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## Does education affect religiosity? Causal evidence from a conservative emerging economy

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## Does education affect religiosity? Causal evidence from a conservative emerging economy

### Abstract

Does education make people more or less religious? The previous literature offers mixed findings on the relationship between education and religiosity. This may be due to endogeneity bias: education and religiosity can be caused by a third variable such as culture or upbringing. We instrument education by exposure to the 1997 education reform in Türkiye which increased mandatory schooling from 5 to 8 years. The schooling reform increased the probability that young girls would complete 8 years of schooling and report lower religiosity later in life. The reform apparently did not influence such outcomes for boys. These effects are observed primarily for females growing up in strongly religious or poor areas.

Keywords: Education, religiosity, 2SLS, gender, social norms, Türkiye.

JEL: H52; I26; J10; Z12.

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## Non-technical summary

### FOCUS

Our paper seeks to shed new light on the causal impact of education on religiosity. A possible reason earlier literature offers mixed results in this respect is endogeneity bias. Education and religiosity can be affected by other variables such as culture and upbringing. We address this problem by utilizing the 1997 reform of compulsory education in Türkiye. The reform increased mandatory schooling from 5 to 8 years.

### CONTRIBUTION

We use the exposure to the 1997 education reform to identify as good as random variation in educational outcomes between birth cohorts affected by the reform and those slightly older who were unaffected by it. Specifically, individuals born between 1981 and 1985 are used as the control group, as they were obliged to remain in school for only five years. Those born between 1987 and 1991 were affected by the reform and thus were required to complete eight years of schooling. Given that there was little change in the nature or quality of education changed after the reform was implemented, the sole difference between these two groups is the amount of schooling that they were required to complete.

### FINDINGS

The reform increased the probability that young girls complete 8 years of schooling, but had no similar impact on such outcome for boys. Girls subject to the reform, in turn, displayed lower self-reported religiosity when surveyed in 2013. These effects are primarily observed for females who grew up in poor or strongly religious areas.

*A little philosophy inclineth man's mind to atheism, but depth in philosophy bringeth men's minds about to religion.* – Francis Bacon

*Where knowledge ends, religion begins.* – Benjamin Disraeli

## 1 Introduction

The Encyclopedia Britannica defines *religion* as “human beings’ relation to that which they regard as holy, sacred, absolute, spiritual, divine, or worthy of especial reverence.”<sup>1</sup> By its nature, religion is based on premises that are unverifiable and taken at face value, supported by long-held beliefs, traditions, and occurrences interpreted as miracles. As such, religion is arguably at odds with *science*, defined by the Encyclopedia Britannica as a “system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation.”<sup>2</sup> This raises the immediate question as to whether an education based on scientific principles and experimental rigor might lead to a decline in the religiosity of an individual.

Religion has a number of important implications, both positive and negative, for personal well-being.

As to benefits, it offers a system of behavioral norms and values such as the *Ten Commandments* in Judaism, Christianity and Islam or the *Noble Eightfold Path* of Buddhism. These norms help improve the outcomes of inter-personal interactions and make them more predictable. Religious people also tend to be happier (see Deaton and Stone, 2013, and the references therein). Many religions even offer the prospect of eternal life, an afterlife existence or reincarnation. Religious communities provide insurance against income shocks (Clark and Lelkes, 2009; Dehejia et al., 2005) and club goods such as spiritual and monetary support, dispute resolution and passage rituals for birth, marriage, and death (Berman, 2000).

As to drawbacks, religion can impose restrictions on behavior and appearance that affect the believers’ ability to participate in the public life, including their labor-market options, especially in conservative and traditional societies. O’Neil and Bilgin (2013) show that religious women in Türkiye are more likely to hold conservative and patriarchal views, while Dildar (2015) finds that religious women in Türkiye identify with patriarchal norms and are less likely to join the labor force than their secular counterparts. Submitting to such restrictions may diminish personal well-being. Inasmuch as education has an impact on religiosity, it can make an important

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<sup>1</sup> Encyclopedia Britannica, <https://www.britannica.com/topic/religion> (accessed September 2023).

<sup>2</sup> Ibid.

contribution to a person's quality of life that impacting their labor-market participation and other outcomes.

The evidence on the relationship between education and religion is mixed. Glaeser & Sacerdote (2008) observe that participation in religious activities increases with an individual's education in the context of the United States. A similar positive correlation is found also in the UK and France, but is absent in other countries. However, Glaeser & Sacerdote (2008) also report a negative correlation between education and religious participation at the level of denominations: the members of the most religiously active groups tend to be the least educated. They attribute this to "sorting," whereby educated individuals (those with more outside options) migrate to less strict religions.

Other studies also fail to reach a consensus on the relationship between education and religion. Some find a negative correlation, e.g. Arias-Vazquez (2012) for the US; Hungerman (2014), Dilmaghani (2019) for Canada; and Mocan and Pogorelova (2017) for European countries. Others find a positive effect, e.g. Albrecht and Heaton (1984) for the Mormon community, and Gruber (2005) for Americans in general. Most such studies, however, constitute correlational evidence and thus lack causal identification free of endogeneity bias. For example, both education and religiosity could be caused by other unobserved variables such as parental upbringing or culture.

Several recent contributions present causal evidence on the relationship between education and religiosity. Using a reform in compulsory years of schooling as an instrumental variable, Hungerman (2014) concludes that higher education levels lead to lower levels of religious participation later in life. An additional year of education results in a 4-percent decrease in the likelihood of an individual identifying with any religious tradition. Becker et al. (2017), using data from 61 German cities between 1890 and 1930 and controlling for city-fixed effects, find that an increase in advanced-school enrollment rates in the studied cities was negatively related to the rate of Protestant church attendance. Mocan and Pogorelova (2014), employing microdata from 11 European countries, find that compulsory schooling reforms enacted in the 1960s and 1970s decreased various measures of religiosity and superstitious tendencies. Similarly, Masuda and Yudhistira (2020) use cohort variations in exposure to the 1978 education reform in Indonesia. They conclude that each extra year of education reduced self-declared religiosity by 4 percent.

