Public Employment Shocks and Female Labor Force Participation in the West Bank: Evidence from Quasi- Experiment

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Abstract

By the end of the Second Intifada, which took place between 2000 and 2004, the Palestinian government disproportionately expanded security personnel in the West Bank, overwhelmingly hiring males. This expansion has limited employment opportunities in the public education sector; a main employer of educated females. The paper utilizes this shock as a quasi- experiment to test the hypothesis that a labor demand decrease in public education causally decreases labor force participation of educated females. The findings confirm this hypothesis, though the effect is limited to the young cohort.

Key Word: Public Employment, Labor Demand, Female Labor Force Participation.

1. Introduction

Existing literature documents cross-country differences in female labor force participation rate (LFPR) (see Verick 2014). A large strand of research has been devoted to explain this phenomenon and relate it to the level of economic development (Goldin 1994; Polachek 2006; Verick 2014; Kluve and Schmitz 2014). Markedly, Goldin (1994) suggests that the linkages with level of development and female LFPR is U-shaped in which female LFPR decreases at initial level of development mainly due to improvement in husband income but increases at later stage of development with the improvement of female education. Another strand of literature highly emphasizes the supply side determinants, mainly looking at the role of societal and cultural barriers (see Olsen *et al* 2006 and Neff *et al* 2012); lack of crèches and institutional child support for female workers (see Bick 2010); spouse's level of income; expected market wage; and fertility (See klasen and Pieters 2012) as well as the change in cost of child caring (Attanasio et al 2008)

At the demand side, researchers often address the impact of sectoral changes (Verdugo and Allegre (2017), demand shocks from natural resources (Maurer and Potlogea (2017), and trade integration (see Gaddis and Pieters 2017).This research visits the linkages between labor demand and female labor force participation, emphasizing the impact of public employment. Notably, the public sector is a main employing sector for educated females both in developed and developing countries (see Anghel et al 2011; ILO 2007). This indicates that labor demand shocks in this sector may have a sizable effect on labor market outcomes of females.

Surprisingly, few papers link public employment to female labor force participation (see Anghel et al 2011; Assaad et al 2018). Assaad et al (2018) highlight the paradox of a substantial rise in female educational attainment and stagnation of female LFPR in MENA region. They argue that the low participation rate is driven by adverse developments on the demand side, mainly manifested via contraction in the public employment. Utilizing labor force data from Algeria, Egypt, Jordan and Tunisia, they show that the decline in the probability for educated females to find jobs in public sector is associated with lower labor force participation or increase in unemployment. To date, little research, if any, has been carried out to test if such a linkage is causal, possibly constrained with estimation challenges, i.e., simultaneity concerns. This paper fills the gap and provides important

insights on how the decrease in public employment causes a decrease in labor force participation mainly of females in countries, where the public sector is their main employer.

Toward the end of the Second Intifada, which took place between 2000 and 2004, the Palestinian government expanded public employment. Though, it was disproportionately limited to security personnel, possibly to restore stability and off-set negative labor market effects of restricting access to the Israeli labor market (Cali et al 2014). The expansion of security employment has come at the expense of other public sub-sectors, mainly education. The demand for workers employed in the public education concomitantly stagnated.

Public education is considered a main employer for educated females in the West Bank. Females prefer to seek employment in such a sector to benefit from shorter working hours, long paid vacations, and generous maternity leave; factors that align with societal and family values in the MENA region (see Assaad et al 2018). The descriptive analysis (see more discussion in section 2) show that employment stagnation in the public education sector has disproportionately affected new labor market entrants (the young educated females) during a period when labor force participation of this cohort has also declined. This paper tests if the decline in public employment has kept some of them out of labor market.

The closet research to this paper is Fallah et al (2019) who link changes in labor force participation for educated females to changes in labor demand utilizing labor force data from the West Bank. Using instrumental variable approach, they show that changes in overall employment does not affect labor force participation for young educated females and that changes in demand for this cohort is what matters; indicating that general improvement in the labor market may not lift all boats. They also show that while the demand for young educated females has decreased during their study period (2005-2011), it was not a product of competition with their male peers.

Complementing the work of Fallah et al (2019), this paper utilizes the employment decline in the Palestinian public education as a quasi-experiment to examine the effect of the decrease in labor demand on female labor force participation. The theoretical reasoning is borrowed from the theory of discouraged worker effect (Becker 1965; Mincer 1966; Dernburg1966). It states that labor supply is higher (lower) when labor market is tight (slack). With poor labor market conditions (e.g. recession), individuals give up on searching for jobs and become discouraged, as the utility associated with the search is lower than the utility of remaining out of the labor force (see Cahuc and Zylberberg, 2004; Benati 2001; Ehrenberg and Smith 1988; Dagsvik 2013).

To establish a causal linkage between the employment decline in public education (demand shock) and labor force participation of educated females, I employ difference in difference (Diff-in-Diff) estimation technique. The identification assumption is that educated females are more likely to remain out of the labor force in localities where this cohort relied on public education as a main source of employment prior to the shock. The validity of this identification is majorly based on two conditions; employment opportunity for educated females in public education had diminished in treated localities after the shock and that all localities share the same trend of labor force participation prior to the shock. The paper provides evidence that both conditions are valid.

This research draws up on yearly labor force data collected and published by the Palestinian Census Bureau of Statistics (PCBS). The time span of the analysis extends from 1999 until 2012 and is limited to the West Bank. In 2007, Hamas militarily controlled Gaza Strip, forming a separate government that set the stage for a different public employment scheme. Since then, Israel has imposed a blockade and waged three consecutive wars against the Gaza Strip, causing a deep recession and diverging the economy away from the West Bank (see World Bank 2007, 2010). These shocks might be hard to empirically control for. The analysis also excludes data from East Jerusalem, where the Palestinian government lacks sovereignty and is barred from providing public services.

The findings of this paper show that the decrease in demand of public education causally decreased the probability for educated females to enter the labor market. As the employment decrease in public education pertains to young educated females, the reported finding is limited to them. The paper also tests for the mechanism that drives the shifts in labor force participation. The results show that it is related to increasing the probability to remain out of the labor market, given the scarce job opportunity in the public sector. The findings are robust to a number of placebo tests, showing that the documented effect is not confounded by other factors or underestimated by commuting effect.

The remainder of the paper is organized as follows; section 2 presents the main descriptive statistics and tracks labor market outcomes of educated females with an emphasis on employment changes in public education. Section 3 discusses Diff-in-Diff methodology and model specifications. Section 4 and 5 presents the main results and a robustness check. The paper concludes in section 6.

2. Demand Shocks and Labor Market Outcomes of Educated females.

This section explores the main aspects that identify changes in labor market conditions of educated females during the study period (1999-2012). In doing so, I utilize data from PCBS's labor force survey (LFS) that is nationally representative and collected quarterly, covering over 7000 households in the West Bank and Gaza Strip. The LFS includes rich socioeconomic and employment information of household members, such as age; sex; education attainment; place of residence; place of work; employment status; type of employment; and wages, among other factors.

