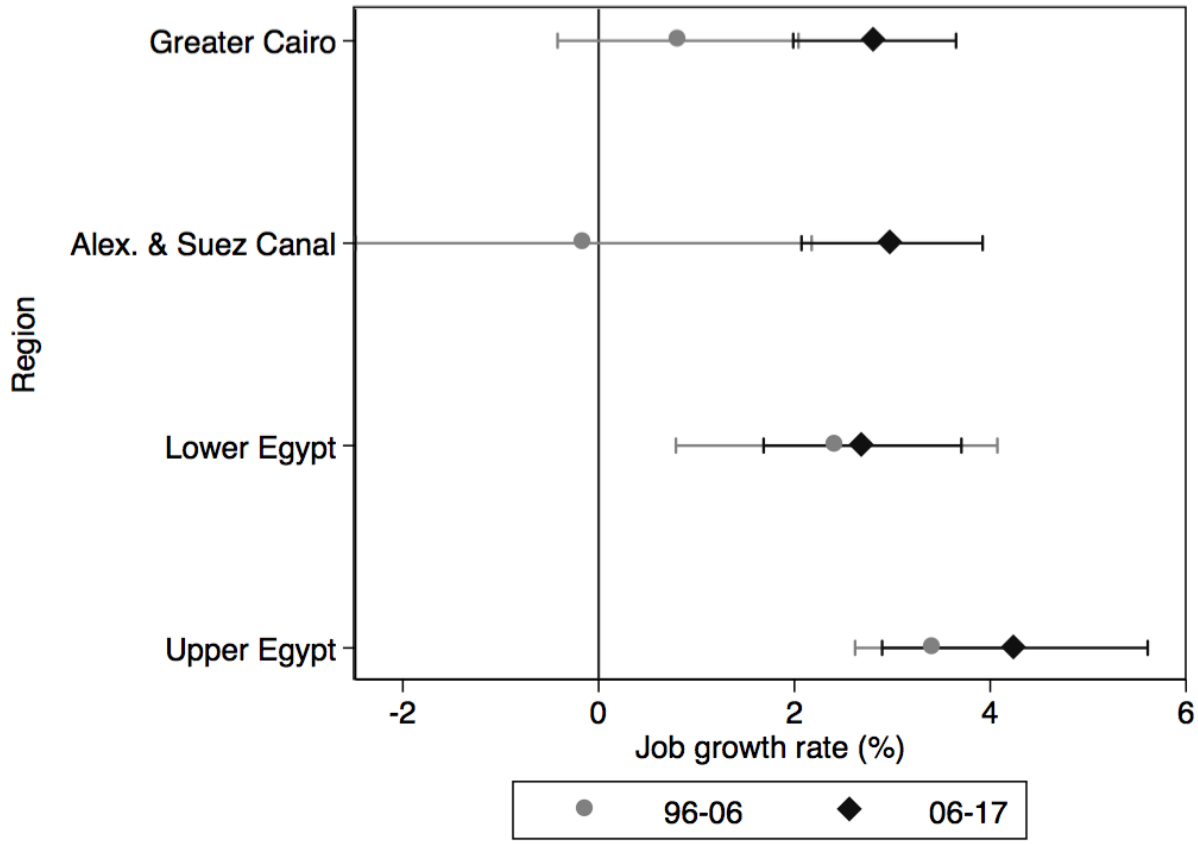
Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017 with years of school from LFS 2011-2013
Notes: Graph display restricted to 5th to 95th percentiles of years of school
Size of points represents size of industry-region cells
Fit line is Epanechnikov kernel-weighted local polynomial smoothing with a rule-of-thumb (mean square error minimizing) bandwidth.

