WAGE RETURNS TO DIFFERENT LEVELS OF SCHOOLING IN TURKEY

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DECLARATION OF ORIGINALITY

I, Özgen Kıribrahim Sarıkaya, certify that

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Date 15.10.2020

ABSTRACT

Wage Returns to Different Levels of Schooling in Turkey

In this paper, I estimate the returns to the different levels of educational attainment, such as completing at least middle school, at least high school, and college for men and women in Turkey by using a fuzzy regression discontinuity design. I exploit the 1997 reform in which extended compulsory schooling from 5 to 8 years in Turkey as a source of exogenous variation in schooling across birth cohorts. My main finding is that the returns to schooling are increasing for higher levels of education. I estimate that the returns to completing different levels of schooling are higher for women than for men. The estimated average causal effects for completing at least high school and college are statistically significant if the sample excludes the birth cohorts 1986-1987 in which there is a fuzziness in the treatment. The possible reasons for higher returns for women than for men are the policy pushes a higher fraction of men to complete middle school and high school whereas pushes a higher fraction of women to complete college, and the rate of women who have a college degree is higher than the rate of college graduates among men in the labor market.

ÖZET

Türkiye'de Farklı Seviyelerde Eğitime Katılımın Maaşlar Üzerindeki Etkisi

Bu çalışmada bulanık regresyon süreksizlik tasarımını kullanarak Türkiye'deki erkekler ve kadınlar için en az ortaokul, lise ve üniversite gibi farklı eğitim seviyelerini tamamlamanın maaşlar üzerindeki etkisi tahmin edilmiştir. Temel olarak Türkiye'de zorunlu eğitimi 5 yıldan 8 yıla çıkaran 1997 tarihli eğitim reformunun kuşakların eğitim seviyelerine katılımında yarattığı dışsal varyasyondan yararlanılmıştır. Çalışmanın temel bulgularından biri eğitim düzeyi arttıkça ücretler üzerindeki getirisinin hem erkekler hem de kadınlar için artmasıdır. Bununla birlikte farklı eğitim seviyelerini tamamlamanın ücretler açısından getirisinin kadınlar için erkeklerden daha yüksek olduğu bulunmuştur. Kadınlar için getirinin erkeklerden daha yüksek olmasının muhtemel nedeni, politikanın erkeklerin daha büyük bir bölümünü ortaokul ve liseyi tamamlamaya iterken kadınların daha büyük bir kısmını üniversite mezunu olmaya itmesidir. Bununla birlikte, iş gücü piyasasında üniversite diplomasına sahip kadınların oranı erkekler arasında üniversite mezunu olanların oranından daha yüksektir.

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CHAPTER 1

INTRODUCTION

Few papers are focusing on the return to schooling in developing countries. Afterthe implementation of the 1997 education reform that extends the compulsory schooling from 5 to 8 years, there has been a growing interest in the causal effects of education on individual outcomes such as labor outcomes, health conditions, marriage, and fertility in Turkey. This paper contributes to this growing literature by studying the returns to different educational attainment levels, such as completing at least middle school, high school, or college on earnings for both men and women in Turkey and exploiting an exogenous variation in schooling across birth cohorts because of the reform.

In 1997, the Basic Education Law was enacted very quickly and unexpectedly, mostly because of the political developments in Turkey and affected the students who would start fifth grade or lower grade in September 1997. The reform induced an exogenous and large jump in the educational attainment of birth cohorts affected by the policy. The identification strategy of this analysis depends on the comparison of the birth cohorts who are treated by the reform with those who are not. Since the treatment assignment was not a deterministic function of the forcing variable, birth cohorts, I use a fuzzy regression discontinuity design that uses the forcing variable as an instrument. I define a binary variable for the policy that equals one if the birth cohort is greater than 1986, 0 otherwise. Also, three different sub sample specifications gradually zoom around the cut off to check the robustness of the results. The result is interpreted within the Local Average

Treatment Effect framework of J. D. Angrist and Imbens (1994).

The data set includes observations from the 2004-2018 Turkish Household Labor Force Survey. Since there is no variation in the policy indicator variable in the same birth cohorts, I apply the wild-cluster bootstrap approach to deal with the few cluster issue. (Cameron et al., 2008) I find that the returns to higher levels of educational attainment are increasing for both men and women. Also, the returns to each level of educational attainment are higher for women than those for men. The reason for higher returns for women might be that the fraction of women who complete higher school in the sample is higher than the rate of men and the policy pushes a higher fraction of men to complete middle school and high school, whereas it pushes a higher fraction of women to complete college. Besides, the results are only for the compliers who change their behavior due to the policy. Aydemir and Kirdar (2017) also report that the higher return of an additional year of schooling for women and Torun (2018) estimates that women in the labor market moved into higher skill and formal sector jobs.

In the next section, I review the related literature and the 1997 compulsory school law in Turkey. Chapter 3 describes the data and the key variables used in this paper. I will discuss the empirical strategy in chapter 4 and presents the results in chapter 5. Chapter 6 concludes.

CHAPTER 2

BACKGROUND AND RELATED LITERATURE

Several studies examine the returns to schooling on earnings. The part of the literature uses the institutional changes that cause exogenous variation in schooling to estimate the causal effect of education on earnings consistently. One of the institutional changes is a reform in compulsory schooling laws.[1]

In the developed country context, there are several studies that estimate the rate of returns to schooling by using changes in compulsory schooling laws as an instrument for educational attainment to solve the endogeneity problem. For instance, Harmon and Walker (1995) and Oreopoulos (2006) compare the birth cohorts are affected by changes in the minimum school exit age with those who are not affected by the reform to estimate returns to schooling in the UK and Ireland. Also, Devereux and Hart (2010) report much smaller returns on earnings in Britain. For the US, while Acemoglu and Angrist (2000) estimate that the rate of return to the schooling is 10%, J. D. Angrist and Krueger (1991) find around 8% returns to one more year of schooling by using quarter of birth as an instrument and the policy change of the minimum school exit age. Aakvik et al. (2010) find returns to schooling of 10% in Norway. Spohr (2003) examines the impact of the 1968 reform in Taiwan. On the other hand, several papers report smaller returns to schooling such as Grenet (2013), that the return to compulsory schooling reforms on earnings is insignificant and close to zero in France. Likewise, Pischke and

[1] There are alternative policy changes that cause exogenous variation used in the literature, for instance Duflo (2001) uses a major school construction policy in Indonesia.

von Wachter (2008) report that the education reform has increased educational attainment but that the return of one more year schooling is insignificant and close to zero in Germany.

