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The Women Empowering Effect of Higher Education

Ahmed Elsayed and Alina Shirshikova

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Ahmed Elsayed, Alina Shirshikova*

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Abstract

This paper analyses the effects of expansion of higher education on labor market outcomes, paying special attention to heterogeneity by gender in a context with very low female labor force participation. Exploiting a staggered rollout of constructing public universities in Egypt in the 60s-70s, the paper documents that the opening of a new university in an individual's province (governorate) increases the likelihood of obtaining a university degree. The impact is driven mainly by women, as social norms were limiting their mobility to get higher education elsewhere. The paper shows that exposure to higher education increased women's likelihood of joining the labor force, and improved the type of jobs they take: e.g., formal, paid, and public employment. The paper also shows evidence of improved marriage outcomes, as well as higher levels of social empowerment for the exposed cohorts. Men, however, seem to be unaffected by the expansion. The effects are robust to several robustness checks.

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Keywords: Empowerment of women, higher education, female labor force participation, Egypt

* Elsayed is affiliated with IZA and ROA, Maastricht University, Email: elsayed@iza.org. Shirshikova is affiliated with IZA, Email: Shirshikova@iza.org

I. Introduction

The last few decades witnessed massive expansions in higher education across most of developing countries. Despite the importance of the topic, very little effort is made to evaluate the impact of access to higher education. Most of the existing literature exploring an effect of changes in an educational system on labor outcomes focused on analysis of compulsory schooling laws in developed countries (see Angrist and Krueger, 1991; Oreopoulos, 2006b; Pischke and Wachter, 2008). Another large group of the studies analyzed changes in access to education from the financial point of view. Thus, Kane and Rouse (1995), Blundell et al. (2000), Lemieux and Card (2001) and Arcidiacono (2005) used the tuition fees, loans and financial aid programs as source of variation, showing that additional years of education due to better financial access result in a significant increase in returns to schooling. Maurin and Xenogiani (2007) investigated impact of changes in perceived benefits from higher education due to abolition of compulsory conscription on labor outcomes of graduates, with their finding suggesting that the decrease in the benefit of pursuing education for men was followed by a fall in educational achievement and by a decrease in their relative entry wages.

Our paper is closer in spirit to literature exploring the effect of physical access to education and expansion of educational infrastructure. Duflo (2001, 2004) uses the exposure to large-scale school construction in Indonesia to identify its effect on educational attainment and wages of male students, showing that the policy increased length of schooling by 0.27 years and led to 3-7% increase in wages for the exposed cohorts. Literature that focuses on higher education expansion is scarce. Card (1995) shows that men who grew up in closer distance to college have significantly higher education and earnings than other men, with the effect concentrated among those with poorly-educated parents. Kyui (2016), Walker and Zhu (2008) and Fengyan et al. (2018) estimate the returns to education using a natural experiments of Russian university expansion during 1990-2005, UK higher education expansion during 1994-2006 and

Chinese university construction in 1999-2008, respectively. Comparing the returns to education among different cohorts Kyui (2016) finds a significant rise in wage for exposed cohorts, with the size of the effect more than twice higher for women compared to men. She also finds that the policy increased employment rates for both genders, with the effect being higher for men. Walker and Zhu (2008) find no change in returns to higher education for men, with the exception for the bottom quartile of wealth distribution, and a significant rise in returns for women. However, results of Fengyan et al. (2018) suggest that in Chinese case returns to education are much lower for women, except when they are the only child in the family. The only study that comes from the similar cultural context is one by Polat (2017), studying the impact of Higher education expansion in Turkey was initiated in 2006, with the number of public universities more than doubling by 2014. Estimating a simple Mincerian wage regression author finds an increase in wages for men due to improved access to higher education. Because of data limitations, it was not possible to estimate the returns to education for women.

For our analysis we employ a rapid growth in number of Egyptian universities during the 70s, when most of the Egyptian governorates got access to higher education within their borders. We treat university construction as a natural experiment. While decision of building a university in particular area could be affected by characteristics of local population or growing demand for educated labor force in the region, an exposure of individuals to the policy is determined by their ages when university was established, which are plausibly exogenous.

Exploiting this difference in cohort exposure to the university opening, we find that the expansion of higher education led to a large increase in probability to get university degree for women, with rather modest effect of the improved university access for men. We show that the effect primarily comes from secondary school graduates who got a chance to continue their education due to improved access to university. There is no evidence of the policy impact on transitional rates between other schooling phases.

Further, our results suggest that labor force participation of the exposed cohorts of women went up by 20% while female employment in public sector increased by almost 28%. We find no effect of the policy on labor outcomes of men.

We contribute to the empirical literature at least in two ways. Firstly, we add to a scarce literature investigating impact of higher education expansion in developing countries. Secondly, the study is the first study that investigates the effects of educational expansion in Middle Eastern country and that is able to explore the effect on wide range of labor outcomes for both genders.

The remainder of this paper is organized as follows. Section II briefly describes the educational system in Egypt. Section III comments on the data and empirical methods we use. Section IV presents the main results while Section V provides discussion and robustness checks. Finally, Section VI concludes the paper.

II. An Overview of Higher Education Expansion in Egypt

During the Nasser presidency in 1950s-1960s Egyptian educational system expanded dramatically. While school education expansion took place during 50s and reached its local peak in early 60s, the university expansion began later (Richards, 1992). School education in Egypt in the period of our interest consisted of 12 grades: 6 years of primary stage (ages 6-11), 3 years of preparatory stage (ages 12-14) and 3 years of general or vocational secondary education (ages 15-17). Vocational training aims to prepare people for entering labor market and the transition rates from vocational to higher education are scanty. Higher education lasts for 4 years and requires students to pass secondary school exit exam (*thanawiya amma*) to enroll.