Figure 7. Predicted job growth rate (annual percentage) and confidence intervals by industry and period



Notes: Bars denote 90% confidence intervals based on Spec. 3 in Table 4

Figure 8. Predicted job growth rate (annual percentage) and confidence intervals by region and period



Notes: Bars denote 90% confidence intervals based on Spec. 5 in Table 4

Table 1. Distribution of employment across sectors by year and sex (percentage of employed)

	Male			Female			Total		
	1998	**2006**	**2012**	**1998**	**2006**	**2012**	**1998**	**2006**	**2012**
Government	26	21	20	50	34	48	30	24	25
Public enterprise	7	5	4	4	2	2	7	5	4
Private agriculture	23	24	19	14	36	20	21	26	19
Priv. non-agr. not in est.	14	18	24	8	7	9	13	15	21
Priv. non-agr. in est.	30	32	34	24	21	20	29	30	31
Total	100	100	100	100	100	100	100	100	100

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006, ELMPS 2012
Notes: Using market definition of work in the 7-day reference period

Table 2. Percentage of workers in private non-ag. establishments by year, sex, and characteristic

	Men			Women			Total		
	1998	**2006**	**2012**	**1998**	**2006**	**2012**	**1998**	**2006**	**2012**
Region									
Greater Cairo	44	48	50	30	33	29	41	44	45
Alex. & Suez Canal	39	47	40	22	32	30	36	43	38
Lower Egypt	27	29	33	18	22	19	26	28	30
Upper Egypt	18	18	17	23	8	8	19	16	16
Economic activity									
B: Mining and quarrying	-	43	53	-	-	-	-	43	53
C: Manufacturing	67	75	77	59	69	58	66	74	75
D: Electricity, gas, steam and air conditioning supply	6	6	11	-	-	-	5	7	10
E: Water supply; sewage, waste management and remediation activities	-	9	12	-	-	-	0	8	11
F: Construction	12	12	11	-	-	-	12	12	11
G: Wholesale and retail trade; repair of motor vehicles and motorcycles	75	77	76	68	64	57	73	74	72
H: Transportation and storage	8	10	4	-	-	-	8	11	4
I: Accommodation and food service activities	95	93	92	-	-	-	95	91	91
J: Information and communication	13	58	61	-	59	-	13	58	59
K: Financial and insurance activities	29	24	29	7	16	-	21	22	27
L: Real estate activities	-	-	-	-	-	-	-	-	-
M: Professional, scientific and technical activities	87	81	84	-	-	75	85	78	82
N: Administrative and support service activities	-	86	85	-	-	-	-	88	84
O: Public administration and defense; compulsory social security	0	1	3	1	1	1	0	1	2
P: Education	3	3	5	6	10	10	4	7	8
Q: Human health and social work activities	9	16	18	20	17	20	14	16	19
R: Arts, entertainment and recreation	32	53	29	-	-	-	28	48	24
S: Other service activities	76	49	49	-	-	-	76	51	49
T: Activities of extraterritorial organizations	-	47	-	-	-	-	-	30	21

	Men			Women			Total		
	1998	**2006**	**2012**	**1998**	**2006**	**2012**	**1998**	**2006**	**2012**
and bodies									
Education level									
Illiterate	23	20	22	31	12	15	25	17	20
Literate without any diploma	31	32	34	53	37	42	32	32	35
Elementary school	36	35	33	55	36	34	37	35	33
Middle school	39	37	32	39	34	18	39	37	30
General high school	49	53	44	-	57	33	46	53	43
Vocational high school	32	35	33	-	-	22	29	34	32
Post-secondary institute	28	36	43	9	14	22	21	30	38
University & above	30	39	43	17	23	19	26	34	36
Job formality									
Informal	34	33	34	43	25	29	35	31	33
Formal	26	31	32	11	15	14	23	27	27
Occupation									
Professionals/Managers	42	43	46	17	22	18	35	37	37
White Collar	35	43	51	31	32	28	34	40	45
Blue Collar	23	24	23	24	12	14	23	21	22
Total	30	32	34	24	21	20	29	30	31

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006, ELMPS 2012
Notes: Using market definition of work in the 7-day reference period
"-" indicates fewer than 30 observations in sample