The studies in Turkey contributes to the developing country context in the literature. Many recent studies estimate the returns to schooling or the causal effect of education on different individual outcomes such as labor market outcomes, health, and political behavior using the 1997 reform as an instrument. For instance, Kırdar et al. (2018) estimate the effect of the education reform on marriage and birth outcomes of teenage women in Turkey, and they found that the increased compulsory schooling years reduce the probability of teenage marriage by age 16 and first-births by age 17 substantially. Bahadır et al. (2018) examine the impact of education on health indicators and smoking among young adults and found that one more year of schooling does not have a significant effect.[2] Torun (2018) estimates the causal impact of compulsory schooling on labor market outcomes. In addition, Aydemir and Kirdar (2017) estimate return to schooling for young men and women in Turkey using the 1997 reform as an instrument. In this study, they design a fuzzy regression discontinuity model which uses the exogenous variation in schooling across birth cohorts caused by the reform. They found that the return of an additional year of schooling is about 7-8% for women and is around 2-2.5% for men, but this is statistically insignificant. This paper is closely related to the study by Aydemir and Kirdar (2017).

Before the 1997 reform, the 5-year primary school was mandatory. After completing 5 grade students could continue education by choosing either a 3-year middle school or

[2] Baltagi et.al. (2019) also analyze the relationship between education and health outcomes.

3-year vocational middle school voluntarily. In August 1997, the Turkish Parliament implemented the Basic Education Law, which extended compulsory schooling from 5 to 8 years. The political developments in Turkey caused the quick pass of the 1997 reform, and it affected the students who had finished the fourth grade or a lower grade nationwide at that time. Since the main reason was political concerns, the timing of the reform was not related to the macroeconomic developments in Turkey. However, one of the main concerns is the quality of education. As stated in the previous studies,[3] the Ministry of Education started to construct new schools, hire new teachers, schedule bus services for students, etc. to provide that students affected by the reform will continue school without a decline in the quality.

The reform required to students who will complete the fifth grade at the end of the 1997-1998 academic year to continue until complete the middle school, 8th grade. In Turkey, children who are are 72 months old by the end of the calendar year usually start school in the academic year. Considering the school start age, the first birth cohort affected by the reform is who were born after September 1986, and children born before September 1986 were exempt from the law's requirement. Before the year the reform implemented, the rate to grades 1-5 was 89.4 %, whereas the enrollment rate to grades 6-8 was 52.8%. (Aydemir & Kirdar, 2017)

The next three figures present the fraction of completing the different levels of educational attainment. The sample comes from the 2004-2018 Turkish Household Labor Force Survey. Figure 1 shows the fraction of students who complete middle school by birth year for men and women. In both panels, the sample is restricted to

[3] See Kırdar et al. (2018), Dulgere (2004).

individuals who are 17 years old or older. In Figure 2, the fraction of individuals who complete high school is presented, and the sample is limited to individuals who are 20 years old or older. Finally, Figure 3 displays the rate of individuals who complete college and are 24 years old or older. The main difference between panel (A) and panel (B) in all figures is that panel (A) uses all data points whereas panel (B) shows the result with donut hole in which excludes 1986 and 1987 birth cohorts around the cutoff because of the imperfect compliance with the reform in these birth cohorts. The drawback of using donut hole around the cutoff is the extrapolation of the polynomials within donut hole until the cutoff.

According to Figure 1, there is a large jump around the cutoff, even in panel (A). For women, the rate is above 50% before the cutoff, whereas it is slightly above 70% right after the cutoff. The rate jumps from about 75% to almost 90% for men. For both genders, the trends for completing middle school are different before and after the cutoff. Even though the trends for women and men are parallel before the cutoff, the trend for women is steeper than for men after the cutoff.

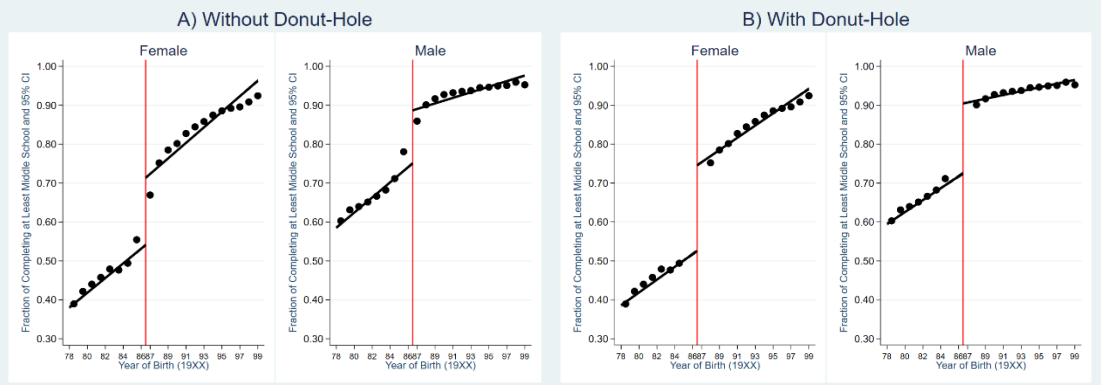

Figure 1. Fraction of completing at least middle school (grade 8)

Notes: The sample consists of individuals who are 17 years old or older from 2004-2018 THLFS. Panel (B) excludes the 1986 and 1987 birth cohorts. Separate linear polynomials are fitted on before and after the cutoff.

As Figure 2 shows, the policy has spillover effects on the fraction of high school completion for both genders. The effects are clearer in panel (B), which excludes the birth cohorts with fuzziness in the treatment. However, the trend after cutoff indicates that the fraction of women who complete high school is increasing sharply though the slope of the trend for men is decreasing.

Even though the discontinuities are not apparent between the 1986 and 1987 birth cohorts for both genders in panel (A) of Figure 3, panel (B) indicates the policy has a small spillover effect the fraction of completing college for women but not a significant effect for men. Besides, the slope of the fitted line after the cutoff has a higher slope than the one before the cutoff for women. Hence, the policy affects not only the rate of completing middle school but also affects the fraction of individuals who complete higher educational attainment.