In 1953 only three public universities were operating in the country, with all of them located in central governorates – in Giza, Cairo and Alexandria. After the national revolution in 1952, Nasser government instituted several higher education reforms. In 1961 unified national secondary school exam was introduced, which guaranteed admission to universities to all secondary school graduates according to their grade. In the same year the government abolished tuition fees in all universities and introduced a public job guarantee for university graduates, which was expanded in 1964 for graduates of vocational secondary schools and technical institutions.

In 1960-s-1970s 16 new universities were constructed, one per each governorate except for desert governorates of Red Sea and South Sinai. This period was special not only because of the large scale of college construction all over the country, but also by the fact that most of this construction took place in the remote governorates, that previously had no higher institutions on their territory: in 16 out of 27 Egyptian governorates first university departments were opend during this period. See Figure 1 for an overview of geography of university construction.

The next large educational reform took place in 1995, when first private universities were licensed in the country and hiring through the centralized labor force allocation system of the Ministry of Manpower was suspended (Assaad, 1997). We limit our analysis to governorates that got university between two educational reforms in order to ensure that all cohorts were under similar circumstances in terms of educational regulations and policies. Thus, our sample includes respondents from governorates where university opened in years 1968-1976.

III. Data and Empirical strategy

a. Data and sample restrictions

For the purposes of our analysis we use two major sources of data. Firstly, in order to get a comprehensive information on higher education expansion we construct a unique dataset containing description of each public university department in Egypt. The dataset covers university construction in all governorates and includes data on the exact years of establishment for each department, its location and field of study. To build this dataset we used presidential decrees that, in accordance with Egyptian political tradition, accompony opening of each university or a university branch in a new location. In order to double-check the obtained data and to eliminate possible inconsistency between officially declared year of establishment and de-facto year of first students' intake we combined this information with that provided on the official webpages of universities and colleges. In total, between years 1938 and 2019, 470 university colleges were opened in the country. The largest expansion of the Egyptian tertiary education system occurred in 1960s and 1970s, following the educational reforms that happened in 1961-63.

Secondly, we employ a cross sectional data from 2009-2016 waves of the Egyptian Labor Market Survey (LFS). This data is collected quarterly by the Central Agency for Public Mobilization and Statistics (CAPMAS) and then published by the Economic Research Forum on the annual basis. The survey includes questions on education, current labor status, wages, job and unemployment characteristics, and covers a sample of urban and rural areas in all Egyptian governorates. The sample size in each year includes 91,584 households (about 255,000 individuals per wave) that are distributed according to the estimated number of households in each governorate and taking into account the percentage of urban and rural population within each governorate. From this dataset we are interested in information about respondents' current occupation, employment status, monthly wage, and weekly

working hours, as well as available demographic indicators, including gender, year of birth and educational level.

We merge datasets using governorate of residence and year when person was 17 years old (average age in the last secondary grade), linking our individuals' data to data on higher education expansion within governorate. Thus, for every person we know the year when the first university college in her governorate was opened, how many colleges there were in that year within governorate, as well as in neighbouring governorates and in the whole country, and can calculate person's age at that moment.

We restrict our sample to those individuals, who have attended school. Further, to ensure that all people in our analysis were under similar circumstances in terms of educational regulations and policies, we consider only those respondents who graduated from school in the period between two educational reforms, i.e. between 1964 and 1995. Additionaly, we exclude from our analysis governorates that got access to higher education earlier or later than in the mentioned period. Thus, governorates with old universities, such as Cairo, Giza and Alexandria, and governorates with recently opened or not yet opened universities (Luxor, North Sinai, New Valley) are not considered in our analysis. Otherwise all people from these governorotes would be marked as either always treated or always untreated.

Notable assumptions of our analysis are that, firstly, individual's governorate of residence was the same when he or she was finishing secondary school, and secondly, person attended university in the governorate of residence. This means that person stayed in the same governorate during the whole time period between school graduation age and year of interview. This assumption may introduce a potential problem of endogenous mobility, since it is possible for some people to move to another governorate with a better supply of higher education. In this case, the effect of the tertiary education expansion would be overestimated due to positive selection. On the other hand, if people reside in governorate different from

one where they have finished school, this would cause an underestimation of the policy effect. This problem could be partly addressed by using a restricted sample of individuals, whose current residence coincide with the place of birth. However, even then the problem of residential mobility cannot be fully solved, since it is still possible that some people returned to their governorate of birth after getting education in another place, which cannot be captured by our data completely.

We argue, however, that the chances of these confounding scenarios are quite small, since the internal mobility rates in Egyptian society are low. From waves 2009, 2010 and 2011 of the LFS survey, which contains a set of questions about place of birth and migration history, we can see that the percent of people who have ever moved across governorates equals to 13.3%, or 19.1% of female sample and 10.8% of male sample. However, a significant amount of moved individuals come from governorates that were affected by Egypt-Israel conflict during 1967-1973 and where many people were displaced due to occupation of Egyptian north-eastern territories. If we exclude these governorates, then the share of ever-moved individuals decreases to 2%, or 2.9% of women and 1.7% of men. Additionaly, only 1.7% of moved individuals reported "Studying" as a reason of moving, with the majority of men moving because of work and majority of women – because of marriage or accomponying their spouses. For our main analysis we will exclude war affected governorates – Suez, Ismailia and Port Said. Thus, although our assumption may seem strict, it goes in line with our data and we do not expect it to confound our results. In order to check it, we conduct several robustness checks in Section 6 running the analysis with war-affected governorates and restricting our sample to people who have never moved across governorates. All in all, the sample includes respondents from 11 out of 27 Egyptian governorates.