To better emphasize labor market outcomes of educated females, I shed light on LFPR for all cohorts, based on sex, age, and level of education. The data exhibits that females performed poorly over the study period, such that their LFPR averaged about 22% relative to 87% for males. Still, differentiating females by level of education shows an interesting pattern; LFPR for the educated amounted to a yearly average of 69.5% as opposed to 14% for the low educated. This, however, contrasts with the male case in which education is less relevant; the corresponding LFPR for the low educated males is 86.5% as opposed to 91% for the educated males. Throughout the remainder of this paper, we identify the young cohort as those with an age boundary of 19-29 years old, versus 30-64 years old for the older cohort.

In the end of 2000, the Second Intifada broke out and economic conditions substantially deteriorated. As the level of violence intensified, Israel severely restricted internal and external mobility across the West Bank areas, and banned access to its labor market for a large section of Palestinian commuters (Cali and Miaari 2018; Fallah 2017; Mansour 2010). During the first two years of the Second Intifada, the share of commuters declined from 25% in 1999 to 12%.As a result, the unemployment rate rose to the unprecedented level of 28%.

As the intensity of the Second Intifada sizably diminished in 2004, Israel gradually lifted closure on the West Bank and eased access to its labor market. Labor market conditions directly improved, such that the unemployment rate declined, though it never went back to the initial level and LFPR started to recover. Still, the analysis shows that improvement in labor market conditions did benefit all cohorts, except for young educated females, whose LFPR has declined and the unemployment rate doubled (See Figure 4 and 5).

In 2004, the Palestinian government disproportionately started expanding security employment, overwhelmingly hiring males, possibly to quell tension in the occupied Palestinian territories and curb the rising unemployment rate (Cali et al 2014). Between 2003 and 2008, the employment share

of this public sub-sector rose from 20% to 28%.[1] This expansion has come mainly at the expense of public education. Figure (1) shows that employment share of public education dropped from 40% in 2003 to 33% in 2006 and 37% in 2008.

Markedly, public education is a main employer of educated females. In 2003, right before expanding the employment of security personnel, the public education sector generated employment for 40% of all educated female workers and 72% of all educated females employed in the public sector. Figure (6) depicts the employment distribution of educated females across the main public sub-sectors[2] over the 1999-2008 period and shows that public education is dominating. Public administration sub-sector comes next, with a substantial gap, and the corresponding share in the security sector is so minimal, not exceeding 5%. To this end, the employment contraction of public education represents a negative demand shock for educated females.

One concern of utilizing employment shares to detect the decline (rise) in the public education (security) sub-sector is that it may just reflect a differential employment growth in both sectors. Thus, any detected labor force participation is spurious. To address this issue, Figure (7) exhibits changes in the number[3] of workers employed across the public subsectors. The results show that the number of security jobs has substantially increased after the shock, while the number of jobs created in the education subsector stagnated for a couple of years, and then picked up. Further tracking the demand changes in the latter sub-sector, administrative records[4] show that the number of vacancies available for the young educated females has substantially decreased after 2003. Though, it remained relatively stable for the older cohort (see Figure 8). Accordingly, the capacity for the public education sub-sector to absorb more of young educated females diminished. Simultaneously with the employment shift in the public education, LFPR of this cohort has declined (see Figure 3). The following section discusses the empirical methodology to examine whether this employment shift is a causal factor.

Empirical Model

[1] Trend changes in security personnel are not reported after 2008 as data on type of employment is not sufficiently disaggregated for those years.

[2] The public sub-sectors include defense, education, health and social services, public administration, and other public activities.

[3] The number of employed in the public education and security sectors is estimated from PCBS's labor force data.

[4] Source of data is Ministry of Education.

I utilize a Diff-in-Diff method to estimate the effect employment decline in public education on the labor force participation of educated females in the West Bank. The Diff-in-Diff model is estimated using a linear probability model. The period of analysis spans between 1999 and 2012;[5] covering an extended period that allows for testing the validity of the Diff-in-Diff method. The model is estimated utilizing unbalanced panel of 88 localities, including a sample of 22,373 educated females.[6]

$$Lf_{ilt} = \alpha+\delta(Sh1999_l)*period +T_t+\eta_l +\lambda_{dt}+controls_{ilt} + e_{ilt}\ldots\ldots\ldots\ldots\ldots(1)$$

The dependent variable is dichotomous, taking a value of one for an educated female "*i*", whose age is between 19-64 years old, lives in locality *l*, and observed in year *t*. The value of the dependent variable is zero if an educated female is reported out of labor force. The treatment variable "$Sh1999_l$" is continuous, measured as an interaction between a *period* dummy and abase line (1999) share of educated female employed in public education in a given locality. This variable is measured as the number of educated females employed in public education relative to total employment of this cohort. The *period* dummy reflects the time of the shock (the employment decrease in public education), taking a value of 1 for the years following 2003 and zero for earlier years.

The vector η_l includes locality fixed effects and vector T_t includes year fixed effects. The control variables also include individual characteristics, specified as dummy variables, covering age, marital status, and education degree. They also include two interaction dummies consisting of education by age and marital status by age. The model also includes locality level variables. In particular, it interacts the *period* dummy with two baseline locality characteristics. The first is locality share of educated individuals employed in the private service sector. This is to ensure that the treatment variable is not capturing demand shocks from other sectors that generate employment for educated females (see Fallah et al 2019). The second is the locality share of educated females, which is included to capture the effects of locality differences on human capital. Finally, the model controls for district-year fixed effect (λ_d) to account for time varying unobserved factors that changes overtime and across districts but are common to localities in each district. In the same fashion, the model controls for place of residence-year fixed effects (π_{rt}).The model is estimated assuming that error terms (e_{ilt}) are clustered at the locality level. Descriptive statistics of the explanatory variables are presented in Table (1).

[5]The empirical analysis is limited to 2012, as data are not readily available at the locality level for later years.
[6] The sample excludes individuals who are reported as employer, self-employed, or unpaid workers (working at their family business).

The identification assumption of utilizing model (1) to estimate the effect of the employment decrease in public education is that labor force participation will be lower for educated females in localities that, prior to the shock, heavily relied on public education as a main source of employment for this cohort. Therefore, the treatment estimate "δ" measures the effect of increases in the share of public education in 1999 on the probability of labor force participation for educated females after the shock.

3. Results

Model (1) will be firstly estimated using the entire sample including all educated females (full model). Then it will be estimated separately for the young and the old. It is expected that the probability effect on labor force participation will affect the young. As discussed above, the employment stagnation in public education, that followed the expansion in the security sector, is limited to this cohort.

Table (2), reported in the appendix,[7]firstly presents the results of a parsimonious version of model (1) (see Column 1), in which the socioeconomic controls and the initial locality characteristics are excluded. Column (2) reports the full model (the preferred model).The results show that the treatment estimate of the parsimonious model is negative and statistically significant at a 10% level. When including all the control variables, the treatment estimate becomes statistically significant at 1% and the magnitude of the treatment estimate increases from -0.09 to -0.15. This indicates that increasing the 1999 share of educated females in public education by 10 percentage points decreases probability of joining the labor force by 1.5 percentage points during the treated period.