Türkiye's Compulsory Education Law of 1997 raised the length of compulsory education from 5 to 8 years for persons born after 1985 (i.e. 11 or younger in 1997). While its stated objective was to prepare Türkiye for entry into the European Union (EU) by increasing access to education and reducing geographic and gender-specific educational disparities, the most pressing drivers of

the reform were political (see discussion in next section). Access to education has been widely accepted by the EU as a way to increase economic and social development in Türkiye, as well as to enhance economic and social cohesion between the country's eastern and western regions. Crucially, the reform increased the duration of compulsory education without affecting the curriculum or the quality of education (Dulger, 2004). The raw figures show the net enrollment rate in primary education for girls increased from 78.97 % in the 1997-98 academic year, to 83.79 %, 88.45 %, and 90.79 % for the 1998-99, 1999-00, and 2000-01 academic years, respectively. It took another six years (i.e. the 2007-08 academic year) before net enrollments at primary education level between girls and boys equalized (Özgenur, 2019).

The findings for girls and their potential heterogeneities raise questions about the intended and unintended consequences of the reform. While there was no explicit government statement linking the policy to gender inequalities or disadvantaged groups, the already high enrollment rates in primary education among boys may explain the more pronounced effects among girls. However, given the significant social and educational inequalities across regions, other characteristics, in addition to gender, may have influenced the impact of educational reforms.

The following analysis seeks to tease out more nuanced effects of education on religiosity. Exploiting Türkiye's 1997 education reform, we estimate the causal effect of educational attainment on religiosity in Türkiye and explore the heterogeneity of this relationship across genders and socio-economic characteristics. Previous studies evaluating the effect of education on religiosity in Türkiye ignore the differential reform intensity across provinces and regions that might produce bias in estimates (Duflo, 2001). Our identification strategy employs instrumental variables with treatment interacted with regional reform intensity measured by teacher-student ratios at the provincial level. Our results show that the effect of education reform on both educational attainment and religiosity is restricted to girls, who report an increase in schooling and subsequent drop in religiosity. These effects, however, are limited to girls from relatively poor or religious regions. Our results are robust to the usage of different regression specifications and survive a multitude of robustness checks.

Our approach builds upon and extends the research of Cesur and Mocan (2018). Their work covers the same reform episode and concludes that urban women who received more education were less likely to vote for an Islamic party, less likely to wear Islamic head-covering and more likely to espouse modern social values. They also found little impact on rural women or men generally. Cesur and Mocan, however, determine "urban" or "rural" status based on the respondent's residence at the time of the survey rather than where the respondent received full-time education. This can introduce bias: individuals may move to urban areas or remain in rural areas based on



their educational attainments or other characteristics. Our methodology, in contrast, segments data based on residence prior to the enactment of the schooling reform. Moreover, while Cesur and Mocan use date of birth as their primary metric for estimating the reform's impact, our analysis integrates date of birth *and* reform intensity across time and provinces. This approach both captures the direct effects of the reform based on birth cohorts and the dynamic changes in educational resources over time and across regions. By incorporating this temporal and provincial variation, we factor in the considerable differences in educational quality and access throughout Türkiye, providing a more comprehensive understanding of the reform's influence on religiosity.

Another closely related paper is Erten & Keskin (2019), which was based on the later educational reform of 2012. They find that the 2012 reform increased school attendance for both boys and girls, led to more girls in religious areas staying in school, and encouraged marginal students to choose vocational over academic high schools. We should note here the important differences between these two reforms. The 1997 reform only changed the duration of education, but it did not affect the content or quality of education. In this sense, the 1997 reform serves as a particularly clean exogenous instrument for studying the causal link between education and religiosity. In contrast, the 2012 education reform (a.k.a. the "4+4+4 reform") was implemented by Recep Erdoğan's Justice and Development Party (AKP), which has dominated Turkish politics since 2002. The 2012 reform increased the duration of compulsory education to 12 years and revised the curriculum. In particular, the reform strengthened the religious education curriculum within the school system and reduced the secular nature of education in Türkiye. The 2012 reform explicitly allowed students to opt for a religious education, which was not permissible under the 1997 rules. For this purpose, the institution of religion schools (the so called Imam Hatip schools) was reinstated (Gün & Baskan, 2014). This increased tolerance and state acquiescence to religious education could confound Erten and Keskin's findings. Indeed, Meyersson (2014) finds that greater tolerance of religious attitudes by some schools in 1994 increased school attendance of pious girls as their schools failed to enforce the headscarf bans in place at the time. No such bans were envisaged by the 2012 reform. By focusing on the 1997 education reform, our analysis provides a more straightforward examination of the relationship between education and religiosity without the confounding effects inherent in the subsequent reform.

Section 2 describes the education reform that increased the length of compulsory education in Türkiye. Section 3 introduces the data and methods. Section 4 presents the results. Section 5 contains the robustness checks, while Section 6 discusses and concludes.