The major concern regarding migration is then if people commute to university located in another governorate. We cannot address this issue due to data limitations; however, such commutations would rather decrease our estimates for the effect of higher education expansion making our results a lower

bound. It also worth to mention, that commuting to university might be more widespread among male students rather than female, given social norms, traditions and cultural constraints that Islamic societies usually impose on female mobility (Assaad & Arntz, 2005).

b. Methodology

Identification strategy is based on the comparison of the university expansion policy effect between cohorts that had opportunity to benefit from newly opened university and those who had no such opportunity. We assign people who were 12-18 years old when the first university college in the governorate became available to be an exposed group, while those who aged 19-25 are considered unexposed. This assignment rule is quite intuitive and comes from the fact that usual secondary school graduation age in Egypt is at 17-18, since an absolute majority of students enter higher education right after general secondary school graduation.

Thus, using differences in a cohort exposure to the expansion policy we estimate the following equation:

$$Y_{irk} = \beta E_{rk} + X_{irk}\gamma + \varphi_r + \mu_k + \varepsilon_{irk} \quad (1)$$

where i denotes individual, r – governorate, and $k -$ cohort of birth. E_{rk} is a dummy variable indicating if an individual belongs to the exposed group, i.e. if he or she was 12-18 years old when governorate got access to higher education. X is a vector of controls that includes, a dummy for urban status of the area and, depending on the specification, dummies for the year of interview (wave fixed effects) and within-governorate time trend. Governorate-specific time trend aims to capture possible changes in educational opportunities between different intake cohorts such as, for example, governorate and time-specific increase in number of available university spots. Some specifications also include general time trend in order to account, firstly, for trends in the expansion of educational system. φ_r and μ_k are governorate and cohort of birth fixed effects, respectively. Y_{irk} – dependent variable that firstly indicates university

degree attainment, and then - labor market outcomes for individual i from governorate r, who belongs to cohort k.

University degree attainment is a dummy variable that equals one if a person has a higher education degree, and zero otherwise. In our sample 18.2% of all respondents have university degree, 19.4% among men and 15.2% among women. Average university degree attainment provides a descriptive suggestion that women have benefited from higher education expansion more, at least in terms of degree attainment. Average higher degree attainment among exposed cohorts equals 17.1% for women and 19.9% for men, while for unexposed cohorts – 15.4% and 18.9% of female and male sample respectively.

For labor market characteristic, we are interested in the five following outcomes. Firstly, the individual's labor force participation, denoted by dummy that equals 1 if person is economically active, i.e. employed or unemployed, and equals 0 if person is housewife (househusband) or belongs to passive category "Others"; students, retired and disabled are coded as missing. Secondly, we examine the impact on paid employment, denoted by dummy that equals 1 if individual has a paid job and 0 otherwise (for unemployed it equals 0). Thirdly, we consider changes in public sector employment - dummy that equals 1 if individual works in public sector and 0 otherwise, and formal employment - dummy that equals 1 if person has an official written job contract, 0 otherwise.

As the error terms are likely to be correlated within governorates, we follow the recommendation of Bertrand et al. (2004) and cluster the standard errors at the level of the policy change and LFS sampling – on the governorate level. To address a possible over rejection problem due to few clusters (11 in our case), we apply wild cluster bootstrapping recommended by Cameron and Miller (2015). We report both governorate clustered standard errors (in parentheses) and bootstrapped p-values (in brackets) for all our specifications.

In summing up, our evaluation of the consequences of higher education expansion goes in two steps. As a first step, we measure a direct impact of the expansion policy: we examine if an improved access to higher education have indeed influenced the university degree attainment of exposed individuals. Next, we investigate the changes in labor market outcomes for exposed cohorts compared to unexposed ones. In addition, due to obvious heterogeneity of average educational attainment by gender in the data, we are interested in whether the expansion's effects differ among men and women.

IV. Results

a. Impact on educational outcomes

Table 1 presents the results of our regressions with higher degree attainment as dependent variable. Regression (1) is a baseline regression: it estimates the impact of being in the exposed cohort when university opened on probability to get higher education, controlling only for governorate and cohort of birth fixed effects. The next specification adds control for urban status of the area, and specifications (3) and (4) subsequently add survey wave fixed effects and within-governorate trend. Model (5) and model (6) include all the aforementioned controls along with linear or squared polynomial of general time trend instead of year of birth fixed effects.

Adding controls to baseline regression only increases the estimate of the coefficient on *Exposed*. As we can see from the most detailed model (6) in Panel A, belonging to the exposed cohorts increases the probability to get higher education by 2.1 percentage points, with the result significant at 10% level. In Panels B-C we present the estimates of the same specifications separately for female and male parts of the sample. For convenience, we will use model (4) as our main specification. The results point out at strong heterogeneity of the effect by gender. Thus, being exposed leads to 4.6 percentage points increase in probability to get higher degree for women and only 1.4 percentage points increase for men. Taking

into account averages of the outcome (15.4% for female and 19.0% for male sample), it means an increase of 29.87% for women and of only 7.37% for men. The coefficient estimates are significant at 5% level for women and insignificant for men. Same pattern is present for the effect on completed years of schooling (Table 2): cohorts of women exposed to university construction have on average completed by 0.536 year more education, while the effect remains small and insignificant for men.

To summarize, our findings at this stage suggest that tertiary education expansion had significant and much larger impact on female higher education attainment than on male, even in presence of relatively lower number of observations.

There are several possible channels for this result. Establishment of university in governorate improves access to higher education in two ways: firstly, it increases capacity by providing additional university spots, so that people have more chances to enroll; secondly, it loosens travelling constrains. Travelling constraints, however, are much tighter for women, since in addition to travelling costs they experience mobility restrictions imposed by cultural norms and society. While male school graduates who were capable to pursue higher degree could travel or commute to college in another governorate, females had lower probability to do so, even if budget constraints for covering travelling expenditures were not binding. Thus, the demand for higher education was not satisfied for a group of eligible men and women who could not afford travelling expenditures, and for group of eligible women whose freedom of movement was limited. Thus, when university opened in closer distance, women were more responsive to this policy than men were.