Now, I turn to test whether the decrease in public employment for educated females has a differential effect across age cohorts. To save space, the analysis is limited to estimating the full model. The results, reported in Table (3), show that the sign of the treatment coefficient is negative, but only significant for the young cohort. The estimate of the latter indicates that increasing the 1999 share of educated females in public education by 10 percentage points decreases the probability of labor force participation of the young cohort by 1.6 percentage points.

A main validity assumption of utilizing the Diff-in-Diff model is that both the control and treated groups have a similar labor force participation trend prior to the shock. To test this hypothesis, I

[7]All reported results are placed in the appendix.

estimate a generalized version of model (1), allowing the treatment effect to vary by year. The results, exhibited in Column (3) of Table (3) and Columns (2) and (4) of Table (4), separately report the estimates for the full sample, young educated females, and older educated females, respectively. Consistent with the parallel trend assumption, the treatment estimate of the three models is statistically insignificant in all the years prior to the shock. Markedly, for the young educated model, the negative effect on labor force participation persists in all the years during the treatment period. As for the older educated females, the treatment estimates are statistically insignificant across the board.

Mechanisms Driving the Decrease in Labor Force Participation

The reported decrease in the probability of labor force participation can be mainly driven by two mechanisms. The employment decrease in public education could increase the probability for unemployed young educated females to leave the labor market (the first mechanism) and/or could increase the probability of remaining out of the labor market given the limited job opportunity (the second mechanism).

To test for the first mechanism, I utilize model (1) to compare the likelihood of seeking employment (being unemployed) versus remaining out of the labor market. In this case the dependent variable is modified such that it takes a value of 1 if an educated female is employed and zero if remained out of the labor market. As for the second mechanism, I compare the likelihood of being employed versus remaining out of the labor market. In a similar fashion, I estimate a separate version of model (1) in which the dependent variable takes a value of 1 if an educated female is employed and zero if remained out of the labor market.

The results, pertaining to the young educated females, provide evidence that the second mechanism prevails. The corresponding estimate of the treatment variable, as reported in Table (5) is sizable (0.38) and statistically significant at a 1% level (see Column 1). Consistently, the year-by-year estimates are statistically significant for most of the years after the shock (see Column 2). On the other hand, the estimate of the treatment variable in the second-mechanism model is smaller in magnitude and statistically significant only at 10% level, though the year-by-year estimates are statistically insignificant (Column 3 and 4). As for the older educated females, the estimates are consistent with the above findings, showing no statistical significance across the board (see Column 5 to 8). Notably, the parallel trend assumption holds for both models. In the same vein, I utilized model (1) to estimate unemployment probability for both cohorts. The dependent variable is

modified to take a value of 1 if an educated female is employed and zero if unemployed (seeking employment). The results, unreported,[8] show that the estimate of the treatment variable is statistically insignificant for both cohorts; further reassuring that the decrease in probability of labor force participation is driven by remaining out of the labor market.

Validity of Identification Assumption

The findings of model (1) so far shows that the probability for a young educated females to be out of the labor force increases in localities with more educated females employed in the public education in 1999 (treated localities) . For this finding to be interpreted as causal relationship, two validity assumptions should hold. The first is that the share of public education (treatment variable) varies across localities. Evidently, the spatial distribution of the treatment variable shows that it does, ranging from 28%, for the 25th percentile, to 47% and 80% for the 50th and 75th percentiles, respectively.

The second validity assumption entails that employment opportunity in public education decreases more disproportionately for young educated females in treated localities. To formally show this, I estimated similar version of model (1) in which the dependent variable takes a value of 1 if a young educated female is employed in public education and zero if employed elsewhere. The estimate of the treatment variable measures the probability for an individual from this cohort to be employed being employed in the public education. The results, reported in Column (1) of Table (6), show that the estimate is negative and statistically significant at a 1% level. Consistently, the results of a generalized version of model (1) are reported in Column (2) and show that the year by year estimates are negative and statistically significant after the shock. This finding ensures that the reported decrease in the labor force participation, as shown below, is driven by a change in labor demand.

Validity Checks

In this section, I explore a number of concerns that may threaten the validity of the reported estimates. These concerns include commuting and confounding factor effects. As for the former, negative demand shocks in localities with a higher 1999 share of educated females employed in public education, may induce educated females to seek employment in other localities. This is expected to bias the treatment estimate downward. To test if the commuting factor attenuates the estimate of the treatment variable, one would ideally use workplace data that identifies localities

[8] Unreported results are available by the author up on request.

where individuals would search for employment. Unfortunately, this kind of data is not available. Alternatively, I utilize place of work data to examine if educated females tend to work in place of work that is different from place of residence as an outcome of the shock.[9]

I estimate a modify version of model (1), which now controls for workers' main type of economic activities, main occupation, and type of employment.[10] The dependent variable is dichotomous taking a value of one if an educated female works in the same locality of residence and zero if she works elsewhere. Data that distinguish place of work from place of residence is only readily available for the years following 2000. Therefore, I limit the analysis to 2001-2012 period. Consistent with the above analysis, I estimate separate a regression for the young and the old educated females. The estimates, reported in Table (7), show that the treatment estimate is statistically insignificant for both cohorts (Columns 1 and 3). Columns (2) and (4) present the estimates for the corresponding generalized Diff-in-Diff model.[11] The results, reported in Column (2) and (4), support the parallel trend assumption. This indicates that the commuting effect plays no role in shaping the estimates.

As for the confounding factor concern, it is possible that the negative effect on labor force participation is driven by other locality characteristics that are not accounted for in the regression model or driven by unobserved shocks. One aspect of this concern is that labor market conditions deteriorated in localities that were highly exposed to employment decreases in public education. In such a scenario, labor force participation is expected to decrease for other cohorts that are less affected by the employment decrease in public education. If this proves to be the case, the linkages between the decrease in public employment and the decline in Labor force participation are spurious.

To test for this hypothesis, I run a couple of placebo tests, in which model (1) will be separately estimated for low educated cohorts, including young females; older-females; young-males; and older-males. Descriptive statistics show that for each of these cohorts, less than 1% is employed in public education, relative to their own overall employment. Since public education generates few jobs for all these cohorts, it is less likely that negative demand shocks in public education would affect their

[9] Prior to the decline in the employment share of public education, 41% of employed educated females work in the same locality of residence.
[10] The type of employment reflects the sector of employment, including, private, public, NGOs, foreign governments, and international institutions.
[11] For young educated model, the treatment estimate of the generalized Diff-in-Diff model is statistically significant only for two treated years. But the overall commuting effect of the overall treated period is statistically insignificant.

labor force participation. Put differently, for the documented effect of public education to be valid, low educated cohorts should not be affected, all else equal.