Table 3. Percentage of workers in non-agricultural establishments by sex and firm size, private sector wage workers only

	Male			Female			Total		
Firm size	**1998**	**2006**	**2012**	**1998**	**2006**	**2012**	**1998**	**2006**	**2012**
1-4	37	47	33	70	70	61	40	49	35
5-9	45	47	42	-	67	72	46	49	44
10-24	65	57	48	61	85	76	64	62	50
30 - 49	96	80	75	-	85	87	86	81	77
50 - 99	86	94	84	-	-	93	88	94	86
More than 100	95	96	92	-	95	98	96	96	93
Don't know	35	39	67	-	-	-	35	42	69
Total	50	56	50	69	79	80	52	59	52

Source: Authors' calculations based on ELMPS 1998, ELMPS 2006, ELMPS 2012
Notes: Using market definition of work
"-" indicates fewer than 30 observations in sample

Table 4. Models of job growth rate (annual percentage) in industry-region cells as a function of year, industry, and region

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
Period: 1996-2006 omit.					
06-17	1.544*	1.314+	-0.044	1.502*	2.008*
	(0.726)	(0.684)	(0.709)	(0.723)	(0.823)
Industry: G: Retail omit.					
C: Manufacturing		-4.217***	-5.559***		
		(1.018)	(1.564)		
E D B: Mining and utilities		1.982	-2.013		
		(1.668)	(1.800)		
F: Construction		1.738**	-2.116*		
		(0.608)	(0.898)		
H: Transportation and storage		2.235	-2.408		
		(3.188)	(2.264)		
I: Accommodation and food service activities		0.196	2.762**		
		(0.977)	(0.865)		
J: Information and communication		-1.198	0.372		
		(1.260)	(9.939)		
K: Financial and insurance activities		-0.479	-7.399***		
		(1.566)	(1.255)		
L: Real estate activities		9.463***	14.788***		
		(1.523)	(1.585)		
M: Professional; scientific and technical activities		0.176	-0.477		
		(0.998)	(1.882)		
N O: Administrative and support service activities		-1.944	-5.378		
		(2.564)	(6.735)		
P: Education		-0.552	1.289		
		(0.663)	(1.888)		
Q: Human health and social work activities		0.636	1.227		
		(1.303)	(1.351)		
R: Arts; entertainment and recreation		-2.887	-2.156		
		(2.162)	(3.244)		
S T U: Other service activities		0.687	-2.181		
		(1.498)	(2.642)		
Industry int. with 2006-2017					
06-17 # C: Manufacturing			2.213		
			(1.748)		
06-17 # E D B: Mining and utilities			6.328**		
			(2.424)		
06-17 # F: Construction			6.598**		
			(1.986)		
06-17 # H: Transportation and storage			7.778***		
			(2.195)		
06-17 # I: Accommodation and food service activities			-3.651***		
			(0.775)		
06-17 # J: Information and communication			-1.335		
			(10.566)		
06-17 # K: Financial and insurance activities			14.649***		
			(0.901)		
06-17 # L: Real estate activities			-5.673***		

	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
			(0.711)		
06-17 # M: Professional; scientific and technical activities			1.051		
			(2.569)		
06-17 # N O: Administrative and support service activities			5.157		
			(6.621)		
06-17 # P: Education			-2.698		
			(3.001)		
06-17 # Q: Human health and social work activities			-0.850		
			(2.133)		
06-17 # R: Arts; entertainment and recreation			-1.260		
			(3.555)		
06-17 # S T U: Other service activities			4.584		
			(3.358)		
Region: Greater Cairo omit.					
Alex. & Suez Canal				-0.250	-0.965
				(0.494)	(1.250)
Lower Egypt				0.541	1.620
				(0.508)	(1.080)
Upper Egypt				1.873***	2.608***
				(0.539)	(0.738)
Region int. with 2006-2017					
06-17 # Alex. & Suez Canal					1.143
					(1.499)
06-17 # Lower Egypt					-1.744
					(1.092)
06-17 # Upper Egypt					-1.175
					(0.991)
Constant	1.476*	2.770***	3.621***	1.113+	0.811
	(0.699)	(0.611)	(0.492)	(0.669)	(0.745)
N	1372	1372	1372	1372	1372
R-squared	0.013	0.115	0.159	0.023	0.028

Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017
Notes: +p<0.10; *p<0.05; **p<0.01; ***p<0.001
Standard errors (clustered on the industry (cell) level) in parentheses

Table 5. Models of job growth rate (annual percentage) in industry-region cells as a function of the characteristics of the cells

	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10
Period: 1996-2006 omit.					
06-17	1.564*	1.270+	1.073	1.008	2.143*
	(0.697)	(0.670)	(0.660)	(0.660)	(0.927)
Region: Greater Cairo omit.					
Alex. & Suez Canal	-0.318	-0.213	0.123	0.232	0.762
	(0.420)	(0.515)	(0.514)	(0.521)	(0.884)
Lower Egypt	-0.280	-0.287	-0.175	-0.006	0.740
	(0.529)	(0.533)	(0.554)	(0.600)	(0.904)
Upper Egypt	1.036+	1.564*	1.106	1.202	1.735+
	(0.601)	(0.674)	(0.697)	(0.748)	(0.939)
Firm size: 1-3 omit.					
% firms 4-7 emp. (SD)	-0.968*	-0.739	-0.305	-0.103	-0.260
	(0.417)	(0.453)	(0.449)	(0.529)	(0.519)
% firms 8-10 emp. (SD)	0.221	0.208	0.375	0.177	0.248
	(0.386)	(0.414)	(0.395)	(0.439)	(0.386)
% firms 11-100 emp. (SD)	-0.281	-0.194	0.201	0.128	0.372
	(0.539)	(0.554)	(0.580)	(0.559)	(0.558)
% firms 101-1000 emp. (SD)	-0.786**	-0.606*	-0.475+	-0.412	-0.232
	(0.257)	(0.276)	(0.276)	(0.276)	(0.322)
% firms 1000+ emp. (SD)	-1.132*	-0.995*	-0.907*	-0.829+	-1.818**
	(0.499)	(0.461)	(0.455)	(0.436)	(0.610)
Mean firm age (SD)		-0.455	-0.291	-0.238	-0.019
		(0.395)	(0.371)	(0.388)	(0.490)
% firms formal (SD)		-0.579	-0.550	-0.752+	-0.946
		(0.459)	(0.434)	(0.430)	(0.670)
Ln(mean K/L) (SD)		0.834+	0.997*	0.793+	0.866+
		(0.459)	(0.415)	(0.419)	(0.485)
TFP (SD)		0.352	0.068	0.008	0.702
		(0.333)	(0.330)	(0.327)	(0.477)
% exporting (SD)		-0.517	-0.406	-0.217	-0.478
		(0.417)	(0.378)	(0.369)	(0.468)
HH-Index (SD)		-0.299	-0.239	-0.278	-0.028
		(0.348)	(0.343)	(0.344)	(0.358)
% female (SD)		0.688*	0.100	0.248	0.461
		(0.292)	(0.353)	(0.476)	(0.540)
% foreign (SD)			0.232	0.246	0.256
			(0.243)	(0.262)	(0.215)
Job req.: % min. less than basic omit.					
% req. basic (SD)			-0.274	-0.183	-0.317
			(0.389)	(0.421)	(0.499)
% req. sec (SD)			-0.256	-0.086	0.310
			(0.407)	(0.444)	(0.569)
% req. higher ed. (SD)			1.282	1.233	1.785*
			(0.882)	(0.832)	(0.880)
% skill required (SD)			0.048	0.294	-0.257
			(0.539)	(0.512)	(0.575)
% req. computers (SD)			-0.508	-0.599	0.415
			(0.483)	(0.536)	(0.666)
% req. physical fitness (SD)			-0.652	-0.592	-0.517
			(0.710)	(0.668)	(0.731)