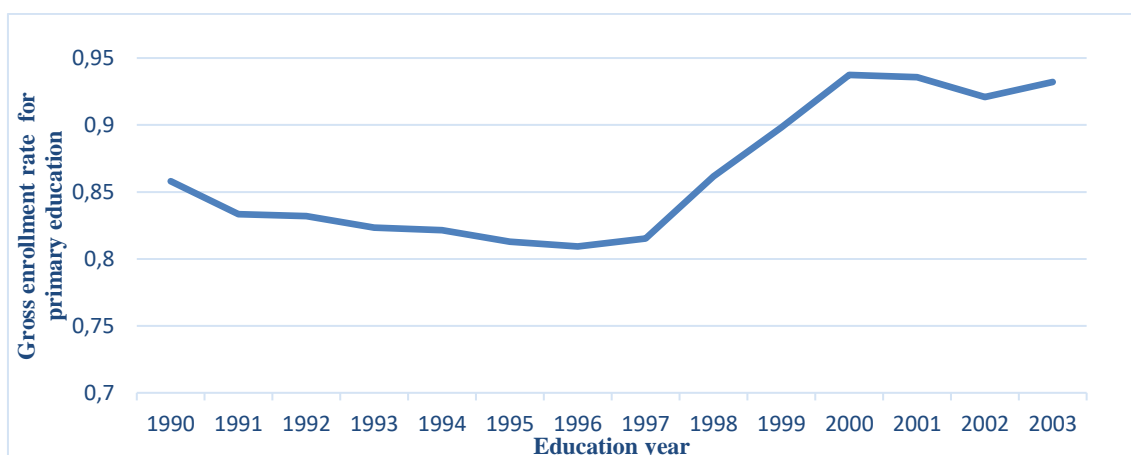
## 2 The 1997 Compulsory Education Reform

The Turkish legislature passed the Compulsory Education Act in August 1997. The new law, which increased compulsory education from 5 to 8 years, applied to children born after 1985 (i.e. aged 11 or younger in 1997). The reform was politically motivated: it was adopted after the short tenure of a government headed by the religious *Welfare Party* (this government assumed office in June 1996 and was deposed by the military in February 1997).<sup>3</sup> Although the stated objective of the reform was to accelerate the process of harmonization with the EU, the reform served to restrict the enrollment of children in religious schools as such schools were not recognized by the reform (Dulger, 2004; Özer et al., 2018, 2023).

The new law combined the primary school (years 1 to 5) and the lower-secondary school (years 6 to 8) to form a new primary school covering years 1 to 8. The net enrollment rate went from 85.6% in 1997 to 96.3% in 2002, which translated to approximately 1.1 million additional students in years 1 to 8 (Figure 1). To meet rising demand, there was a substantial increase in the number of teachers employed with over 70,000 new primary school teachers hired after 1997 (Figure 2). In order to accommodate the increased demand for school placements, a total of 81,500 new primary school classrooms were built between 1997 and 2002, resulting in a roughly 40 % increase in capacity (World Bank, 2005). Various plans were implemented to improve access for rural children, including bus transport, the establishment of boarding schools, and the consolidation or closure of some village schools. Students from low-income families were given free textbooks and school meals (Dulger, 2004). Implementation of the Compulsory Education Plan, calculated to cost \$11.3 billion, was funded with allocations from the general budget and financial support from the World Bank.

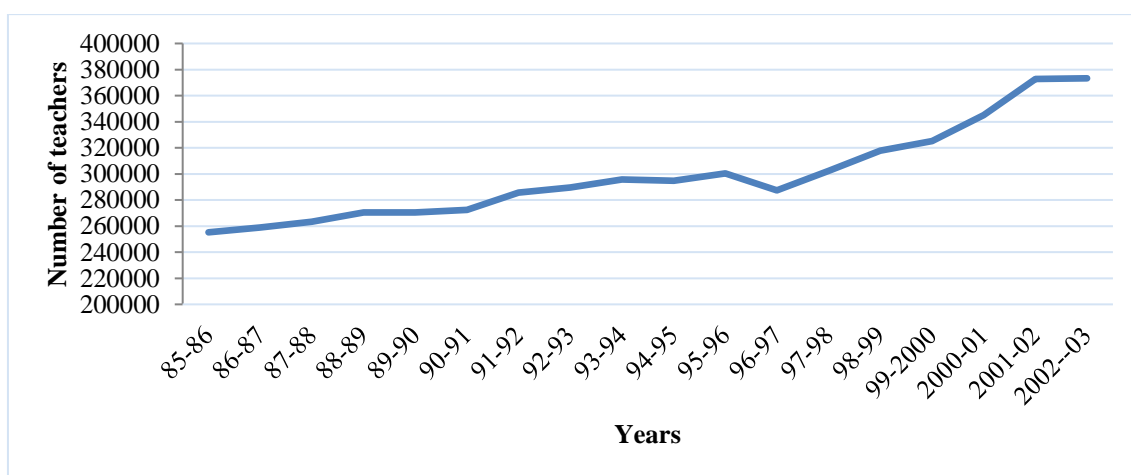
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<sup>3</sup> The *Welfare Party* won the general elections held in December 1995, receiving 21.4 percent of the vote and 158 seats in the Grand National Assembly. The margin was insufficient to form a unity government, and the resulting coalition government only managed to enter office on June 28, 1996. On February 28, 1997, the Turkish Armed Forces seized power and forced the government to resign. On May 21, 1997, the Chief Public Prosecutor of the Supreme Court, filed a lawsuit against the *Welfare Party* for “acting against the principles of the secular republic.” After 8 months of litigation, the *Welfare Party* was dissolved by the Constitutional Court on January 16, 1998.



**Figure 1.** Gross enrollment rates for Grades 1 to 8 over time.

*Source:* Authors' calculation from the National Education Statistics yearbooks of Türkiye's Ministry of Education. The ratio is calculated by dividing the number of students in 1 to 8 grades with a population aged 6 to 13, the population should be at school.



**Figure 2.** Number of teachers for Grades 1 to 8 over time.

*Source:* Authors' calculation from the National Education Statistics yearbooks of Türkiye's Ministry of Education.