The results are reported in Table (7). Columns (1) and (3) report the results of the young and old low-educated females. The treatment estimate, for both models, is negative but statistically insignificant. The corresponding estimates of the low-educated male cohorts, presented in Columns (5) and (7), are positive but statistically insignificant. Nevertheless, the estimates reported in Table (5), the columns with even numbers, show that the parallel trend assumption is violated for the older male and female cohorts. Still, the overall conclusion of the placebo tests suggests that the reported findings of the young educated females do not pick other confounding effects.

Other Placebo groups include educated males.

Another potential placebo test is to examine the effect on probability of labor force participation for other cohorts that are less affected by the decline in public employment. Namely, I extend the analysis to include young and educated males. For both, public employment accounts for a fraction of their total employment prior to the shock; 14% of the young in 1999 and and The share young educated males employed in public education prior to 2014 made up only 14% of the total employment for this cohort.

So far, the findings show that the effect of the employment decrease in public education is limited to the young educated females. This is supported by the fact that the decrease in employment mainly affected them and that public education is a main employing sector. I expand the analysis to examine if the findings hold for educated males. Following the same logic, one would expect to observe a decrease in the probability of labor force participation if the aforementioned two conditions hold. The administrative data of vacancies in the Ministry of Education show that it did decrease for the young educated males between 2002 and 2005 but picked up by 2008. The trend for the older educated males generally follows upward sloping (see Figure 9). Nonetheless, the share young educated males employed in public education prior to 2014 made up only 14% of the total employment for this cohort.

4. Conclusion

Upon the end of the Second Intifada, the Palestinian government expanded employment of security personnel at the expense of other public employment, namely education, which is a main employer for educated females. I utilize this shock as a quasi-experiment to examine the effect of labor

demand shock on labor force participation of educated females. Using Diff-in-Diff estimation technique, the findings show that the negative shock in public education causally reduces the probability of joining the labor market. The findings show that the effect is limited to young educated females. The main policy implication of this paper is that downsizing public employment may have repercussions on the labor force participation for the most affected group.

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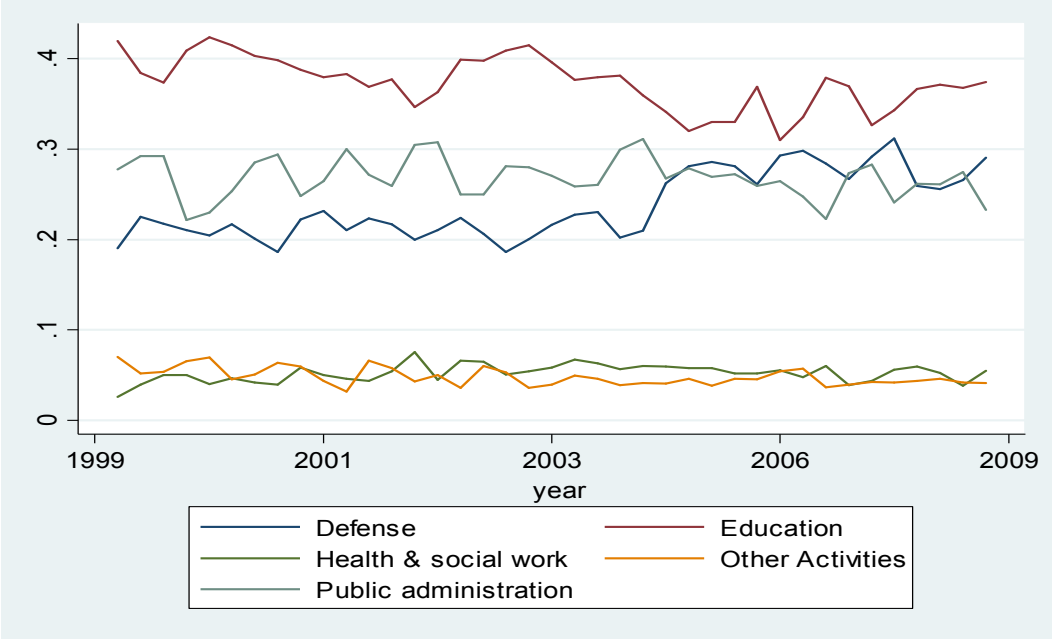
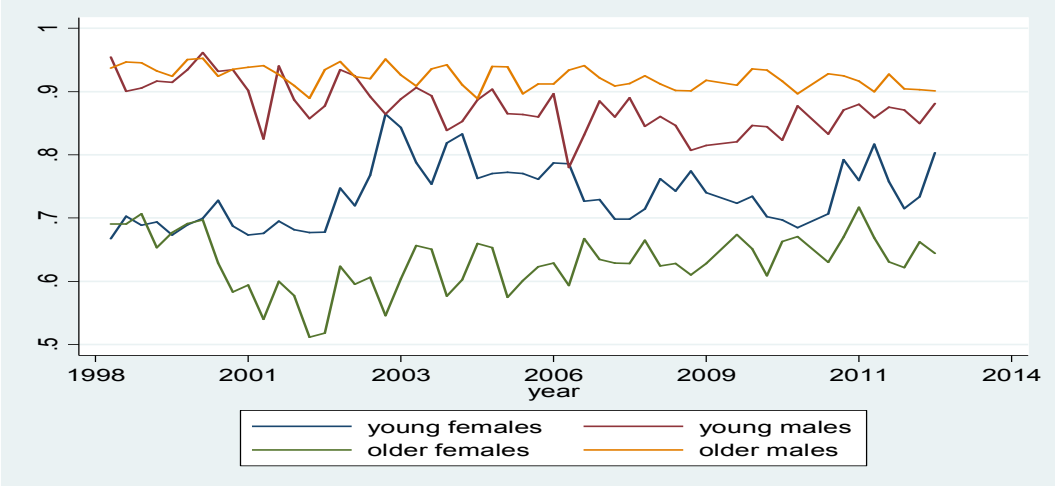
Appendix

Figure (1): Employment Shares Across Public Sub-Sectors 1999-2008, Quarterly.