Figure 2 in the checks this intuition by plotting the results for dummies of person's age when university in governorate opened instead of single exposure dummy. We can see that for women in the exposed age cohorts (12-18) coefficients on age dummies are large, positive and significant and decrease

as the age grows, becoming close to zero and insignificant after the age of 19. While for a 18 years old girl probability to get higher degree is approximately by 8 percentage points higher compared to 25 years old, it equals 4 percentage points for 19 years old and only 2.8 percentage points for 20 years old, with the last result not statistically different from zero. For the male sample (Column 2) there is no recognizable pattern for the effect of university opening, suggesting that an average effect of the reform for them was close to zero. Tertiary education expansion went gradually with first university opening in a new governorate almost year by year (see Table A1), and some governorates who experienced new university construction lie relatively close to each other. Therefore, part of male respondents from unexposed group (too old when college in their governorate was opened) could take a chance to enroll to university in neighboring governorate, if it was established earlier. This could explain the observed lag in decrease of the estimates for the male sample, described above. Second reason of higher educational attainment for women in response to the policy may arise from the differences between men's and woman's opportunities and access to job market. Boys may have a trade-off between entering labor market or enrolling into technical college after completing compulsory education and staying in school to proceed with university studies, while for women alternative costs to continuing studies and enrolling to university are lower due to possible discrimination on labor market and lower supply of unskilled paid jobs for them.

b. Labor market outcomes

We proceed by investigating the impact of higher education expansion on labor market. Table 3 explores, whether the opening of university in governorate affected labor market outcomes of female (Panel A) and male respondents (Panel B). The results for female sample suggest that labor force participation (LFP) increased by 3.2 percentage points on average for the exposed individuals, with the result significant on 1% level (Panel A, Column 1). Given that average labor force participation for these cohorts equals 41.8%, this means a 8.4% increase in female employment and explains 22.5% of the difference in outcome

between exposed and unexposed individuals. By exploring changes in labor characteristics further, we find that building a university in governorate was also associated with 3.3 percentage points increase in paid employment (8.6% increase), and 4.0 percentage points increase in formal employment (11.24% increase). As it could be intuitively expected from presence of public job guarantee for university graduates, availability of university education increased female public sector employment by 4.4 percentage points (12.7% increase). Moreover, as Column 5 shows increase in labor force participation was accompanied by a growth in high skilled employment for women by 3.6 pp., i.e. 10.2% increase, with the result significant at 5% level. Contrariwise, availability of higher education in governorate had no effect on labor outcomes of men. As shown in Panel B of Table **3**, coefficients on policy-exposure dummy are close to zero and insignificant for all labor outcomes.

Such a large impact of the higher education expansion policy on female labor force participation may be associated with a public job guarantee for university graduates. While labor force participation of men is traditionally high and close to 100%, it is difficult for women to compete with men in a private sector jobs. Even in case when female and male candidates are equally skilled, due to childbearing and maternity leave it is more advantageous for employer to hire a male employee. Public job, on the other hand, provided a guaranteed lifetime employment, with more favorable working conditions for Family-Work balance. In addition, it may happen because of the positive selection into labor market among women. Since the performance of housework usually lies on woman's shoulders, she may decide to take a job only if the job's quality and pay are high enough to compensate for a decrease in household production, which is more probable for high-skilled individuals, and abstain from labor force participation otherwise. Thus, giving women an opportunity to get higher qualification by attending university could boost their participation in labor market.

In presence of fewer acceptable employment opportunities in private and low-skilled sectors, expansion of higher education system, that gave women a chance to enter university without need to travel long distances and with a guaranteed public job upon graduation, could lead to rapid growth of female labor force participation. This is exactly what our findings suggest.

c. Heterogeneity by residence status

As we have mentioned before, opening university may have heterogenous impact on different groups of society. Thus, one could expect men coming from poorer or more remote households to benefit from policy more than those with more family wealth and residing in big cities, since the cost and travelling to university constraint is more binding for them in absence of reform. Similar holds for women, with an aditional restriction on female mobility which may highly depand on social norms and traditions within community. To investigte possible differences and shed some light on mechanisms we preform heterogeneity analysis by status of the area where individual resides (urban vs rural). Results for are presented in Table 4.

Our findings suggest that university opening have mostly affected women residing in cities. On average they have experienced a 6.1 percentage points increase in university degree attainment (Panel A, Column 1), 0.661 years increase in completed years of schooling and 5 percentage points increase in employment, with te first two results significant at 5% level and the latter one at 10%. Estimates of the effect for omen in rural areas are twice lower, and the only result for an increase in degree attainment by 2.6 percentage points being significant at 10% level.

Such a difference between rural and urban areas could arise in several ways. First, one might assume that communities in rural areas are more strict or cost-constrained with regard to female mobility, and availability of university in some city within governorate have not influenced the decision to continue

education for majority of women in such communities because attending university still requires travelling and involves commuting costs. Second reason could be lower educational attainment within rural residents: if attending school and finishing secondary education was associated with additiona costs for rural residents compared to urban ones, then less people from exposed cohorts could fulfil the recuirement (finishing secondary school) to be eligible to enter university. However, as we are approximating the location of a person by current place of residence, we cannot exclude possibility of selection of individuals into urban residence, since people from rural areas who benefited from university could decide to stay in a city after grduation. In this case, our estimates will underestimate the effect of the university cinstruction for people from rural areas and overestimate it for city residents.

Interestingly, among male population university construction had no effect on urban residents while had a positive impct on men in rural area. They have experienced 1.8 percentage point increase in university degree attainment and 0.249 years increase in the length of scholing, both results significant at 10% level. This suggests additional hypothesis why women from rural areas have benefited from university opening less: given a budget constraint family could decide to educate their son rather than daughter.

d. Marriage outcomes

We further explore effect of the oplicy on marriage outcomes for women, taking into account heterogeneity we have discovered. Since we do not have detailed data in LFS we employ waves 1995-2014 of DHS survey. The sample is different from that of LFS since in DHS only ever-marriad women aged 15-49 were surveyed. To assure the impact of university opening, we replicate part of our previous analysis for DHS data. Table 5 shows the results for educational attainment and employment outcomes.