### 3 Data and Methodology

#### 3.1 Data

We use the 2013 wave of the Turkish Household Life Satisfaction Survey (THLSS) administered by the Turkish Statistical Institute. The use of a single wave was necessary as questions on respondents' province and region of residence (needed in the identification strategy) was only included in 2013. Our analysis is based on individuals born between 1981 and 1991. We designate

those born after 1986 as the treatment group, while those born before 1986 constitute the control group. Due to the lax enforcement of the age cut-off, there remains ambiguity regarding the status of individuals born in 1986. Some may have been affected by the reform, some not. To circumvent potential misclassification, we omitted the respondents born in 1986 from the data. In our robustness checks, we assess the implications of including individuals born in 1986, by examining them as part of the treatment group and part of the control groups.

Educational attainment is measured with the following educational outcomes: did not receive any education; did not finish primary school; completed primary school; completed junior high school; completed senior high school; and graduated from university. From this variable, we isolate and construct three relevant educational outcomes to be used in the analysis: a) completed 8 years of schooling (graduated from junior high school, or JHSG), b) completed senior high school (graduated from senior high school, or SHSG) and c) completed university education (university graduate, or UG).

Religiosity is captured by three variables, namely: 1) “How important are the religious beliefs of other people around you to you?” with “important”, “moderate” and “not important” as possible answers; 2) “How important is the opinion of the people around you (relatives, friends, neighbors, etc.) about your religious beliefs?” again with “important”, “moderate” and “not important” as possible answers; and finally, 3) “To what extent are you interested in religion?” with “interested”, “moderately interested” and “not interested” as possible answers.<sup>4</sup> Each of the three religiosity variables is dichotomized (1 for “important” or “interested” and 0 otherwise) and then all three are aggregated to form an index (i.e. ranging from 0 to 3) which is finally normalized by dividing the index values by three.

## 3.2 Empirical strategy

To address the potentially endogenous relationship between education and religiosity, we adopt an instrumental variable (IV) approach. The 1997 education reform increased the number of years of compulsory education from 5 to 8 and established new primary schools (years 1 to 8), integrating the previous compulsory primary (years 1 to 5) and non-compulsory junior high schools (years

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<sup>4</sup> A fourth response “I do not know” was also available. We record such responses as missing due to the lack of clarity on its interpretation. All questions were formulated in a neutral fashion, without implying judgement concerning the respondent’s religious views.

5 to 8). The reform itself was politically motivated and unrelated to the Turkish educational situation at the time, rendering it a policy change that could provide exogenous variation to study the effects of education.

In practice, there was substantial geographical heterogeneity in reform implementation with greater intensity in regions with low pre-reform gross enrollment in secondary schools (Dinçer et al., 2014; Özer et al., 2018). Duflo (2001) argues that in countries where disparities in educational attainments are common across regions and provinces, the use of a single dummy variable as an instrument for schooling is inappropriate. Following Duflo (2001), and in contrast to most past studies on Turkish education reforms, we employ an identification strategy that interacts the treatment variable with intensity so as to capture the effect of the reform by province and year. For our reform intensity variable, we use variation in the number of teachers by province and year of birth.<sup>5</sup> The first stage regression is given in Eq. (1), whereby exposure to the education reform augmented by reform intensity is used as an instrument.

$$S_{ipc} = \beta_0 + \beta_1(Teacher_{pc} * Treated_i) + \beta_2 Teacher_{pc} + \beta_3(Genrol96_p * Treated_i) + \mu_p + \theta_c + \varepsilon_{ipc} \quad (1)$$

$S_{ipc}$  denotes the education level of individual  $i$  living in city  $p$  and birth year  $c$ .  $Treated_i$  denotes the treatment status and takes the value of 1 for the group born between 1987 and 1991, who completed 8 years of compulsory education due to the education reform. A value of 0 is given to the those born between 1981 and 1985 as they are assumed to not be affected by the education reform.  $Teacher_{pc}$  is a treatment intensity variable and is obtained by dividing the number of teachers in years 1 to 8 in province  $p$  when the cohort with birth year  $c$  started in year 6 by the total number of students at primary and secondary schools for cohort  $c$  and province  $p$ .  $Genrol96_p$  is the gross enrollment rate to sixth grade in the 1996-97 academic year, which we include to control for the pre-reform state of education in the province (see below for further details).  $\mu_p$  denotes the province fixed effects capturing unobserved and time-invariant regional factors (e.g. socio-economic development, school and teacher quality, urbanization rates),  $\theta_c$  stands for the birth-year

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<sup>5</sup> Data for the number of teachers by province and year were collected from the National Education Statistics yearbooks of the Ministry of Education. These allow detailed categorization according to the number of teachers and year. However, data collation requires reviewing all yearbooks and manually aggregating teacher numbers at the province level. Information on the number of children aged 6 to 13 comes from the censuses of 1985, 1990, and 2000. The exponential function method was used for the missing years between the censuses. The main source of the teacher-pupil ratio is the increase in the number of teachers. For this reason, filling the missing data with the exponential function method makes no significant difference in the calculations. However, we cannot say that the missing data imputations to fill the data between the census years are correct for the estimation requirement.

fixed effects, capturing cohort effects such as economic and social policies that may affect religion, education, or both, while  $\varepsilon_{ipc}$  is a random error term.

The effect of the reform on education of the treatment group is calculated as  $\beta_1 + \beta_2$ , while the effect on the control group is  $\beta_2$ .  $\beta_1$  therefore shows the effect of education reform on the treated group when the control and treatment groups are equally affected by other factors related to the intensity variable and the reform is exogenous. The identifying assumption is that there is no correlation between education reform and uncontrolled region-specific or time-varying variables (Duflo, 2001). As the intensity of the reform could be correlated with the pre-reform enrollment rates in 1996, the estimation may be biased without controlling for such factors. As a control, we interact the treatment dummy with gross enrollment rates in 1996, i.e.  $Genrol96_p$ .