	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10
% employment formal (SD)			-1.259*	-1.421*	-2.443**
			(0.599)	(0.663)	(0.813)
Occup.: % prof./man. omit.					
% white collar (SD)			0.877	1.024	0.780
			(1.157)	(1.205)	(1.371)
% blue collar (SD)			-0.123	0.164	-0.040
			(1.261)	(1.276)	(1.490)
Industry: G: Retail omit.					
C: Manufacturing				-0.632	
				(1.394)	
E D B: Mining and utilities				5.900*	
				(2.380)	
F: Construction				6.216***	
				(1.406)	
H: Transportation and storage				4.340+	
				(2.304)	
I: Accommodation and food service activities				0.837	
				(1.103)	
J: Information and communication				-1.427	
				(2.065)	
K: Financial and insurance activities				2.353	
				(2.415)	
L: Real estate activities				13.044***	
				(2.218)	
M: Professional; scientific and technical activities				-0.270	
				(2.131)	
N O: Administrative and support service activities				-0.674	
				(2.339)	
P: Education				0.409	
				(2.247)	
Q: Human health and social work activities				0.416	
				(1.737)	
R: Arts; entertainment and recreation				-0.534	
				(2.990)	
S T U: Other service activities				0.341	
				(1.284)	
Interactions with Time					
Region: Greater Cairo omit.					
06-17 # Alex. & Suez Canal					-1.045
					(1.196)
06-17 # Lower Egypt					-1.516
					(1.091)
06-17 # Upper Egypt					-1.284
					(1.348)
Firm size: 1-3 omit.					
06-17 # % firms 4-7 emp. (SD)					-0.307
					(0.701)
06-17 # % firms 8-10 emp. (SD)					0.501
					(1.324)
06-17 # % firms 11-100 emp. (SD)					0.077
					(1.509)

	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10
06-17 # % firms 101-1000 emp. (SD)					-2.114**
					(0.717)
06-17 # % firms 1000+ emp. (SD)					1.546*
					(0.643)
06-17 # Mean firm age (SD)					-0.623
					(0.632)
06-17 # % firms formal (SD)					0.912
					(0.928)
06-17 # Ln(mean K/L) (SD)					0.686
					(0.685)
06-17 # TFP (SD)					-1.208+
					(0.695)
06-17 # % exporting (SD)					0.366
					(0.729)
06-17 # HH-Index (SD)					0.029
					(0.724)
06-17 # % female (SD)					-0.635
					(0.718)
06-17 # % foreign (SD)					-0.105
					(0.208)
Job req.: % min. less than basic omit.					
06-17 # % req. basic (SD)					0.105
					(0.721)
06-17 # % req. sec (SD)					-1.036
					(0.768)
06-17 # % req. higher ed. (SD)					-0.858
					(1.457)
06-17 # % skill required (SD)					0.590
					(0.770)
06-17 # % req. computers (SD)					-1.465+
					(0.844)
06-17 # % req. physical fitness (SD)					-0.285
					(1.234)
06-17 # % employment formal (SD)					2.175+
					(1.221)
Occup.: % prof./man. omit.					
06-17 # % white collar (SD)					0.374
					(1.965)
06-17 # % blue collar (SD)					0.048
					(2.184)
Constant	1.438*	1.627**	1.925***	1.642**	1.475*
	(0.571)	(0.529)	(0.527)	(0.559)	(0.614)
N	1372	1372	1372	1372	1372
r2	0.107	0.140	0.177	0.211	0.236

Source: Authors' calculations based on EsC 1996, EsC 2006, EsC 2017, LFS 2011-2013, EcC 2012/13, and ELMPS 2012

Notes: +p<0.10; *p<0.05; **p<0.01; ***p<0.001

Standard errors (clustered on the industry (cell) level) in parentheses