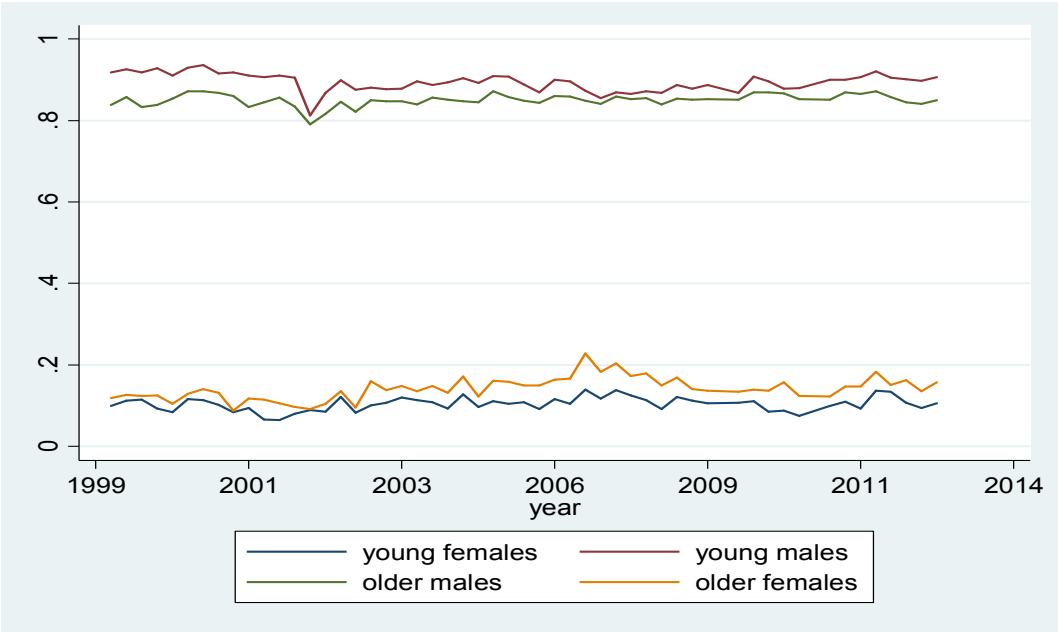
Notes: This figure plots quarterly changes in share of workers across public subsectors. Source of data is PCBS's Labor Force Survey, 1999-2008.

Figure (2):LFPR for Educated Cohorts 1999-2012,Quarterly.



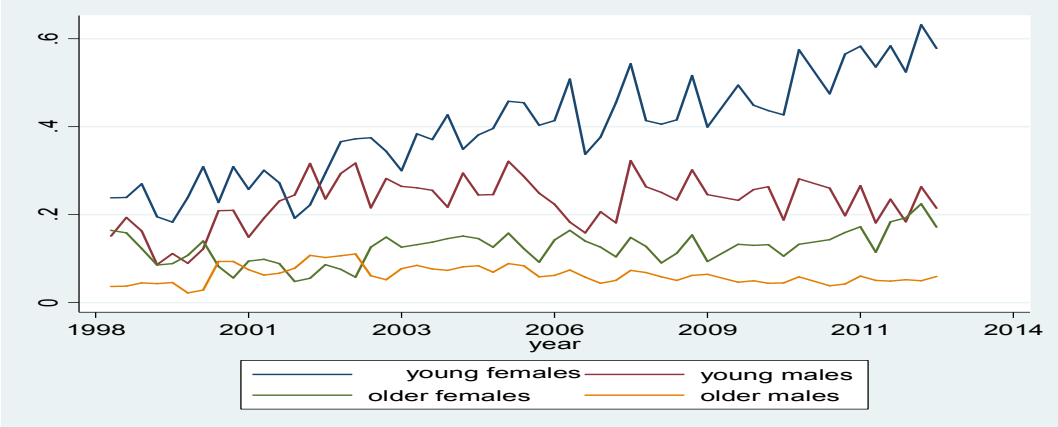
This figure plots quarterly changes in LFPR by age and gender for educated individuals. Source of data is PCBS's Labor Force Survey, 1999-2012. Young cohort includes individuals with age boundary of 19 and 29,while older cohort includes individuals with age boundary of 30 and 54. Educated cohorts are defined as those with tertiary education.

Figure (3): LFPR for Low Educated Cohorts 1999-2008, Quarterly.



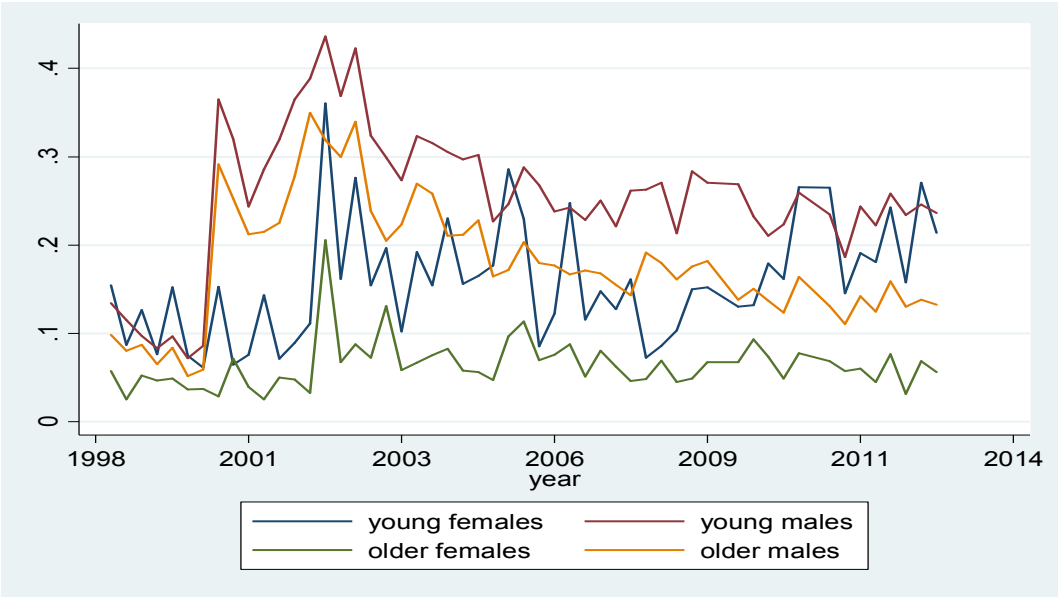
This figure plots quarterly changes in LFPR by age and gender for low educated individuals. Source of data is PCBS's Labor Force Survey, 1999-2012. Young cohort includes individuals with age boundary of 19 and 29,while older cohort includes individuals with age boundary of 30 and 64. Educated cohorts are defined as those with notertiary education.

Figure (4): Unemployment Rate for Educated Cohorts 1999-2012, Quarterly.



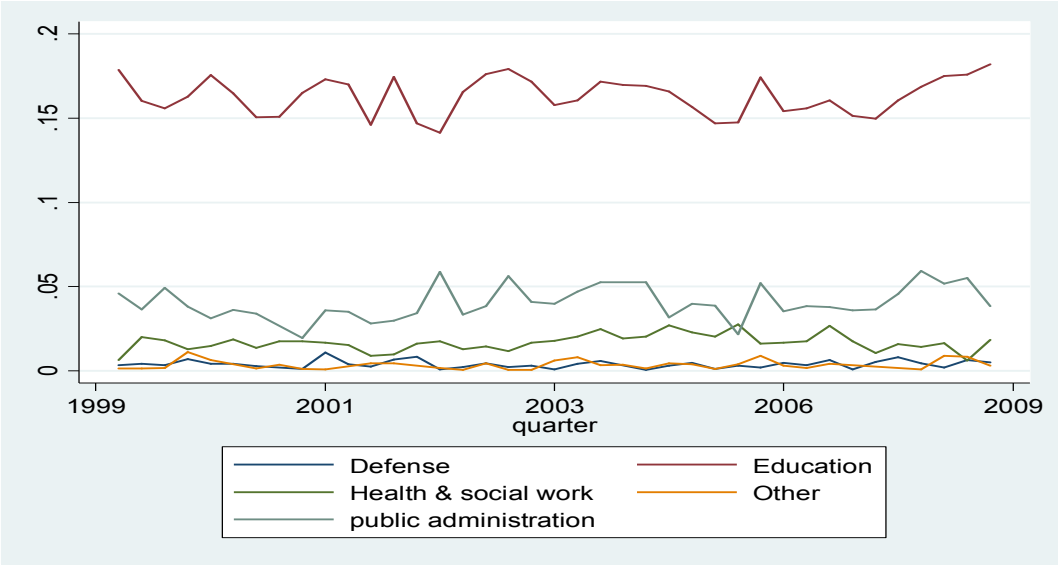
This figure plots quarterly changes in unemployment rate by age and gender for educated individuals. Source of data is PCBS's Labor Force Survey, 1999-2012. Young cohort includes individuals with age boundary of 19 and 29,while older cohort includes individuals with age boundary of 30 and 64. Educated cohorts are defined as those with tertiary education.