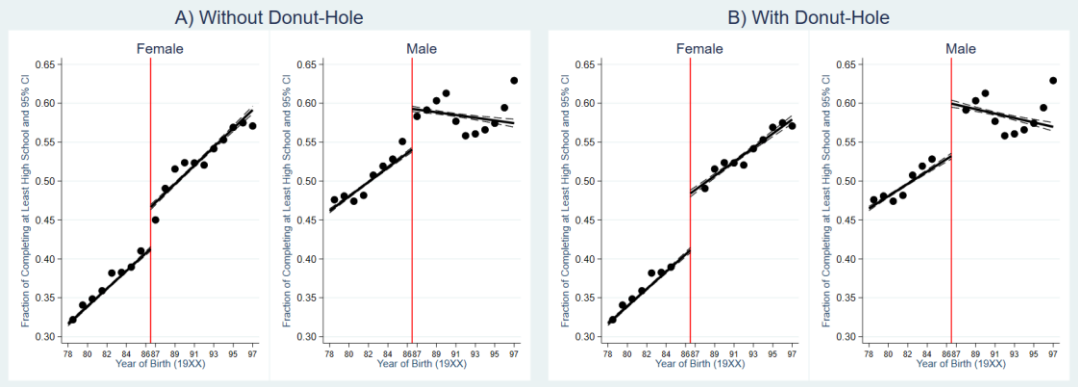

Figure 2: Fraction of completing at least high school

Notes: The sample consists of individuals who are 20 years old or older from 2004-2018 THLFS. Panel (B) excludes the 1986 and 1987 birth cohorts. Separate linear polynomials are fitted on before and after the cutoff.

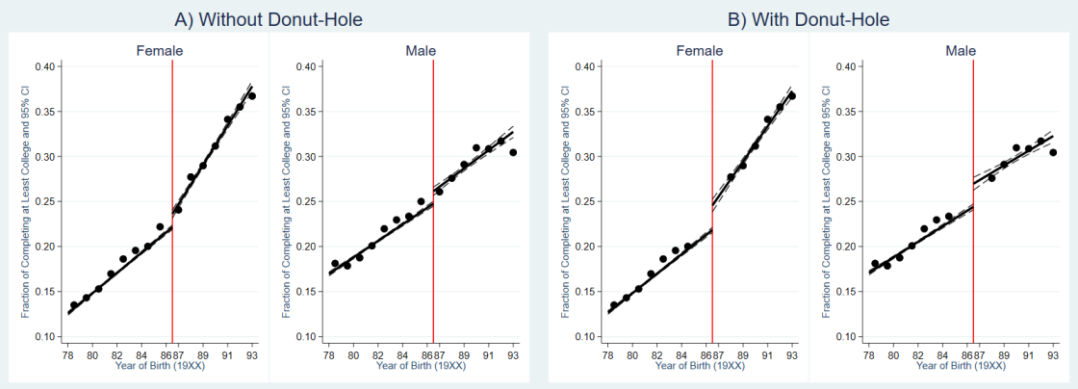

Figure 3: Fraction of completing college

Notes: The sample consists of individuals who are 24 years old or older from 2004-2018 THLFS. Panel (B) excludes the 1986 and 1987 birth cohorts. Separate linear polynomials are fitted on before and after the cutoff.

CHAPTER 3

DATA AND DESCRIPTIVE STATISTICS

The main data sources for all the analyses in this paper are the Turkish Household Labor Force Survey (HLFS) micro-level data sets compiled and published by the Turkish Statistical Institute (TURKSTAT). The design of the data is repeated cross-sectional surveys with no panel dimension and is at NUTS-2 level.[4] I employ all available data from 2004 to 2018 to capture any trend behavior rather than focus on particular years. The data starts from 2004 since the format of the data changes after that date. I also do not limit the data to the specific regions; instead, apply the methodology to every region in Turkey. The data provides detailed information about the individuals' social and demographic characteristics such as the age, year of birth, and the highest level of educational attainment as well as information about the labor market outcomes, including hours of work for reference week, whether the job is permanent or temporary, and earnings of individuals during the past month, including bonus payments and premiums. [5]

The sample is restricted to individuals with a permanent job which is reasonable because the fraction of workers who have a permanent job is about 89% for men and about 91% for women. I also trim the top 1% and bottom 1% of the hours of work distribution to exclude workers with fewer than 20 hours and more than 84 hours during the reference week. Since I include college graduates in my primary sample, I limit the

[4]See Appendix A for a detailed description of NUTS-2 regions in Turkey
[5]See Appendix B for a detailed descriptive statistic.

sample to individuals who are at least 24 years old in the survey year in order to avoid excluding individuals who are still attending college. Moreover, the non-treated individuals are on average older than the treated individuals. Since the year of birth of the first treated cohort is 1987, the sample is restricted to individuals who are 31 years old or younger to balance the characteristics of the treated and the control groups. [6] The sample is restricted to wage and salary earners only because the data set does not include information self-employed individuals' earnings. I also trim the top 2.5% and bottom 2.5% of the wage distribution to exclude outlier observations.

The main measure of earning for all analyses in this study is earning per hour. The reason is that there are two sources of the variation of monthly earnings across workers, such as the number of hours they work in a month and the differences in the hourly earnings. In addition, the number of hours workers work in a month could differ across educational groups since the workers who have higher educational attainment level may be more likely to be employed at a given time or more likely to work for longer hours (Card (1999)). I compute the hourly wages by using the information on monthly income and hours of work (monthly income/(weekly hours*4.3)), and the dependent variable in this study is the log hourly wages. Moreover, wages are adjusted for inflation by taking 2004 as a base year.

[6] See Appendix B for the birth cohorts affected by the reform.

CHAPTER 4

EMPIRICAL STRATEGY

In this section, I describe the identification strategy and econometric specifications that this paper based on. My aim is to establish a causal link between the level of educational attainment and wages for both women and men. The endogeneity of schooling could result from omitted variables such as ability, and motivation is the main problem to establish the link. To address this problem, a regression discontinuity design is implemented to compare the level of educational attainment and earnings of individuals who are affected by the reform with those of individuals who are not affected.

As Figure 1 indicates, there is imperfect compliance with the compulsory education reform. Even though there is a jump at the cutoff after implementation of the education reform, the fraction of individuals who complete middle school converges to one in the later years. There could be two possible explanations for imperfect compliance. The first one is that the reform could be implemented in the following years in some urban areas and may lead to some student who are born in a year after December 1986 are not affected by the reform. Secondly, there could be some children who are born after 1986, but they start school earlier than the usual school age so that they would not be affected by the reform.(Aydemir & Kirdar, 2017) Moreover, the imperfect compliance with the reform causes fuzziness around the cutoff point, as shown in Figure 1. There could be a difference between individuals affected by the reform and increase the level of educational attainment and individuals who are not treated because of the imperfect compliance and do not change the level of educational attainment in terms of

unobserved characteristics. The fuzzy regression discontinuity design is intended for solving this potential problem by using the education reform as the instrumental variable. (Aydemir & Kirdar, 2017) Since the government implemented the policy in all regions of, the assumption that the instrumental variable is randomly assigned is satisfied.