Similar to LFS results, the analysis suggests a significant positive impact on university degree attainment (3.8 pp.increase), years of schooling (0.861 years increase) and female employment (about 7 pp. increase).

Table 6 shows the results for selected marriage outcomes of exposed cohorts. According to results for the whole sample of ever-married women of fertile age in Panel A, cohorts exposed to benefit from university on average have married about 0.677 years later than women from unexposed cohorts. Moreover, age difference with the spouse have decreased for exposed women by approximately 1.5 years on average. Panels B and C show same analysis for rural and urban population separately. As we can see, the effect comes mostly from omen in rural areas: for them age at first marriage increased by 0.567 years, probability of early marriage (dummy = 1 if age at marriage less than 17) decresed more than twice, by 54.2 pecentage points, while age difference with the husband decreased by 2.56 years. The first two results are significant at 5% level and the latter one at 10%, however number of observationa is also lower for the latter outcome (2,220 against 2,666 in forst two regressions).

This findings suggest that despite lower relative to uban population (or underestimated due to selection into urban areas) benefits from university, women in rural areas have experienced much larger shift in attitudes towards marriage and family planning. Thus, university construction have facilitated a convergence between rural and urban population in terms of marriage timing and quality.

The impact on further outcomes related to the social empowerment of women will be estimated in the following versions of the paper …….

V. Conclusion

This paper analyses the effect of a 10-year expansion of the Egyptian higher education system on educational attainment and labor market outcomes. Our results suggest that expansion of educational

system in remote Egyptian governorates caused a large jump in female university degree attainment, which led to a rapid convergence between male and female university enrollment rates by the end of 80s. Moreover, we find an evidence of significant returns to higher education in terms of increased labor force participation for women, while our finding suggest no effect of the expansion policy on male labor outcomes. We also find that women in urban areas are the ones who benefited from policy most, while in rural areas university opening had a slight positive impact on both men and women. Our findings are insensitive to alternative window width, functional forms of included controls for time trend and alternative clustering and sample restrictions. One of the possible channels of our results is connected to strict cultural norms regarding female mobility in Middle Eastern countries that prevented women from getting benefits from higher education until there is an opportunity to enroll to university within an admissible distance.

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Table 1. Impact of university opening on higher degree attainment, LFS.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Both genders						
Exposed	0.021*	0.021*	0.021*	0.021*	0.022*	0.021*
	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)
	[0.067]	[0.063]	[0.069]	[0.079]	[0.080]	[0.067]
Observations	74,399	74,399	74,399	74,399	74,399	74,399
R-squared	0.014	0.055	0.055	0.055	0.055	0.014
Mean of Outcome	0.180	0.180	0.180	0.180	0.180	0.180
Effect size, %	11.67	11.67	11.67	11.67	11.67	11.67
Panel B: Female sample						
Exposed	0.039**	0.040***	0.046***	0.046**	0.045**	0.044**
	(0.010)	(0.010)	(0.010)	(0.010)	(0.012)	(0.011)
	[0. 016]	[0. 008]	[0. 007]	[0. 013]	[0.015]	[0.011]
Observations	20,582	20,582	20,582	20,582	20,582	20,582
R-squared	0.015	0.054	0.054	0.055	0.055	0.055
Mean of Outcome	0.154	0.154	0.154	0.154	0.154	0.154
Effect size, %	25.32	25.97	29.87	29.87	29.22	28.57
Panel B: Male sample						
Exposed	0.018*	0.016	0.014	0.014	0.017*	0.015*
	(0.008)	(0.008)	(0.007)	(0.007)	(0.009)	(0.008)
	[0.086]	[0.149]	[0.195]	[0.202]	[0.067]	[0.086]
Observations	53,817	53,817	53,817	53,817	53,817	53,817
R-squared	0.012	0.055	0.055	0.057	0.056	0.056
Mean of Outcome	0.190	0.190	0.190	0.190	0.190	0.190
Effect size, %	9.47	8.42	7.37	7.37	8.95	7.89
Governorate FE	YES	YES	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES	-	-
Urban status	-	YES	YES	YES	YES	YES
Governorate-specific trend	-	-	YES	YES	YES	YES
Year of interview dummies				YES	YES	YES
General time trend	-	-	-	-	linear	squared

Notes: Dependent variable – dummy = 1 if person finished university education, zero otherwise. Variable *Exposed* is a dummy that equals 1 if person aged 12-18 when university in governorate opened, and equals 0 if person was 19-25 years old when university in governorate opened. Sample restricted to individuals, who have completed at least one year of education, and for whom university in their governorate opened between years 1967 and 1977. *Effect size* calculated as coefficient of *Exposed* divided on mean of the outcome for unexposed cohorts. Standard errors clustered at governorate level (11 clusters) in parentheses, wild bootstrapped p-values reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 2. Impact of university opening on completed years of schooling, LFS.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Both genders						
Exposed	0.239**	0.241*	0.263***	0.264**	0.264**	0.263**
	(0.061)	(0.066)	(0.053)	(0.059)	(0.068)	(0.068)
	[0.026]	[0.057]	[0.004]	[0.013]	[0.017]	[0.016]
Observations	66,769	66,769	66,769	66,769	66,769	66,769
R-squared	0.024	0.085	0.086	0.088	0.088	0.088
Mean of Outcome	9.168	9.168	9.168	9.168	9.168	9.168
Effect size, %	2.61	2.63	2.87	2.88	2.88	2.86
Panel B: Female sample						
Exposed	0.504**	0.521**	0.544**	0.536**	0.465**	0.511**
	(0.185)	(0.155)	(0.150)	(0.156)	(0.144)	(0.149)
	[0. 037]	[0. 035]	[0. 018]	[0. 035]	[0.031]	[0.027]
Observations	18,592	18,592	18,592	18,592	18,592	18,592
R-squared	0.041	0.115	0.117	0.120	0.119	0.119
Mean of Outcome	9.070	9.070	9.070	9.070	9.070	9.070
Effect size, %	5.95	5.74	6.00	5.91	5.12	5.63
Panel B: Male sample						
Exposed	0.158	0.142	0.158	0.160	0.234**	0.240**
	(0.084)	(0.098)	(0.077)	(0.080)	(0.110)	(0.106)
	[0.155]	[0.270]	[0.149]	[0.184]	[0.036]	[0.011]
Observations	48,177	48,177	48,177	48,177	48,177	48,177
R-squared	0.023	0.081	0.082	0.084	0.083	0.083
Mean of Outcome	9.206	9.206	9.206	9.206	9.206	9.206
Effect size, %	1.72	1.54	1.72	1.74	2.54	2.61
Governorate FE	YES	YES	YES	YES	YES	YES
Cohort FE	YES	YES	YES	YES	-	-
Urban status	-	YES	YES	YES	YES	YES
Governorate-specific trend	-	-	YES	YES	YES	YES
Year of interview dummies				YES	YES	YES
General time trend	-	-	-	-	linear	squared