The effect of schooling on religiosity is given in the second stage, Eq. (2):

$$R_{ipc} = \beta_0^r + \beta_1^r S_{ipc} + \beta_2^r Teacher_{pc} + \beta_3^r (Genrol96_p * Treated_i) + \mu_p^r + \theta_c^r + \varepsilon_{ipc}^r, \quad (2)$$

where  $R_{ipc}$  is the religious outcome of individual  $i$  living in province  $p$  and born in year  $c$ , and the rest of the notation is as previously explained. The regression in the second stage incorporates all the controls from the first stage, making the identification of the coefficient for predicted schooling solely reliant on the exclusion of the interaction term from the regression in this second stage. Provided that the ratio of primary school teachers to children ( $Teacher_{pc}$ ) only impacts religiosity through its effect on schooling, the 2SLS models estimate should reflect the causal impact of schooling on religiosity.

Our estimations use the linear 2SLS model proposed by Angrist (1991) and Angrist (2001). For binary outcomes and instrumental variables, linear models predict marginal treatment effects more robustly and accurately than non-linear models, regardless of whether the dependent variable is binary or continuous (Angrist & Pischke, 2009). Considering that standard errors may be correlated for individuals with the same birth year, region, or both, we cluster standard errors by region of residence and year of birth (Pischke and von Wachter, 2008; Brunello, Fabbri and Fort, 2013; Agüero and Bharadwaj, 2014; Grépin and Bharadwaj, 2015).

### 3.3 Heterogeneity

Heterogeneity of effects is explored according to a number of background characteristics. We focus on pre-determined characteristics to avoid considering outcomes affected by education. First, we split the sample by gender to see whether our analysis confirms past findings. Second, we

examine whether the results differ according to the strength of religiosity in the student's province prior to the roll-out of the reform. We do this by splitting the sample at the median of the distribution of province-level votes for the Islamist political party, the Welfare Party, in the 1995 general election.<sup>6</sup> Provinces with voting percentages above the national median (i.e. 22.2 % of the vote) are considered to exhibit stronger religiosity sentiment. Third, we split the sample according to the provincial income based on the per capita 1996 Gross Domestic Product. Following Taşöz Düşündere (2019), we classify provinces into low middle income and high middle income categories in 1996 (the World Bank classified no Turkish provinces as low income or high income that year). Fourth, we categorize provinces according to Kurdish population density, identifying provinces with significant Kurdish minorities and those without.<sup>7</sup>

## 4 Analysis

### 4.1 Descriptive statistics

Panel A of Table 1 presents the descriptive statistics by gender and treatment status. For all educational outcomes, men have higher attainments than women. The pre-reform proportion of those completing an 8-year education is 45 % and 72 % for women and men, respectively. This rises post-reform to 74 % for women and 90 % for men. Smaller increases are observed for the other two education variables. As for religiosity, women seem more devoted than men for each of the religiosity variables. For both genders, the differences in religiosity between the treatment and control groups seem marginal.

Panel B shows the descriptive statistics for the main subgroups considered in the heterogeneity analysis. Unsurprisingly, well-off regions have significantly higher educational levels than poorer regions. Smaller differences can also be observed between less and more religious regions. Also in line with expectations, provinces below the median level of income display higher levels of religiosity for both men and women than provinces with above-median incomes. Provinces with greater support for political Islam show higher average levels of religiosity. Finally, particularly

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<sup>6</sup> The election results for the 79 provinces in 1995 were obtained from <http://www.secim-sonuclari.com/1995>.

<sup>7</sup> Determining the exact percentage of people belonging to the Kurdish minority can be complex due to such factors as the policies of local authorities and the historical context of the region. In areas with a history of inter-ethnic conflict, people may be reluctant to express their ethnic identities. Similarly, the authorities may undercount their presence (by considering all Turkish citizens to be ethnic Turks), which would further complicate our efforts to obtain accurate demographic data. Therefore, we classify provinces as having a significant Kurdish identity based on the historical presence of Kurdish political movements and their electoral performance. The provinces included in this study as having a significant Kurdish presence are Diyarbakır, Mardin, Şırnak, Van, Batman, Hakkari, Siirt, Tunceli, Ağrı, Bitlis, Muş, and Iğdır. Note that although Kurds are a minority in Türkiye as a whole, they are generally believed to be the majority or dominant ethnicity in the aforementioned provinces.

glaring differences appear when considering the presence of the Kurdish minority, i.e. Kurdish-dominated regions show substantially lower educational attainment than Turkish-dominated regions (especially for girls). The Kurdish areas also seem more religious, but these differences are less dramatic.

When comparing the control and treatment groups, it is apparent that the dichotomies discussed in the previous paragraph were only slightly diminished by the reform of compulsory education.

**Table 1a.** Descriptive statistics: education and religiosity (full sample)

	Females				Males			
	Control (81-85 cohort)		Treatment (87-91 cohort)		Control (81-85 cohort)		Treatment (87-91 cohort)	
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
<b>A. Full Sample</b>								
JHS graduate	12609	0.452	10859	0.743	8263	0.719	7260	0.910
SHS graduate	12609	0.345	10859	0.470	8263	0.551	7260	0.625
University graduate	12609	0.174	10859	0.236	8263	0.279	7260	0.274
Religiosity index	12609	0.571	10859	0.579	8263	0.518	7260	0.510
Importance to those around me	12609	0.501	10859	0.506	8263	0.434	7260	0.430
Care about beliefs of others	12609	0.423	10859	0.434	8263	0.396	7260	0.390
Interested in religion	12609	0.789	10859	0.796	8263	0.725	7260	0.710

*Source:* Turkish Household Life Satisfaction Survey (2013 wave). JHS and SHS stand for junior and senior high school, respectively.