Since estimating the treatment effect using two-stage least squares is equivalent to using the fuzzy regression discontinuity design(Hahn et al. (2001)), I used the following first stage equation to estimate the impact of the 1997 reform of compulsory schooling on the different level of educational attainment for both women and men

$$s_i = \alpha_0 + \alpha_1 D_i + \beta_1 x_{i1} + \beta_2 x_{i2} + X_i^J \Theta + \mu_i \qquad (4.1)$$

where s_i is an indicator variable for whether individual *i* complete the at least interested level of education such as middle school, high school, or college, D is a binary variable for the policy, X^J is a vector of individual-covariates which includes dummies for each survey year and dummies for NUTS-2 level regions. I allow that time trends differ before and after the cutoff, x_{i1} controls for time trends before the cutoff x_{i2} controls for time trends after the cutoff by using the year of birth of individual i, which is the assignment variable. [7]The second stage equation is

$$logw_i = \beta_0 + \gamma s_i + \beta_1 x_{i1} + \beta_2 x_{i2} + X_i^J \Theta + \nu_i \qquad (4.2)$$

where *w* denotes the hourly wage rate. The main parameter of interest, γ, captures the percent change on wages when individual i completed the at least interested level of educational attainment.

[7] x_{ij} is the first order polynomial function of the year of birth.i.e. x_{ij} = (yearofbirth – 1986.5)*d_{ij} where j={1,2}, d_{i1} = 1 if year of birth ≤ 1987, zero otherwise, and d_{i2} = 1 if year of birth ≥ 1986, zero otherwise.

I used three different time windows of birth cohorts to estimate equations (4.1) and (4.2). Since the sample is restricted to individuals at least 24 years old in the survey year, which are between 2004-2018 in the data set, the latest birth cohort in the sample is 1994. So, there are eight birth cohorts after the cutoff, which are between 1987-1994. Hence, I take eight birth cohorts before the cutoff between 1979-1986, so these birth cohorts consist of the first subsample. I also define two more subsamples by reducing the number of birth cohorts one by one both before and after the cutoff to zoom in around the cutoff, so one of the samples consists of the 1980-1993 time interval and includes seven birth cohorts on either side of the cutoff, and the other sample contains the 1981-1992 time interval which has six birth cohorts on either side. Moreover, since there is fuzziness around the cutoff, I also estimate the equations (4.1) and (4.2) with donut hole in which I drop the birth cohorts 1986 and 1987 from the sub samples. Thus, the narrowest time interval has ten birth cohorts with donut hole.

Because of the group structure of the error terms, I allow standard errors to be correlated within the year of birth level. (Moultan, 1986) However, the clustered standard errors still might be problematic since the broadest time interval has sixteen clusters in my sample. Hence, I use the wild cluster bootstrap approach in order to deal with the few cluster issue. (Cameron et al., 2008) In addition, the sample is weighted in the estimation of both equations by a probability weight using the sampling weights that are included with the survey data sets.

Finally, since I apply two stage least-squares method to estimate the causal effect, we need to check the assumptions of excludability besides the random assignment. [8] The

[8] The other assumption is monotonicity in LATE framework. (J. D. Angrist & Imbens, 1994)

assumption of excludability states that the educational reform as an instrument not to be correlated with wages through other channels beyond educational attainment. Firstly, the timing of the reform which is not the result of macroeconomic developments is independent of wages, as I discussed earlier. Second of all, the year of birth cannot be controlled by individuals, so it is uncorrelated with unobservable characteristics. Also, in Appendix C, I report the result of the policy effect on labor outcomes, and the estimated effects are not statistically significant on employment and wage employment outcomes.

CHAPTER 5
RESULTS AND DISCUSSION

This section displays and examines the estimated effect of the policy on completing the different levels of schooling and the estimated effect of the different levels of educational attainment on wages and discuss these results.

First of all, the validity of the instrument requires that it does not directly affect the wages, only indirectly through the treatment variable. The main concern is that the education reform might also affect individuals' employment status, which affects the distribution of observed wages. (Aydemir & Kirdar, 2017) To address this subject, I estimate the effect of the policy on employment status by using the equation (4.1). In this case, the dependent variable is a binary variable for interested labor outcomes. Table C[9] presents the result of the policy effect on related labor outcomes such as employment, wage employment, and having a permanent job. The sample is restricted to age groups 24 and 31 in 2004-2018 HLFS. The results are reported for employment in panel (A), for wage employment in panel (B) and for a permanent job in panel (C). Panel A includes all types of employment, such as wage workers and self-employment. Hence, the policy has no significant effect on employment and wage employment for women, but the probability of having a permanent job increases 1.3 percentage points in panel (C), which is statistically significant at 1% level. For men, the policy effect on the probability of employment is about 1 percentage point and is statistically significant at 10% level, and it has only a small negative impact on the likelihood of having a permanent job.

[9] See Appendix C

5.1 First stage results

In this section, I present the estimated effect of the policy on the different levels of educational attainment for women and men separately. Table 1 reports the first-stage results for men and women using different time windows with and without donut hole.

Panel (A) shows that the policy raised the fraction of individuals who complete middle school by about 5.7 percentage points for women and about 9.8 percentage points for men without donut hole. Moreover, the effect is higher for both women, around 9.2-9.7 percentage points, and for men, roughly 14.8-15.8 percentage points when I exclude the birth cohorts 1986 and 1987. The results indicate that the instrument is highly relevant for completing middle school. When I compare the estimates, the effect is higher for men than for women. The reason could be that the women who participate labor force and are wage workers in the sample have more likely the higher education level than wage workers among men in the sample as shown in Table B1 (Appendix B); hence completing middle school is less likely to change with the reform for women.[10]

Panel (B) reports that the policy effect on the rate of individuals who complete high school for women and men separately. The coefficients are small for women, about 2.6 percentage points and the statistical significance level is low without the bubble around the cutoff. The statistical significance of estimation for the 1980-1993 time interval and the 1979-1994 time interval are at 10% level. When I estimate the result by excluding the birth cohorts 1986 and 1987, the effect is about 6 percentage points and statistically

[10] Dayioglu and Kirdar (2009) shows that the probability of having higher levels of education is more likely for wage earners among women than among men.

significant at 1% level. Moreover, the calculated wild bootstrap p-values are consistent with the results of the clustered standard errors. For men, the estimation is around 3.8-4.7 percentage points without donut hole and is about 7 percentage points with donut hole. All results for men are statistically significant at 1% level.