Notes: Dependent variable – effective years of education completed by individual (without repeated grades). Variable *Exposed* is a dummy that equals 1 if person aged 12-18 when university in governorate opened, and equals 0 if person was 19-25 years old when university in governorate opened. Sample restricted to individuals, who have completed at least one year of education, and for whom university in their governorate opened between years 1967 and 1977. *Effect size* calculated as coefficient of *Exposed* divided on mean of the outcome for unexposed cohorts. Standard errors clustered at governorate level (11 clusters) in parentheses, wild bootstrapped p-values reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Impact of university opening on labor market outcomes, LFS.

VARIABLES	Labor force active	Formal employment	Paid job	Public sector job	High skill job
	(1)	(2)	(3)	(4)	(5)
Panel A: Female sample					
Exposed	0.032***	0.040**	0.033**	0.044***	0.036**
	(0.010)	(0.013)	(0.013)	(0.011)	(0.013)
	[0.009]	[0.014]	[0.032]	[0.009]	[0.034]
Observations	17,989	17,989	17,989	17,989	17,989
R-squared	0.109	0.102	0.100	0.099	0.102
Mean of Outcome	0.418	0.350	0.383	0.346	0.354
Effect size, %	8,4	11,4	8,6	12,7	10,2
Panel B: Male sample					
Exposed	-0.001	-0.011	-0.001	-0.010	0.007
	(0.001)	(0.009)	(0.003)	(0.011)	(0.009)
	[0.520]	[0.305]	[0.669]	[0.445]	[0.448]
Observations	42,233	42,233	42,233	42,233	42,233
R-squared	0.033	0.083	0.020	0.078	0.046
Mean of Outcome	0.98	0.573	0.984	0.541	0.585
Effect size, %	0,1	1,9	0,1	1,8	1,2

*Notes***:** Variable *Exposed* is a dummy = 1 if person aged 12-18 when university in governorate opened, and = 0 if aged 19-25 at that moment. All regressions include cohort of birth and governorate FEs. Controls include dummies for year of interview, urban status of the, governorate-specific linear time trend and number of colleges in the rest of Egypt. Sample restricted to individuals, who have completed at least one year of education, and for whom university in their governorate opened between years 1967 and 1977**.** *Effect size* calculated as coefficient of *Exposed* divided on mean of outcome for unexposed cohorts. Standard errors clustered at governorate level (11 clusters) in parentheses, wild bootstrapped p-values reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Impact of university opening on education and employment, heterogeneity by urban/rural status of residence.

VARIABLES	University degree (1)	Years of schooling (2)	Currently working (3)
Panel A: Female sample			
Urban			
Exposed	0.061**	0.661**	0.050*
	(0.015)	(0.173)	(0.024)
	[0.011]	[0.016]	[0.099]
Observations	11,540	10,465	9,766
R-squared	0.027	0.058	0.093
Mean of Outcome	0.216	10.26	0.440
Effect size, %	28.24	6.44	11.36
Rural			
Exposed	0.026*	0.363	0.008
	(0.010)	(0.210)	(0.029)
	[0.098]	[0.234]	[0.826]
Observations	9,042	8,127	8,223
R-squared	0.022	0.077	0.121
Mean of Outcome	0.075	7.54	0.373
Effect size, %	34.66	4.81	2.14
Panel B: Male sample			
Urban			
Exposed	0.010	0.015	0.002
	(0.011)	(0.142)	(0.003)
	[0.410]	[0.913]	[0.594]
Observations	19,649	17,681	14,609
R-squared	0.025	0.029	0.013
Mean of Outcome	0.296	10.86	0.988
Effect size, %	3.37	0.14	0.20
Rural			
Exposed	0.018*	0.249*	-0.001
	(0.007)	(0.105)	(0.002)
	[0.098]	[0.067]	[0.725]
Observations	34,168	30,496	27,624
R-squared	0.015	0.039	0.036
Mean of Outcome	0.129	8.25	0.985
Effect size, %	13.95	3.02	0.10

Notes: Variable *Exposed* is a dummy = 1 if person aged 12-18 when university in governorate opened, and = 0 if aged 19-25 at that moment. All regressions include cohort of birth and governorate FEs. Controls include dummies for year of interview, governorate-specific linear time trend and number of colleges in the rest of Egypt. Sample restricted to individuals, who have completed at least one year of education, and for whom university in their governorate opened between years 1967 and 1977. *Effect size* calculated as coefficient of *Exposed* divided on mean of outcome for unexposed cohorts. Standard errors clustered at governorate level (11 clusters) in parentheses, wild bootstrapped p-values reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Impact of university opening on education and employment, DHS.