**Table 1b.** Descriptive statistics: education and religiosity (regional breakdowns)

<b>B. Regional Sub-samples</b>	Obs.	Mean	Obs.	Mean	Obs.	Mean	Obs.	Mean
<b>Poorer Regions</b>								
JHS graduate	7576	0.375	6921	0.656	4470	0.693	4137	0.892
SHS graduate	7576	0.279	6921	0.394	4470	0.529	4137	0.596
University graduate	7576	0.129	6921	0.203	4470	0.267	4137	0.265
Religiosity index	7576	0.375	6921	0.656	4470	0.693	4137	0.892
Importance to those around me	7576	0.603	6921	0.602	4470	0.537	4137	0.534
Religious belief of others important	7576	0.525	6921	0.515	4470	0.456	4137	0.449
Interested in religion	7576	0.456	6921	0.456	4470	0.413	4137	0.419
Interested in religion	7576	0.828	6921	0.835	4470	0.746	4137	0.733
<b>Richer Regions</b>								
JHS graduate	5033	0.554	3938	0.879	3793	0.746	3123	0.940
SHS graduate	5033	0.437	3938	0.579	3793	0.574	3123	0.671
University graduate	5033	0.230	3938	0.290	3793	0.296	3123	0.301
Religiosity index	5033	0.534	3938	0.535	3793	0.494	3123	0.477
Importance to those around me	5033	0.467	3938	0.476	3793	0.407	3123	0.403
Religious belief of others important	5033	0.390	3938	0.390	3793	0.375	3123	0.353
Interested in religion	5033	0.745	3938	0.741	3793	0.700	3123	0.674
<b>More Religious Regions</b>								
JHS graduate	6097	0.416	5529	0.709	4078	0.707	3613	0.908
SHS graduate	6097	0.312	5529	0.436	4078	0.548	3613	0.634
University graduate	6097	0.152	5529	0.218	4078	0.291	3613	0.281
Religiosity index	6097	0.611	5529	0.618	4078	0.556	3613	0.548
Importance to those around me	6097	0.533	5529	0.539	4078	0.468	3613	0.458
Care about beliefs of others	6097	0.470	5529	0.477	4078	0.430	3613	0.424
Interested in religion	6097	0.830	5529	0.839	4078	0.769	3613	0.762
<b>Less Religious Regions</b>								
JHS graduate	6512	0.485	5330	0.775	4185	0.734	3647	0.920
SHS graduate	6512	0.378	5330	0.495	4185	0.555	3647	0.626
University graduate	6512	0.191	5330	0.255	4185	0.272	3647	0.282
Religiosity index	6512	0.536	5330	0.530	4185	0.472	3647	0.467
Importance to those around me	6512	0.467	5330	0.456	4185	0.388	3647	0.398
Religious belief of others important	6512	0.383	5330	0.378	4185	0.354	3647	0.353
Interested in religion	6512	0.754	5330	0.755	4185	0.672	3647	0.650
<b>Kurdish-dominated Regions</b>								
JHS graduate	1850	0.229	2034	0.398	925	0.625	1020	0.810
SHS graduate	1850	0.168	2034	0.236	925	0.465	1020	0.490
University graduate	1850	0.085	2034	0.132	925	0.258	1020	0.226
Religiosity index	1850	0.669	2034	0.666	925	0.349	1020	0.590
Importance to those around me	1850	0.573	2034	0.552	925	0.471	1020	0.491
Religious belief of others important	1850	0.540	2034	0.537	925	0.473	1020	0.467
Interested in religion	1850	0.894	2034	0.909	925	0.796	1020	0.813
<b>Turkish-dominated Regions</b>								
JHS graduate	10759	0.487	8825	0.818	7338	0.731	6240	0.930
SHS graduate	10759	0.374	8825	0.516	7338	0.562	6240	0.652
University graduate	10759	0.185	8825	0.259	7338	0.284	6240	0.290
Religiosity index	10759	0.558	8825	0.557	7338	0.508	6240	0.495
Importance to those around me	10759	0.489	8825	0.489	7338	0.425	6240	0.418
Religious belief of others important	10759	0.410	8825	0.407	7338	0.385	6240	0.376
Interested in religion	10759	0.777	8825	0.775	7338	0.714	6240	0.689

Source: Turkish Household Life Satisfaction Survey (2013 wave). JHS and SHS stand for junior and senior high school, respectively.

## 4.2 Results

The results of the first stage estimations by gender are given in Table 2. The instrument has a strong positive and statistically significant effect on the junior high school completion rates (JHSG) for women born in or after 1987. The F-statistic is 40.7 indicating instrument validity and allowing robust estimation (Staiger & Stock, 1997). The results indicate also an increase in the probability of senior high school graduation (SHSG) for the treated but the instrument does not appear sufficiently strong, with the F-statistic being only 4.9. We find no effect of the reform on university education for females. This is not surprising, as the reform did not affect education beyond the junior high school. On the other hand, the estimated effects of the reform on males are insignificant (or only moderately significant for the senior high school). Overall, the change in the law had little effect on male education but seemed to significantly affect female JHS completion. Therefore, we continue the analysis by focusing on females and causally evaluate the effect of women's education on religiosity.