Panel (C) presents that the estimation of policy effect on the fraction of students who complete college. The results for the samples in which includes the birth cohorts 1986 and 1987 are not statistically significant for both men and women. However, when I estimate the effect of reform on the fraction of completing college for the samples with donut hole, the results for women is around 4.5 percentage points and statistically significant at 5% level, however the estimated effect for men is around 1.9-3.2 percentage points and statistically significant at 10% level. Besides, the p-values calculated with the wild bootstrap approach are only consistent with the significance level for the 1979-1994 birth cohorts.

In other words, the instrument is highly relevant to completing middle school for both men and women. Moreover, the educational reform is relevant to completing high school for men and has a small effect on the rate of male wage earners who complete college if the sample excludes the birth cohorts 1986 and 1987. For women who wage earners, the relevance assumption holds for higher levels of educational attainment if the sample has the bubble around the cutoff. Therefore, the policy pushes a higher fraction of men to complete middle school and high school, whereas pushes a higher fraction of women to complete college. The reason is that the higher rate of female wage earners has a college degree compared to male wage earners. Thus, the rate of compliers persuaded by the policy to complete college is higher among women, whereas the rate of

male wage earners who have middle or high school degrees is higher compared to the rate of those among female wage earners.

Table 1. First Stage Results

	Without Donut Hole			With Donut Hole	
	Female	Male		Female	Male
Birth Cohorts in Sample			Birth Cohorts in Sample		
(1)	(2)	(3)	(4)	(5)	(6)
A) Policy Effect on Completing Middle School					
1981-1986, 1987-1992	0.055***	0.085***	1981-1985, 1988-1992	0.097***	0.148***
	(0.016)	(0.025)		(0.008)	(0.011)
Wild Bootstrap p-value	0.003	0.004	Wild Bootstrap p-value	0.007	0.010
# of Observations	60,486	148,087	# of Observations	48,477	118,555
1980-1986, 1987-1993	0.057***	0.098***	1980-1985, 1988-1993	0.093***	0.158***
	(0.015)	(0.026)		(0.005)	(0.013)
Wild Bootstrap p-value	0.004	0.002	Wild Bootstrap p-value	0.002	0.000
# of Observations	67,248	166,654	# of Observations	55,239	137,122
1979-1986, 1987-1994	0.059***	0.101***	1979-1985, 1988-1994	0.092***	0.156***
	(0.015)	(0.025)		(0.004)	(0.011)
Wild Bootstrap p-value	0.002	0.000	Wild Bootstrap p-value	0.000	0.000
# of Observations	72,254	181,092	# of Observations	60,245	151,560
B) Policy Effect on Completing High School					
1981-1986, 1987-1992	0.025	0.038**	1981-1985, 1988-1992	0.065***	0.074***
	(0.015)	(0.013)		(0.018)	(0.013)
Wild Bootstrap p-value	0.103	0.009	Wild Bootstrap p-value	0.040	0.018
# of Observations	60,486	148,087	# of Observations	48,477	118,555
1980-1986, 1987-1993	0.026*	0.043***	1980-1985, 1988-1993	0.060***	0.077***
	(0.014)	(0.013)		(0.014)	(0.012)
Wild Bootstrap p-value	0.076	0.001	Wild Bootstrap p-value	0.034	0.003
# of Observations	67,248	166,654	# of Observations	55,239	137,122
1979-1986, 1987-1994	0.028*	0.047***	1979-1985, 1988-1994	0.060***	0.081***
	(0.014)	(0.013)		(0.013)	(0.012)
Wild Bootstrap p-value	0.077	0.002	Wild Bootstrap p-value	0.022	0.002
# of Observations	72,254	181,092	# of Observations	60,245	151,560
C) Policy Effect on Completing College					
1981-1986, 1987-1992	0.008	0.003	1981-1985, 1988-1992	0.046**	0.019*
	(0.017)	(0.007)		(0.017)	(0.009)
Wild Bootstrap p-value	0.669	0.770	Wild Bootstrap p-value	0.193	0.309
# of Observations	60,486	148,087	# of Observations	48,477	118,555
1980-1986, 1987-1993	0.010	0.005	1980-1985, 1988-1993	0.042**	0.023*
	(0.016)	(0.008)		(0.016)	(0.010)
Wild Bootstrap p-value	0.585	0.584	Wild Bootstrap p-value	0.104	0.185
# of Observations	67,248	166,654	# of Observations	55,239	137,122
1979-1986, 1987-1994	0.014	0.011	1979-1985, 1988-1994	0.047***	0.032**
	(0.016)	(0.010)		(0.014)	(0.013)
Wild Bootstrap p-value	0.483	0.370	Wild Bootstrap p-value	0.027	0.053
# of Observations	72,254	181,092	# of Observations	60,245	151,560

Note: The sample includes observations from 2004-2018 Turkish Household Labor Force Surveys and is restricted to the age group 24-31. In each panel, I use alternative bandwidths gradually zooming in around the cutoff. The policy dummy is one when the year of birth is greater 1987. Each cell comes from a separate regression (4.1) of the specified level of educational attainment on the policy dummy, controls include split linear time trends on either side of the cutoff, survey year dummies, and NUTS-2 level region dummies. The restricted sample is weighted by survey year weights. The first row in each segment corresponds to the main parameter of interest, α_1. The values in parentheses are clustered standard errors at the year-of-birth level. The third row shows the p-values calculated using wild-cluster bootstrap estimation of Cameron et al (2008). The fourth row shows the number of observations. ***, **, and * refer to 1%, 5%, and 10% significance levels, respectively

5.2 Second stage results

Table 2 reports the estimated results for returns to the different levels of educational attainment by gender for the three-time intervals with and without donut hole defined as in chapter 4. The table also presents the clustered standard errors at the year of birth level and wild cluster bootstrap p-value estimations.

I will start with Panel (A) which shows the returns of at least completing middle school on wages. The compliers include individuals induced to complete at least middle school with the policy but who would otherwise only complete primary school or any grade level from 0 to 7. However, the estimated returns of at least completing middle school on wages are only statistically significant for the widest time window for both men and women if the sample includes the birth cohorts 1986-1987. In this case, the estimated return is about 29% for women and approximately 7% for men. On the other hand, the returns of at least completing middle school on wages are around 39-43% for women, and 8.7-11% for men in the samples with donut hole. The results are statistically significant for both gender and the wild bootstrap p-values are consistent with the statistical significance levels.