Figure (5): Unemployment Rate for Low Educated Cohorts 1999-2012, Quarterly.



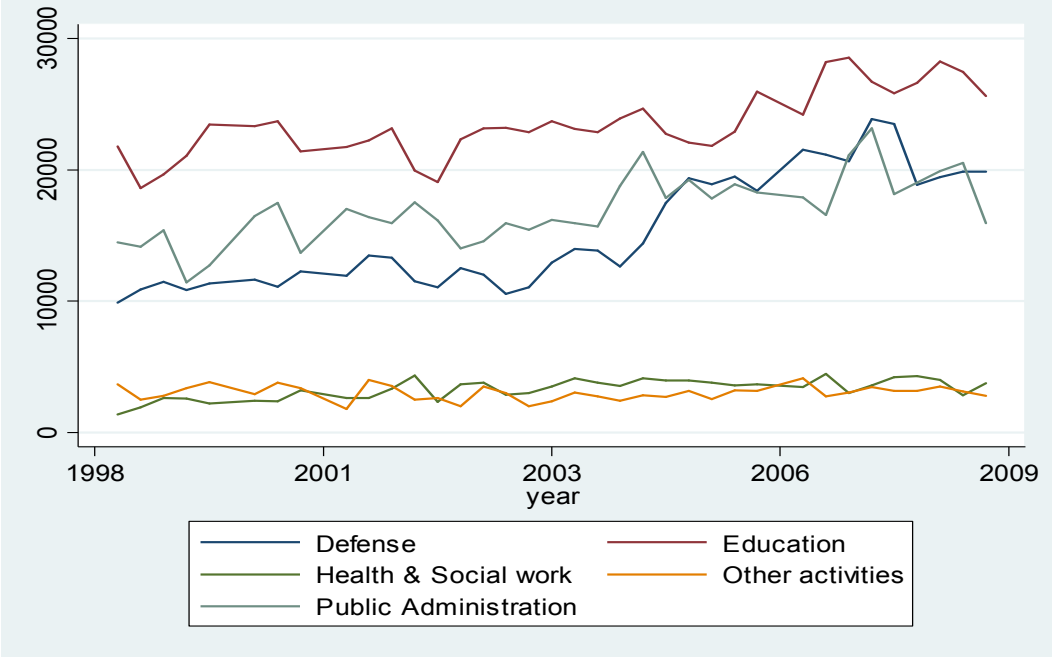
This figure plots quarterly changes in unemployment rate by age and gender for low educated individuals. Source of data is PCBS's Labor Force Survey, 1999-2012. Young cohort includes individuals with age boundary of 19 and 29,while older cohort includes individuals with age boundary of 30 and 64. Low educated cohorts are defined as those with notertiary education.

Figure (6): Employment Shares for Educated Females Across Public Sub-Sectors: 1999-2008, Quarterly.



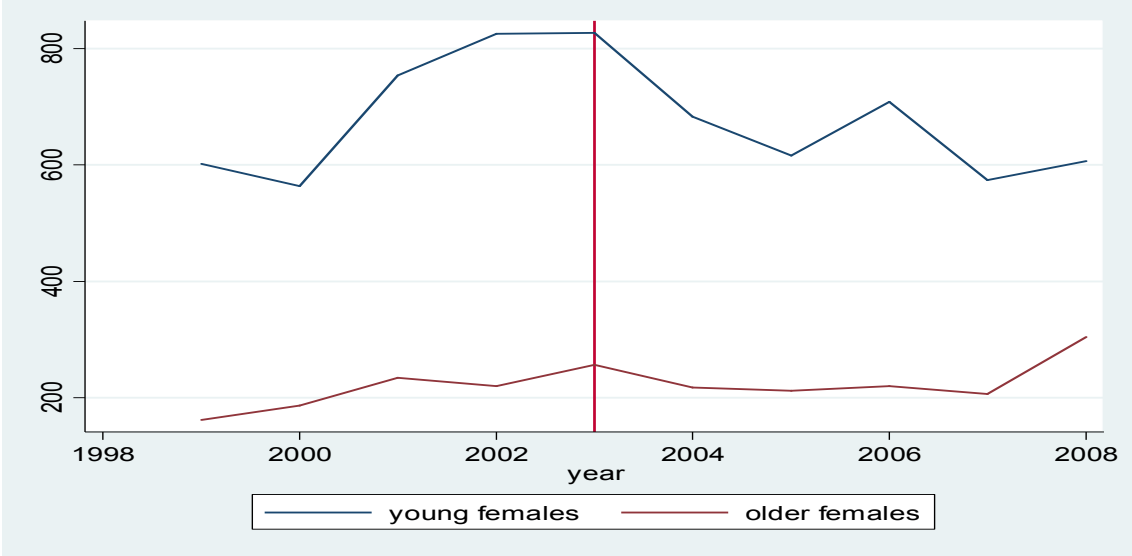
This figure plots overtime changes in share of educated females across public subsectors. Source of data is PCBS's Labor Force Survey, 1999-2008. Young cohort includes individuals with age boundary of 19 and 29,while older cohort includes individuals with age boundary of 30 and 64. Educated cohorts are defined as those with tertiary education.

Figure (7): Total Employment Across Pubic Sub-sectors: 1999-2008, Quarterly.



This figure plots overtime changes in the number of workers across public subsectors. Source of data is PCBS's Labor Force Survey, 1999-2008.

Figure (8): Total Employment in the Public Education Sector: 1999-2008, Quarterly.



This figure plots overtime changes in the number of new public employment jobs for the young and older educated females. Source of data is administrative records from Ministry of Education. Young cohort includes individuals with age boundary of 19 and 29,while older cohort includes individuals with age boundary of 30 and 64. Educated cohorts are defined as those with tertiary education.