**Table 2.** Effect of schooling reform on educational attainment (first stage)

	Females			Males		
	JHSG	SHSG	UG	JHSG	SHSG	UG
Treated*Teacher	6.001*** (0.941)	2.577** (1.159)	0.588 (0.933)	0.995 (0.782)	2.172* (1.134)	1.293 (0.909)
F-statistic	40.67	4.94	0.4	1.62	3.66	2.02
Observations	23,468	23,468	23,468	15,523	15,523	15,523

**Notes:** Robust standard errors clustered at the region of residence by birth year are reported in parenthesis. Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

According to the OLS regressions in Table 3, the completion of 8 years of compulsory education decreases the women's religious orientation for all four variables used in the study. The IV estimates for the most part confirm these findings, but suggest an even larger impact of education on religiosity. Specifically, we find that the reform reduced the probability that respondents consider the religious belief of those around them important by 42 percentage points, while a drop of 32 percentage points was estimated for the probability of the respondent being interested in

religion. The religiosity index was reduced by 0.37 units, implying a 65 % drop in religiosity (the mean religiosity index in Table 1 is 0.57).<sup>8</sup>

**Table 3.** Effect of schooling reform on religiosity for females (second stage)

	Religiosity in- dex	Important to those around me	Care about beliefs of others	Interested in reli- gion
<b>OLS</b>				
JHSG	-0.110*** (0.009)	-0.111*** (0.012)	-0.111*** (0.010)	-0.109*** (0.008)
<b>IV</b>				
JHSG	-0.365** (0.154)	-0.360 (0.228)	-0.420** (0.175)	-0.315** (0.158)
Observations	23,468	23,468	23,468	23,468

**Notes:** Robust standard errors clustered at the region of residence by-birth year are reported in parenthesis. Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

### 4.3 Robustness checks

As previously explained, those born in 1986 were dropped from the main estimations. To examine how the results change when this year is included, we repeat the estimations while including it first in the treatment group and then in the control group. Tables 4 and 5 present the results of the first and second-stage regressions suggesting that our findings are robust to these alterations.

<sup>8</sup> Note that our results suggest that exposure to schooling reduced religiosity, while the descriptive statistics in Table 1 suggest that religiosity remained similar in the women exposed to the schooling reform and those who were unaffected (we are grateful to an anonymous referee for pointing this out). This is because the IV estimates are the conditional Local Average Treatment Effects (conditional LATEs), i.e. they show the effect on religiosity conditional on the control variables for compliers (those who changed their intended educational attainment as a result of the reform). The descriptive statistics are the unconditional Average Treatment Effects (unconditional ATEs). Additional education may have affected religiosity directly, or indirectly through its effect on some of the covariates.

**Table 4.** The effect of the reform on completing Junior High School (JHS) for females when 1986 birth cohort is included in the sample (first stage)

	1986 in treatment group	1986 in control group
Treated*Teacher	4.875*** (1.031)	5.656*** (0.861)
F-statistic	22.35	43.18
Observations	25,873	25,873

**Notes:** Robust standard errors clustered at the region of residence by-birth year are reported in parenthesis. Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

**Table 5.** The effect of education on religiosity (second stage) for females when 1986 birth cohort is included in the sample

	Religiosity index	Important to those around me	Care about beliefs of others	Interested in religion
<b>1986 in treatment group</b>				
JHSG	-0.432** (0.179)	-0.425 (0.259)	-0.376* (0.193)	-0.496** (0.210)
<b>1986 in control group</b>				
JHSG	-0.362** (0.154)	-0.354 (0.226)	-0.390** (0.177)	-0.342** (0.146)
Observations	25,873	25,873	25,873	25,873

**Notes:** Robust standard errors clustered at the region of residence by-birth year are reported in parenthesis. Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

Further, we examine the robustness of the first-stage results by birth cohort. We expand Eq. (1) such that, instead of collapsing cohorts to a binary treatment, we interact the policy intensity variable with birth cohort dummies and estimate the effect of the reform on educational attainment separately for each cohort.

$$S_{ipc} = \beta_0 + \beta_1 \sum_{i=1}^{10} (Teacher_{pc} * Cohort_{ic}) + \beta_2 Teacher_{pc} + \beta_3 (Genrol96_p * Treated_i) + \mu_p + \theta_c + \varepsilon_{ipc} \quad (3)$$

where  $Cohort_{ic}$  denotes different cohort dummies. Results are presented in Table 6. In line with our previous findings, the effect of the reform is non-significant for all cohorts before the reform took place, while it turns highly significant and positive for birth years 1987 onwards.

**Table 6.** Estimation effect of schooling reform on female Junior High School Graduation by birth cohort

1982	1.736 (2.178)
1983	-1.436 (1.920)
1984	-1.224 (2.109)
1985	0.573 (2.298)
1986	-0.210 (2.315)
1987	6.607*** (2.154)
1988	6.743*** (2.410)
1989	5.265** (2.482)
1990	5.308** (2.487)
1991	5.105** (2.099)
<b>Observations</b>	<b>23,468</b>

**Notes:** 1981 birth year is the reference category. Robust standard errors clustered at the region of residence by-birth year are reported in parenthesis. Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and teacher ratio by province and year.

**Table 7.** Effect of schooling reform on female education and religiosity when restricting window of birth cohorts to 1982-1990

Variable	First Stage De- pendent Variable		Second Stage Dependent Variables			
	JHSG	Vari- able	Religiosity index	Important to those around me	Care about be- liefs of others	Interested in religion
Treated*Teacher	5.604*** (1.067)	JHSG	-0.320* (0.183)	-0.221 (0.263)	-0.346* (0.201)	-0.394** (0.198)
F-statistic	27.56					
Observations	18,694		18,694	18,694	18,694	18,694

**Notes:** Robust standard errors clustered at the region of residence by-birth year are reported in parenthesis. Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

As a final robustness check, we examine a narrower window of birth years, keeping only those born between 1982 and 1990 in the sample. This brings control and treatment groups closer to each other in terms of age. Individuals born between 1982 and 1985 form the control group with the rest of the treatment group. The caveat here is that the reduction in the number of observations implies larger standard errors. Table 7 suggests that the narrower birth year window does not significantly alter the reform's effect on education or religiosity when compared to the main results.