In Panel (B), the returns of at least completing high school are reported for both genders. For women, the coefficients of the samples with donut hole, around 60-67%, are higher than the coefficients for those without donut hole, around 50-62%. The returns of completing at least high school for men in the samples without donut hole, 10-14%, is lower than the result of the samples in which exclude the birth cohort 1986-1987, approximately 20%. In addition, the significance level is higher for the samples with donut hole, and the wild bootstrap p-values are also lower in those samples for both men

and women.

Table 2. Second Stage Results

	Without Donut Hole			With Donut Hole	
	Female	Male		Female	Male
Birth Cohorts in Sample			Birth Cohorts in Sample		
(1)	(2)	(3)	(4)	(5)	(6)
A) At Least Completing Middle School					
1981-1986, 1987-1992	0.228	0.044	1981-1985, 1988-1992	0.418***	0.094**
	(0.193)	(0.045)		(0.155)	(0.040)
Wild Bootstrap p-value	0.527	0.503	Wild Bootstrap p-value	0.140	0.000
# of Observations	60,486	148,087	# of Observations	48,477	118,555
1980-1986, 1987-1993	0.241	0.043	1980-1985, 1988-1993	0.391***	0.087**
	(0.148)	(0.039)		(0.102)	(0.040)
Wild Bootstrap p-value	0.393	0.474	Wild Bootstrap p-value	0.002	0.053
# of Observations	67,248	166,654	# of Observations	55,239	137,122
1979-1986, 1987-1994	0.291**	0.068*	1979-1985, 1988-1994	0.433***	0.115***
	(0.128)	(0.041)		(0.080)	(0.043)
Wild Bootstrap p-value	0.251	0.310	Wild Bootstrap p-value	0.000	0.013
# of Observations	72,254	181,092	# of Observations	60,245	151,560
B) At Least Completing High School					
1981-1986, 1987-1992	0.495	0.098	1981-1985, 1988-1992	0.623**	0.188**
	(0.381)	(0.101)		(0.309)	(0.080)
Wild Bootstrap p-value	0.493	0.482	Wild Bootstrap p-value	0.135	0.000
# of Observations	60,486	148,087	# of Observations	48,477	118,555
1980-1986, 1987-1993	0.523*	0.097	1980-1985, 1988-1993	0.604**	0.179**
	(0.305)	(0.086)		(0.255)	(0.080)
Wild Bootstrap p-value	0.365	0.437	Wild Bootstrap p-value	0.007	0.063
# of Observations	67,248	166,654	# of Observations	55,239	137,122
1979-1986, 1987-1994	0.626**	0.145*	1979-1985, 1988-1994	0.671***	0.222***
	(0.271)	(0.078)		(0.236)	(0.071)
Wild Bootstrap p-value	0.268	0.298	Wild Bootstrap p-value	0.000	0.016
# of Observations	72,254	181,092	# of Observations	60,245	151,560
C) Completing College					
1981-1986, 1987-1992	1.532	1.448	1981-1985, 1988-1992	0.889***	0.749**
	(1.846)	(2.872)		(0.337)	(0.352)
Wild Bootstrap p-value	0.461	0.537	Wild Bootstrap p-value	0.149	0.000
# of Observations	60,486	148,087	# of Observations	48,477	118,555
1980-1986, 1987-1993	1.370	0.786	1980-1985, 1988-1993	0.855**	0.610***
	(1.364)	(0.642)		(0.370)	(0.180)
Wild Bootstrap p-value	0.414	0.443	Wild Bootstrap p-value	0.001	0.054
# of Observations	67,248	166,654	# of Observations	55,239	137,122
1979-1986, 1987-1994	1.210	0.597**	1979-1985, 1988-1994	0.855***	0.557***
	(0.785)	(0.252)		(0.298)	(0.122)
Wild Bootstrap p-value	0.280	0.304	Wild Bootstrap p-value	0.000	0.009
# of Observations	72,254	181,092	# of Observations	60,245	151,560

The sample includes observations from 2004-2018 Turkish Household Labor Force Surveys and is restricted to the age group 24-31. In each panel, I use alternative bandwidths gradually zooming in around the cutoff. The policy dummy is one when the year of birth is greater 1987. Each cell comes from a separate regression (4.2) of log hourly wages on the specified level of educational attainment, the policy dummy and controls include split linear time trends on either side of the cutoff, survey year dummies, and NUTS-2 level region dummies. The restricted sample is weighted by survey year weights. The first row in each segment corresponds to the main parameter of interest, α_1. The values in parentheses are clustered standard errors at the year-of-birth level. The third row shows the p-values calculated using wild-cluster bootstrap estimation of Cameron et al (2008). The fourth row shows the number of observations. ***, **, and * refer to 1%, 5%, and 10% significance levels, respectively.

Finally, Panel (C) presents the estimated coefficients for completing college for both men and women. The returns of completing college for women are more steady than the coefficients for men across time windows. Nevertheless, the results for both men and women are statistically insignificant in the samples without donut hole, the estimated returns for the samples with donut hole are statistically significant at 1% level. The returns of completing college for women, around 85%, are higher than those for men, which are range from 55% to 75%.

One of the key findings in this study is that the returns to completing at least interested schooling level are higher for women than for men. In addition, the increase in the rate of women who complete at least high school and college is higher than the rate of men, as shown in Figure 2 and Figure 3. In addition, Table 2 indicates that the returns to college are higher than high school and middle school for both men and women. On the other hand, the difference in returns to college are between men and women smaller than the difference in completing at least high school. The reason for the difference in the estimated average causal effects between men and women might arise from the differences in the rate of labor force partition conditional on educational attainment because the individuals who complete college has a higher share in female compliers than those among men, and the estimation of average causal effect for women gives a higher weight to college graduates than the estimation for men. The results are consistent with the results of Aydemir and Kirdar (2017) in which they argue the returns to schooling are higher for women than for men and discuss the possible reasons. Also, Torun (2018) finds that the policy has a positive effect on the fraction of women who work in higher skill and formal sector jobs.

In this section, I have also carried out a robustness test for age restrictions. I impose different minimum age restrictions, such as 23 and 25 to test the robustness of the estimates. Since I can observe individuals who were born the latest 1993 cohort at 25 years old, I use only two subsamples. Besides, the data includes individuals who were born the latest 1995 birth cohort at 23 years old so I added one more time interval, 1978-1995. Table D1 (Appendix D) shows the second stage results with the minimum age restriction 25, and Table D2 (Appendix D) reports the second stage results with the minimum age restriction 25. The results suggest that the estimated average causal effects are robust. The magnitude of coefficients is not changing significantly with the minimum age restrictions. Hence the results cannot be explained by the age composition of the sample.