Table (1): Descriptive Statistics for Model Variables

Variable	Mean	Std. Dev.	Min	Max
1999 share of educated females in public education	0.61	0.31	0.1	1
1999 share of educated females	0.09	0.06	0.006	0.26
1999 share of educated individuals employed in Services	0.42	0.22	0.03	1

marital Status	percent
Share of Single (never married) educated females	0..28
Share of married educated females	0.67
Others	0.05

Education attainment	percent
Diploma degree	0.40
Bachelor degree	0.57
High diploma	0.005
Master degree	0.027
PhD degree	0.002

Labor force participation	percent
Share of educated females join labor market	0.68

Table (2): Effect Decrease in Public Education on labor force participation for Educated Females

VARIABLES	(1) Parsimonious Model	(2) Full Model	(3) Full Model-By years
Treatment Variable post shock	-0.11*	-0.150***	
	(0.053)	(0.05)	
Treatment Effect- Year by Year			
2000			-0.143
			(0.115)
2001			-0.076
			(0.112)
2002			-0.084
			(0.121)
2003			-0.059
			(0.106)
2004			-0.164
			(0.115)
2005			-0.209**
			(0.100)
2006			-0.334***
			(0.103)
2007			-0.276*
			(0.141)
2008			-0.273**
			(0.121)
2009			-0.129
			(0.129)
2010			-0.200
			(0.130)
2011			-0.189
			(0.131)
2012			-0.222*
			(0.115)
Share of educated females	No	Yes	Yes
Share of educated individuals employed in service sector	No	Yes	Yes
Education attainment	No	Yes	Yes
Age, marital status	No	Yes	Yes
marital status by age	No	Yes	Yes
education attainment by age	No	Yes	Yes
District-Year fixed effects	No	Yes	Yes
Place of Residence-Year fixed effects	No	Yes	Yes
No. of observations	22,373	21,816	20,421
R-squared	0.050	0.225	0.222

The dependent variable is dichotomous taking a value of one if an educated female joins the labor market and zero reported out of labor force. The treatment variable is measured as an interaction between a *period* dummy and a base line (1999) share of educated female employed in public education in a given locality. The share of educated females is measured by interacting the *period* dummy with locality share of educated females in 1999. The share of educated individuals employed in the service sector is measured in the same fashion. Young cohort includes individuals between 19 and 29 years old. Older cohort includes individuals between 30 and 64 years old. Robust standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1

Table (3): Effect of Decrease in Public Education on Labor Force Participation for Educated Females; Young vs. Older Cohorts

VARIABLES	-1- Young	-2- Young	-3- Older	-4- Older
Treatment Variable post shock	-0.23***		-0.041	
	(0.056)		(0.091)	
Treatment Effect- by year				
2000		-0.137		-0.105
		(0.208)		(0.194)
2001		-0.208		0.047
		(0.227)		(0.199)
2002		-0.209		-0.038
		(0.201)		(0.235)
2003		-0.215		-0.005
		(0.181)		(0.176)
2004		-0.281		-0.135
		(0.186)		(0.180)
2005		-0.355**		-0.053
		(0.174)		(0.197)
2006		-0.573***		-0.143
		(0.185)		(0.195)
2007		-0.507**		-0.119
		(0.22)		(0.239)
2008		-0.533***		-0.009
		(0.184)		(0.204)
2009		-0.347*		-0.061
		(0.207)		(0.190)
2010		-0.372*		-0.011
		(0.193)		(0.197)
2011		-0.319*		-0.047
		(0.183)		(0.225)
2012		-0.387**		-0.05
		(0.138)		(0.222)
Share of educated females	Yes	Yes	Yes	Yes
Share of educated individuals employed in service sector	Yes	Yes	Yes	Yes
Education attainment	Yes	Yes	Yes	Yes
Age, marital status	Yes	Yes	Yes	Yes
marital status by age	Yes	Yes	Yes	Yes
education attainment by age	Yes	Yes	Yes	Yes
District-Year fixed effects	Yes	Yes	Yes	Yes
Place of Residence-Year fixed effects	Yes	Yes	Yes	Yes
Observations	7695	7,695	12,399	12,399
R-squared	0.251	0.252	0.220	0.220

The dependent variable is dichotomous taking a value of one if an educated female joins the labor market and zero reported out of labor force. The value of the dependent variable takes zero if an educated female is reported out of labor force. The treatment variable is measured as an interaction between a *period* dummy and a base line (1999) share of educated female employed in public education in a given locality. The share of educated females is measured by interacting the *period* dummy with locality share of educated females in 1999. The share of educated individuals employed in the service sector is measured in the same fashion. Young cohort includes individuals between 19 and 29 years old. Older cohort includes individuals between 30 and 64 years old. Robust standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1

Table (4): Effect of Decrease in Public Education on Labor Force Participation for Educated Females-Potential Mechanism; Young vs. Older Cohorts

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	young educated females				older educated females			
Treatment Variable post shock	-0.382***		-0.198*		-0.068		0.039	
	(0.093)		(0.103)		(0.109)		(0.078)	
Treatment Effect- by year								
2000		-0.356		0.307		-0.115		-0.304
		(0.278)		(0.251)		(0.247)		(0.218)
2001		-0.104		-0.319		0.061		-0.247
		(0.276)		(0.311)		(0.247)		(0.218)
2002		-0.227		-0.214		-0.018		-0.256
		(0.250)		(0.263)		(0.282)		(0.177)
2003		-0.260		0.091		-0.016		0.037
		(0.229)		(0.239)		(0.207)		(0.235)
2004		-0.369		0.017		-0.115		-0.317
		(0.237)		(0.260)		(0.219)		(0.191)
2005		-0.476*		-0.099		-0.072		-0.005
		(0.262)		(0.216)		(0.228)		(0.278)
2006		-0.857***		-0.361		-0.218		-0.108
		(0.235)		(0.241)		(0.238)		(0.264)
2007		-0.962***		-0.223		-0.163		-0.177
		(0.252)		(0.286)		(0.280)		(0.284)
2008		-0.747***		-0.300		0.002		-0.189
		(0.237)		(0.245)		(0.248)		(0.240)
2009		-0.458*		-0.230		0.046		-0.006
		(0.250)		(0.264)		(0.240)		(0.190)
2010		-0.479*		-0.239		-0.028		0.050
		(0.259)		(0.222)		(0.247)		(0.204)
2011		-0.534**		-0.155		-0.061		-0.118
		(0.247)		(0.228)		(0.288)		(0.187)
2012		-0.318		-0.297		-0.137		-0.099
		(0.240)		(0.239)		(0.299)		(0.232)
Share of educated females	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Share of educated individuals employed in service sector	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Education attainment	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Age, marital status	Yes	Yes	Yes	Yes	Yes	Yes		Yes
marital status by age	Yes	Yes	Yes	Yes	Yes	Yes		Yes
education attainment by age	Yes	Yes	Yes	Yes	Yes	Yes		Yes
District-Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Place of Residence-Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Observations	5,119	5,119	4,411	4,411	11,265	11,265	5309	5,309
R-squared	0.309	0.312	0.347	0.349	0.230	0.231	0.326	0.328