VARIABLES	(1) University degree	(2) Years of schooling	(3) Currently working
Exposed	0.038**	0.859***	0.072*
	(0.019)	(0.247)	(0.034)
	[0.049]	[0.009]	[0.088]
Observations	4,276	4,276	4,273
R-squared	0.074	0.203	0.082

Notes: Variable *Exposed* is a dummy = 1 if person aged 12-18 when university in governorate opened, and = 0 if aged 19-25 at that moment. All regressions include cohort of birth and governorate FEs. Controls include dummies for year of interview, governorate-specific linear time trend, urban status of the area and religion. Sample restricted to individuals, who have completed at least one year of education, and for whom university in their governorate opened between years 1967 and 1977. Standard errors clustered at governorate level (11 clusters) in parentheses, wild bootstrapped p-values reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

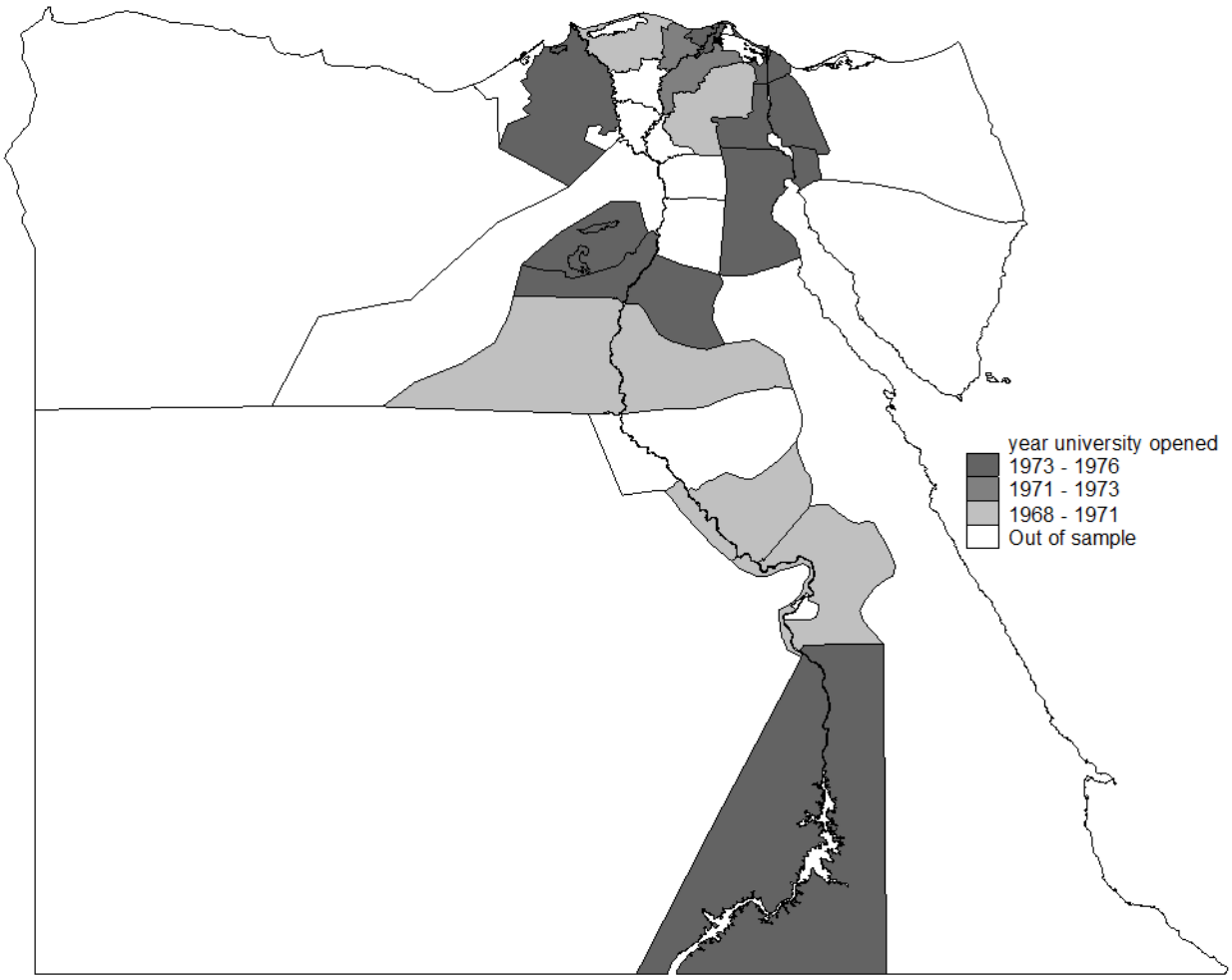
Table 6. Impact of university opening on marriage and fertility, DHS.

VARIABLES	(1) Age at 1st marriage	(2) Early marriage	(3) Age difference with husband
Panel A: Whole sample			
Exposed	0.677*	-0.047	-1.474*
	(0.290)	(0.027)	(0.654)
	[0.084]	[0.135]	[0.086]
Observations	6,760	6,760	5,759
R-squared	0.143	0.122	0.063
Mean of outcome	20.28	0.233	8.41
Effect size, %	3.33	20.17	17.52
Panel B: Urban			
Exposed	0.681	-0.027	-0.488
	(0.440)	(0.041)	(0.746)
	[0.240]	[0.556]	[0.567]
Observations	4,094	4,094	3,539
R-squared	0.053	0.061	0.081
Mean of outcome	21.45	0.144	7.89
Effect size, %	3.22	18.75	6.19
Panel C: Rural			
Exposed	0.569**	-0.542**	-2.564*
	(0.213)	(0.026)	(1.266)
	[0.032]	[0.031]	[0.095]
Observations	2,666	2,666	2,220
R-squared	0.085	0.080	0.067
Mean of outcome	18.50	0.370	9.22
Effect size, %	3.10	146,49	27.81

Notes: Variable *Exposed* is a dummy = 1 if person aged 12-18 when university in governorate opened, and = 0 if aged 19-25 at that moment. All regressions include cohort of birth and governorate FEs. Controls include dummies for year of interview, governorate-specific linear time trend, urban status of the area (in Panel A) and religion. Sample restricted to individuals, who have completed at least one year of education, and for whom university in their governorate opened between years 1967 and 1977. *Effect size* calculated as coefficient of *Exposed* divided on mean of outcome for unexposed cohorts. Standard errors clustered at governorate level (11 clusters) in parentheses, wild bootstrapped p-values reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

List of Figures

Figure 1. Governorates of Egypt by year of university establishment.