CHAPTER 6

CONCLUSION

In this paper, I estimate the returns to the different levels of educational attainment such as completing at least middle school, at least high school, and college for men and women in Turkey by using the 1997 compulsory schooling law as an instrument and contribute the literature of return of schooling in developing countries. The reform increases compulsory schooling from 5 to 8 years and causes exogenous variation in schooling across birth cohorts. I use a fuzzy regression discontinuity design to estimate the local average treatment effects and find that the instrument is highly related to completing at least middle school for men and women. Moreover, the policy has a significant positive effect on at least completing high school for men. However, I found a significant effect on completing at least high school and college for women and on completing college for men in the samples excludes the birth cohorts 1986-1987 in which has fuzziness on treatment.

I found that the returns of higher levels of educational attainment are increasing for both men and women. For women, the return to at least completing middle school is around 40%, at least completing high school is approximately 60%, and to college is about 85% and 10%, 18%, and 70% for men, respectively in the samples with donut hole. Hence, the first contribution of the paper is to investigate the return of completing higher education levels in Turkey. There is no other study in the Turkey context that examines the returns of different levels of schooling with such a rich data set.

The second contribution of the paper is that the results indicate that the returns to each level of educational attainment are higher for women than those for men. The possible explanation is that the policy pushes a higher fraction of men to complete middle school and high school, whereas it pushes a higher fraction of women to complete college, and the fraction of women who have a college degree is higher than the rate of college graduates among men in the labor market.

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APPENDIX A

NUTS-2 LEVEL REGIONAL DIVISIONS

Region No	Region Name	Cities Included
1	Istanbul	Istanbul
2	Tekirdag	Tekirdag, Edirne, Kirklareli
3	Balikesir	Balikesir, Canakkale
4	Izmir	Izmir
5	Aydin	Aydin, Denizli, Mugla
6	Manisa	Manisa, Afyonkarahisar, Kutahya, Usak
7	Bursa	Bursa, Eskisehir, Bilecik
8	Kocaeli	Kocaeli, Sakarya, Duzce, Bolu, Yalova
9	Ankara	Ankara
10	Konya	Konya, Karaman
11	Antalya	Antalya, Isparta, Burdur
12	Adana	Adana, Mersin
13	Hatay	Hatay, Kahramanmaras, Osmaniye
14	Kirikkale	Kirikkale, Nevsehir, Aksaray, Nigde, Kirsehir
15	Kayseri	Kayseri, Sivas, Yozgat
16	Zonguldak	Zonguldak, Karabuk, Bartin
17	Kastamonu	Kastamonu, Cankiri, Sinop
18	Samsun	Samsun, Tokat, Corum, Amasya
19	Trabzon	Trabzon, Ordu, Giresun, Rize, Artvin, Gumushane
20	Erzurum	Erzurum, Erzincan, Bayburt
21	Agri	Agri, Kars, Igdir, Ardahan
22	Malatya	Malatya, Elazig, Bingol, Tunceli
23	Van	Van, Mus, Bitlis, Hakkari
24	Gaziantep	Gaziantep, Adiyaman, Kilis
25	Sanliurfa	Sanliurfa, Diyarbakir
26	Mardin	Mardin, Siirt, Batman, Sirnak

APPENDIX B

DESCRIPTIVE STATISTICS AND THE BIRTH COHORTS AFFECTED BY THE REFORM

Table B1. Descriptive Statistics of Treatment and Control Groups

	Treatment Group			Control Group		
	Female	Male	Total	Female	Male	Total
Labor force participation (%)	44.05	89.09	66.10	36.03	91.76	62.58
Employment	35.34	78.16	56.31	30.28	80.71	54.31
Unemployment	8.71	10.93	9.80	5.75	11.05	8.28
Wage workers (%)	74.90	80.52	78.72	67.93	76.13	73.74
Permanent job (%)	91.28	86.71	88.10	92.38	89.78	90.48
Hours of work for a week	46.02	50.80	49.31	46.87	53.03	51.36
Hourly wage	6.47	5.62	5.89	6.01	4.87	5.18
Monthly wage	1185,51	1152,64	1162,89	1105,19	1027,17	1048,36
Age	26.40	26.47	26.45	27.64	27.71	27.69
Educational Attainment (%)						
Literate & No degree	1.97	2.62	2.42	0.98	1.45	1.32
Primary & Middle School	12.98	32.28	26.27	19.87	40.62	35.00
High school	13.31	15.16	14.58	14.15	14.71	14.56
Two year college or University	60.13	32.49	41.11	50.81	24.05	31.31
# of obs.	26,986	59,627	86,613	45,268	121,465	166,733

Notes: The first five rows come from 2004-2018 HLFS which is restricted to age groups 24-31 and to the birth cohorts in between 1979-1994. The remaining rows are calculated by using the restricted sample.

Table B2. The Birth Cohorts Affected by The Reform

AGE/YEARS	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
24	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980
25	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979
26	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978
27	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
28	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976
29	1989	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975
30	1988	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974
31	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1975	1974	1973

APPENDIX C

POLICY EFFECT ON LABOR OUTCOMES

	Female	Male
	OLS	OLS
A)Employment		
1981-1986 1987-1992	0.002	0.010*
	(0.006)	(0.005)
# of obs.	299,806	279,165
1980-1986 1987-1993	0.003	0.009*
	(0.007)	(0.005)
# of obs.	340,987	316,645
1979-1986 1987-1994	0.004	0.009*
	(0.007)	(0.005)
# of obs.	373,143	345,528
B)Wage Employment		
1981-1986 1987-1992	0.007	0.004
	(0.007)	(0.004)
# of obs.	98,123	223,255
1980-1986 1987-1993	0.003	0.006
	(0.006)	(0.003)
# of obs.	109,905	252,870
1979-1986 1987-1994	0.002	0.004
	(0.006)	(0.003)
# of obs.	119,043	275,942
C) Permanent job		
1981-1986 1987-1992	0.013***	-0.005**
	(0.004)	(0.002)
# of obs.	70,112	175,284
1980-1986 1987-1993	0.013***	-0.007**
	(0.004)	(0.003)
# of obs.	77,963	197,219
1979-1986 1987-1994	0.012**	-0.009***
	(0.005)	(0.003)
# of obs.	83,819	214,021

Notes: The sample includes observations from 2004-2018 Turkish Household Labor Force Surveys and is restricted to age group 24-31. The policy dummy is one when year of birth is greater 1987. Each cell comes from a separate regression (4.1) dependent variable on the policy dummy, controls include split linear time trends on either side of the cutoff, survey year dummies, and NUTS-2 level region dummies. The dependent variable is a binary variable for employment in panel (A), for wage employment in panel (B), and for permanent job in panel (C) The first row in each segment corresponds to the main parameter of interest. The values in parentheses are clustered standard errors at the year-of-birth level. The fourth row shows the number of observations. ***, **, and * refer to 1%, 5%, and 10% significance levels, respectively.