The dependent variables in Column (1), (2), (5), and (6) is dichotomous taking a value of 1 if an educated female is employed and zero if out of labor force. The dependent variables in Column (3), (4), (7), and (8) is dichotomous taking a value if educated female is unemployed and zero if out of labor force. The treatment variable is measured as an interaction between a *period* dummy and a base line (1999) share of educated female employed in public education in a given locality. The share of educated females is measured by interacting the *period* dummy with locality share of educated females in 1999. The share of educated individuals employed in the service sector is measured in the same fashion. Young cohort includes individuals between 19 and 29 years old. Older cohort includes individuals between 30 and 64 years old. Robust standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1

Table (5): Effect of Employment Decline in Public Education on Commuting for Educated Females; Young vs. Older Cohorts

VARIABLES	(1) young	(2) young	(3) Older	(4) Older
Treatment Variable post shock	-0.140		-0.148	
	(0.144)		(0.095)	
Treatment Effect- by year				
2001		0.075		0.111
		(0.218)		(0.184)
2002		-0.198		0.484***
		(0.352)		(0.169)
2003		-0.497		0.112
		(0.353)		(0.247)
2004		-0.442		-0.248
		(0.333)		(0.226)
2005		-0.637*		-0.330
		(0.333)		(0.204)
2006		-0.812**		0.262
		(0.321)		(0.192)
2007		-0.461		0.166
		(0.323)		(0.183)
2008		-0.763**		-0.003
		(0.332)		(0.177)
2009		-0.080		0.249
		(0.257)		(0.203)
2010		-0.198		0.195
		(0.221)		(0.214)
2011		-0.192		0.222
		(0.260)		(0.214)
2012		0.097		0.233
		(0.254)		(0.219)
Share of educated females	Yes	Yes	Yes	Yes
Share of educated individuals employed in service sector	Yes	Yes	Yes	Yes
Type of Industry and type of employment	Yes	Yes	Yes	Yes
Education attainment	Yes	Yes	Yes	Yes
Age, marital status	Yes	Yes	Yes	Yes
marital status by age	Yes	Yes	Yes	Yes
education attainment by age	Yes	Yes	Yes	Yes
District-Year fixed effects	Yes	Yes	Yes	Yes
Place of Residence-Year fixed effects	Yes	Yes	Yes	Yes
Observations	2,705	2,705	6,050	6,050
R-squared	0.514	0.524	0.586	0.589

The dependent variable is dichotomous taking a value of one if an educated female joins the labor market and zero reported out of labor force. The treatment variable is measured as an interaction between a *period* dummy and a base line (1999) share of educated female employed in public education in a given locality. The share of educated females is measured by interacting the *period* dummy with locality share of educated females in 1999. The share of educated individuals employed in the service sector is measured in the same fashion. Young cohort includes individuals between 19 and 29 years old. Older cohort includes individuals between 30 and 64 years old. Robust standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.

Table (6): The Effect on Probability of Being Employed in the Public Education

VARIABLES	(1)	(2)
pub_empsh99tr	-0.610***	
	(0.089)	
Treatment Effect- Year by Year		
2000		0.015
		(0.252)
2001		0.067
		(0.222)
2002		-0.159
		(0.245)
2003		-0.230
		(0.264)
2004		-0.729**
		(0.309)
2005		-0.896***
		(0.327)
2006		-0.581**
		(0.265)
2007		-0.505*
		(0.280)
2008		-0.417*
		(0.228)
2009		-0.641***
		(0.213)
2010		-0.920***
		(0.267)
2011		-0.465*
		(0.265)
2012		-1.225***
		(0.273)
Share of educated females	Yes	Yes
Share of educated individuals employed in service sector	Yes	Yes
Education attainment	Yes	Yes
Age, marital status	Yes	Yes
marital status by age	Yes	Yes
education attainment by age	Yes	Yes
District-Year fixed effects	Yes	Yes
Place of Residence-Year fixed effects	Yes	Yes
No. of observations	3,284	3,284
R-squared	0.346	0.350

The dependent variable is dichotomous taking a value of one if an educated individual is employed in the public education sector and zero reported if employed else where. The treatment variable is measured as an interaction between a *period* dummy and a base line (1999) share of educated female employed in public education in a given locality. The share of educated females is measured by interacting the *period* dummy with locality share of educated females in 1999. The share of educated individuals employed in the service sector is measured in the same fashion.. Robust standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1

Table (7): Effect Decrease in Public Education on Labor Force Participation for Low Educated Cohorts-Placebo Tests

VARIABLES	-1- Young Females	-2- Young females	-3- Older females	-4- Older females	-5- Young males	-6- Young males	-7- Older males	-8- Older Males
Treatment Variable post shock	-0.024		-0.008		-0.032		0.035	
	(0.018)		(0.013)		(0.036)		(0.038)	
Treatment Effect- Year by Year								
2000		-0.032		-0.057***		0.036		0.055
		(0.035)		(0.018)		(0.075)		(0.058)
2001		-0.007		-0.069***		0.016		0.061
		(0.042)		(0.02)		(0.069)		(0.059)
2002		0.009		0.018		0.125		0.206***
		(0.062)		(0.037)		(0.097)		(0.063)
2003		-0.01		0.009		0.111		0.118**
		(0.061)		(0.038)		(0.074)		(0.055)
2004		-0.015		0.035		0.149		0.084
		(0.06)		(0.030)		(0.093)		(0.091)
2005		-0.013		-0.058*		-0.056		0.133*
		(0.051)		(0.030)		(0.075)		(0.071)
2006		-0.033		-0.010		0.0005		0.200***
		(0.036)		(0.030)		(0.070)		(0.065)
2007		-0.051		-0.010		-0.070		0.186**
		(0.052)		(0.030)		(0.092)		(0.075)
2008		-0.047		-0.053*		-0.053		0.042
		(0.050)		(0.028)		(0.113)		(0.075)
2009		-0.064		-0.081***		0.149		0.150**
		(0.064)		(0.023)		(0.086)		(0.063)
2010		-0.027		-0.032		0.098		0.135**
		(0.057)		(0.029)		(0.084)		(0.056)
2011		-0.037		-0.039		0.064		0.106*
		-0.015		(0.033)		(0.083)		(0.061)
2012		-0.031		0.077**		0.082		0.168**
Share of educated females		(0.056)		(0.033)		(0.087)		(0.078)
Share of educated individuals	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
employed in the service sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education attainment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age, marital status	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
marital status by age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
education attainment by age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Place of Residence- Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,503	27,503	60,341	60,341	22,158	22,158	29,529	29,529
R-squared	0.168	0.168	0.142	0.142	0.149	0.151	0.311	0.204

The dependent variable is dichotomous taking a value of one if an educated female joins the labor market and zero reported out of labor force. The treatment variable is measured as an interaction between a *period* dummy and a base line (1999) share of educated female employed in public education in a given locality. The share of educated females is measured by interacting the *period* dummy with locality share of educated females in 1999. The share of educated individuals employed in the service sector is measured in the same fashion. Young cohort includes individuals between 19 and 29 years old. Older cohort includes individuals between 30 and 64 years old. Robust standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1.