Notes: Map illustrates rollout of university construction in Egyptian governorates in time period between two educational reforms. In order to be sure that all age cohorts in our analysis (people aged 12-25 when university opened) were under similar educational regulations, we restrict our analysis to governorates colored in shades of grey, i.e. where university was constructed during years 1968-1976. Governorates colored in white got access to higher education either before or after period of interest.

Figure 2. Plotted coefficients of the age dummies in the higher degree attainment equation.

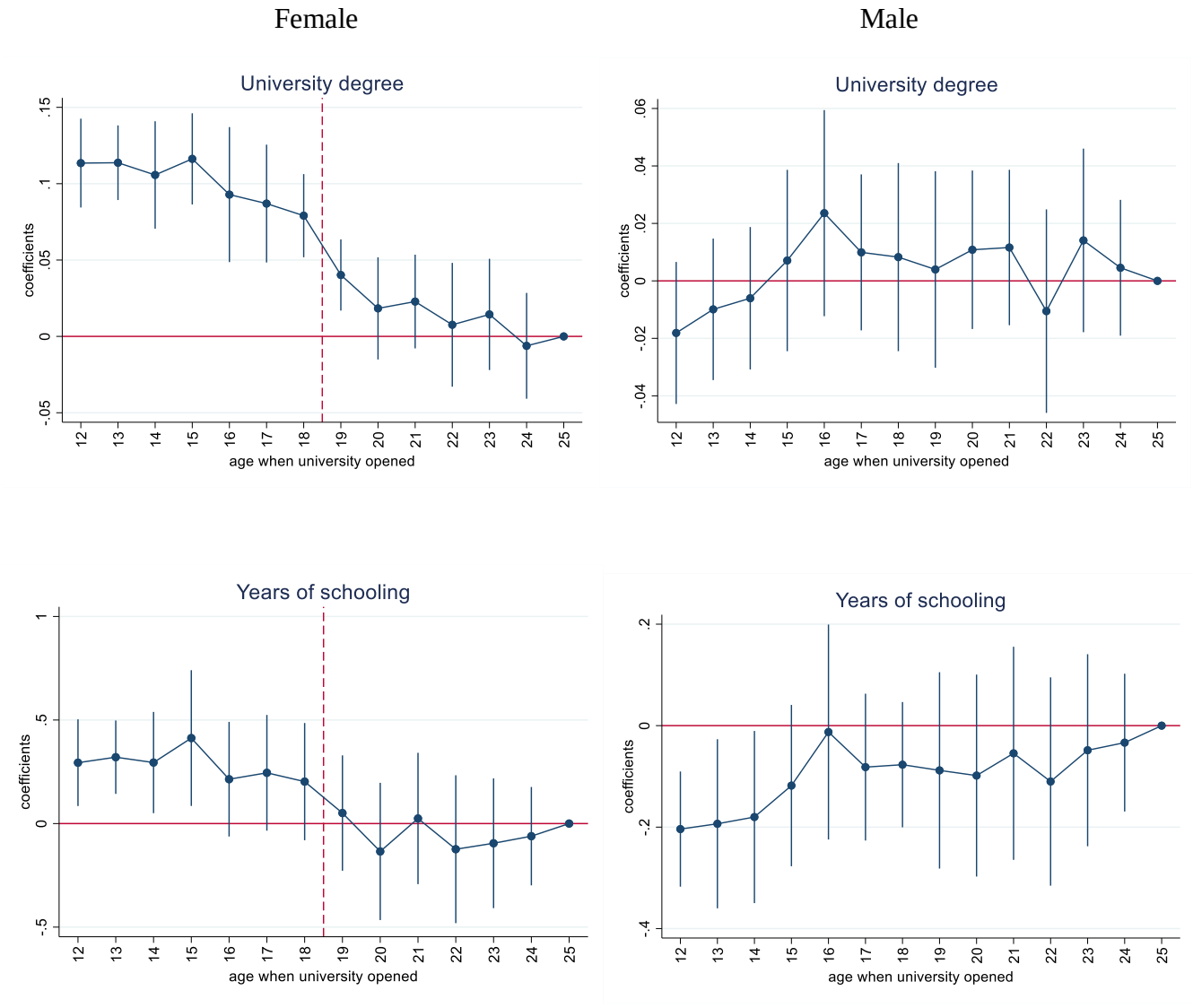


Table A1. Governorates of Egypt listed by year of university establishment.

	Governorate	Year when first public university was opened
1	Giza	1839
2	Cairo	1908
3	Alexandria	1938
4	Matruh	1954
5	Asyut	1957
6	Monufia	1958
7	Gharbia	1963
8	Qalyubia	1963
9	Sharqia	1968
10	Kafr El Sheikh	1969
11	Minya	1969
12	Qena	1970
13	Sohag	1971
14	Dakahlia	1973
15	Aswan	1975
16	Beheira	1975
17	Faiyum	1975
18	Port Said	1975
19	Suez	1975
20	Beni Suef	1976
21	Damietta	1976
22	Ismailia	1976
23	New Valley	1993
24	Luxor	1996
25	North Sinai	2016

Notes: In order to be sure that all age cohorts in our analysis (people aged 12-25 when university opened) were under equal circumstances in terms of educational regulation we keep only governorates colored in red. Governorates colored in grey were affected by armed conflict that caused displacement of many people in 1968, and are excluded from our analysis.