APPENDIX D

ROBUSTNESS CHECKS

Table D1. Second Stage Results with Minimum Age Restriction 25

	Without Donut Hole			With Donut Hole	
	Female	Male		Female	Male
Birth Cohorts in Sample			Birth Cohorts in Sample		
(1)	(2)	(3)	(4)	(5)	(6)
A)At Least Completing Middle School					
1981-1986 1987-1992	0.171	0.086*	1981-1985 1988-1992	0.378**	0.148***
	(0.201)	(0.051)		(0.151)	(0.041)
Wild Bootstrap p-value	0.636	0.408	Wild Bootstrap p-value	0.178	0.000
# of Observations	52,028	129,300	# of Observations	41,386	103,077
1980-1986 1987-1993	0.210	0.069	1980-1985 1988-1993	0.377***	0.121***
	(0.168)	(0.047)		(0.119)	(0.044)
Wild Bootstrap p-value	0.497	0.430	Wild Bootstrap p-value	0.013	0.016
# of Observations	57,524	144,842	# of Observations	46,882	118,619
B)At Least Completing High School					
1981-1986 1987-1992	0.489	0.201*	1981-1985 1988-1992	0.654*	0.297***
	(0.477)	(0.121)		(0.334)	(0.084)
Wild Bootstrap p-value	0.632	0.422	Wild Bootstrap p-value	0.179	0.000
# of Observations	52,028	129,300	# of Observations	41,386	103,077
1980-1986 1987-1993	0.581	0.162	1980-1985 1988-1993	0.662**	0.248***
	(0.392)	(0.106)		(0.303)	(0.084)
Wild Bootstrap p-value	0.493	0.381	Wild Bootstrap p-value	0.013	0.012
# of Observations	57,524	144,842	# of Observations	46,882	118,619
C)Completing College					
1981-1986 1987-1992	3.382	-37.026	1981-1985 1988-1992	1.002**	1.082**
	(15.987)	(1,601.7)		(0.498)	(0.502)
Wild Bootstrap p-value	0.635	0.397	Wild Bootstrap p-value	0.184	0.000
# of Observations	52,028	129,300	# of Observations	41,386	103,077
1980-1986 1987-1993	2.449	4.329	1980-1985 1988-1993	1.005*	0.870**
	(5.896)	(22,068)		(0.577)	(0.349)
Wild Bootstrap p-value	0.465	0.408	Wild Bootstrap p-value	0.011	0.006
# of Observations	57,524	144,842	# of Observations	46,882	118,619

Table D2. Second Stage Results with Minimum Age Restriction 23

	Without Donut Hole			With Donut Hole	
	Female	Male		Female	Male
Birth Cohorts in Sample			Birth Cohorts in Sample		
(1)	(2)	(3)	(4)	(5)	(6)
A)At Least Completing Middle School					
1981-1986 1987-1992	0.299**	0.036	1981-1985 1988-1992	0.426***	0.073
	(0.148)	(0.044)		(0.130)	(0.048)
Wild Bootstrap p-value	0.271	0.520	Wild Bootstrap p-value	0.106	0.121
# of Observations	68,153	165,396	# of Observations	54,893	133,094
1980-1986 1987-1993	0.273**	0.039	1980-1985 1988-1993	0.381***	0.073*
	(0.117)	(0.037)		(0.080)	(0.040)
Wild Bootstrap p-value	0.218	0.409	Wild Bootstrap p-value	0.000	0.104
# of Observations	75,526	185,222	# of Observations	62,266	152,920
1978-1986 1987-1995	0.360***	0.082**	1978-1985 1988-1995	0.462***	0.125***
	(0.97)	(0.040)		(0.076)	(0.048)
Wild Bootstrap p-value	0.116	0.189	Wild Bootstrap p-value	0.001	0.035
# of Observations	85,448	212,938	# of Observations	72,188	180,636
A)At Least Completing High School					
1981-1986 1987-1992	0.501**	0.081	1981-1985 1988-1992	0.583**	0.150
	(0.251)	(0.100)		(0.235)	(0.100)
Wild Bootstrap p-value	0.275	0.539	Wild Bootstrap p-value	0.086	0.121
# of Observations	68,153	165,396	# of Observations	54,893	133,094
1980-1986 1987-1993	0.462**	0.087	1980-1985 1988-1993	0.529***	0.150*
	(0.216)	(0.080)		(0.191)	(0.80)
Wild Bootstrap p-value	0.220	0.441	Wild Bootstrap p-value	0.000	0.103
# of Observations	75,526	185,222	# of Observations	62,266	152,920
1978-1986 1987-1995	0.621***	0.170**	1978-1985 1988-1995	0.657***	0.234***
	(0.197)	(0.70)		(0.175)	(0.070)
Wild Bootstrap p-value	0.102	0.212	Wild Bootstrap p-value	0.000	0.034
# of Observations	85,448	212,938	# of Observations	72,188	180,636
A) Completing College					
1981-1986 1987-1992	1.125*	2.046	1981-1985 1988-1992	0.800***	0.728*
	(0.626)	(6.428)		(0.208)	(0.403)
Wild Bootstrap p-value	0.290	0.524	Wild Bootstrap p-value	0.091	0.132
# of Observations	68,153	165,396	# of Observations	54,893	133,094
1980-1986 1987-1993	0.943**	0.694	1980-1985 1988-1993	0.717***	0.561***
	(0.529)	(0.515)		(0.244)	(0.193)
Wild Bootstrap p-value	0.235	0.420	Wild Bootstrap p-value	0.000	0.131
# of Observations	75,526	185,222	# of Observations	62,266	152,920
1978-1986 1987-1995	0.896***	0.554***	1978-1985 1988-1995	0.738***	0.537***
	(0.288)	(0.175)		(0.153)	(0.102)
Wild Bootstrap p-value	0.111	0.207	Wild Bootstrap p-value	0.000	0.029
# of Observations	85,448	212,938	# of Observations	72,188	180,636