#### 4.4 Counterfactual tests

To test whether the findings are driven by unobserved time trends, we perform a temporal counterfactual test, whereby individuals born between 1980 and 1982 are denoted as the control group and those born between 1983 and 1985 are denoted as treated. Given that neither of these groups was actually affected by the education reform, we would expect no statistically significant effects either on educational attainment or on religiosity. Table 8 presents the result for the first and second-stage regressions. All coefficients are statistically insignificant and the F-statistic is close to zero, suggesting the absence of effects on outcomes and low explanatory power for the instrument.

**Table 8.** The effect of the reform on female education and religiosity in a temporal counterfactual test

Variable	First stage dependent variable		Second stage dependent variables			
	JHSG	Variable	Religiosity index	Important to those around me	Care about beliefs of others	Interested in religion
Treated*Teacher	-0.071 (1.022)	JHSG	2.555 (39.191)	10.755 (154.057)	-15.143 (213.210)	12.054 (172.684)
F-statistic	0.00					
Observations	25,575		23,468	23,468	23,468	23,468

**Notes:** Robust standard errors clustered at the region of residence by birth year are reported in parenthesis. Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

## 4.5 Heterogeneity

In this section, we present the results of a nuanced analysis of the impact of educational outcomes on religiosity, particularly with respect to gender. Table 9 presents the results of splitting the provinces according to vote percentage for the *Welfare Party* in the 1995 election. Although educational outcomes improve across the board, it is apparent that the magnitude of this improvement is more pronounced in provinces with stronger religiosity. This suggests that the reform might have been particularly instrumental in bridging the educational gap for females in religious regions. This finding has significant implications for gender equality. It indicates that reforms targeting education can potentially counteract deeply entrenched cultural and religious norms that might otherwise hinder female educational attainment. It also resonates with the idea that providing education in regions with stronger religious sentiments can be a strategic move towards achieving gender equality.

**Table 9.** Effect of education on religiosity (i.e. second stage) for females by share of votes for the Welfare Party.

Variable	First stage dependent variable		Second stage dependent variable			
	JHSG	Variable	Religiosity index	Important to others around me	Care about beliefs of others	Interested in religion
<b>Below median Welfare Party vote</b>						
Treated*Teacher	6.177*** (1.345)	JHSG	-0.262 (0.211)	0.048 (0.273)	-0.495** (0.221)	-0.338 (0.271)
F-statistic	21.08					
Observations	11,308		11,308	11,308	11,308	11,308
<b>Above median Welfare Party vote</b>						
Treated*Teacher	9.876*** (1.645)	JHSG	-0.341** (0.141)	-0.482** (0.226)	-0.470** (0.217)	-0.072 (0.105)
F-statistic	36.02					
Observations	11,626		11,626	11,626	11,626	11,626

**Notes:** Robust standard errors clustered at the region of residence by birth year are reported in parenthesis. Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

Table 10 presents results according to provincial income per person. We find that for provinces with higher GDP per capita, the reform had no effect on educational attainment. This means that the instrument is too weak to allow us to make any inference about the relationship between

education and religiosity in such regions. On the contrary, the reform increased education, which lowered religiosity in poorer provinces.

**Table 10.** The effect of education on religiosity (i.e. second stage) for females by provincial per capita income classification

Variable	First stage		Second stage			
	JHSG	Variable	Religiosity index	Important to those around me	Care about beliefs of others	Interested in religion
<b>Low middle income</b>						
Treated*Teacher	6.016*** (1.138)	JHSG	-0.476** (0.241)	-0.336 (0.360)	-0.580** (0.264)	-0.511* (0.265)
F stat	27.95					
Observations	14,497		14,497	14,497	14,497	14,497
<b>High middle income</b>						
Treated*Teacher	-0.511 (1.488)	JHSG	4.074 (11.891)	4.281 (12.284)	5.200 (15.056)	2.740 (8.687)
F stat	0.12					
Observations	8,971		8,971	8,971	8,971	8,971

**Notes:** Robust standard errors clustered at the region of residence by birth year are reported in parenthesis. Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrollment rate in 1996, gross enrollment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

As a final element of our heterogeneity analysis, we explore the impact of education reform on religiosity by comparing regions with a significant Kurdish presence (see Table 11). The instrument is insignificant in the Kurdish areas, but remains significant for the rest of Türkiye. Given that the instrument is weak in areas with a significant Kurdish presence, we are unable to make any meaningful inferences about the effect of education on religiosity there.



**Table 11.** The effect of education on religiosity (i.e. second stage) for females by provincial share of Kurdish population

Variable	First Stage		Second stage			
	JHSG	Variable	Religiosity index	Religious belief important	Other's religious belief important	Interested in religion
<b>Provinces without significant Kurdish presence</b>						
Treated*Teacher	4.873*** (1.060)	JHSG	-0.404** (0.200)	-0.402 (0.300)	-0.454** (0.226)	-0.356* (0.207)
F stat	21.13					
Observations	19,584		19,584	19,584	19,584	19,584
<b>Provinces with significant Kurdish presence</b>						
Treated*Teacher	-3.796 (5.470)	JHSG	-0.454 (1.421)	-0.653 (1.949)	0.447 (1.756)	-1.155 (1.920)
F stat	0.48					
Observations	3,884		3,884	3,884	3,884	3,884

**Notes:** Robust standard errors clustered at the region of residence by-birth year are reported in parenthesis. Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . All regressions control for fixed effects of birth year, the interaction of treatment variable and gross enrolment rate in 1996, gross enrolment rates, fixed effects of 26 regions of residence, the instrument (the interaction of treatment and Teacher ratio by province and year), and Teacher ratio by province and year.

## 5 Conclusions

This paper investigated the effect of education on religiosity in Türkiye after the 1997 Compulsory Education Reform that increased the duration of compulsory education from 5 to 8 years. Our paper extends the existing literature by focusing on the heterogeneity of the policy effect and identifies the channels through which such an effect might work. Further, we offer a methodological extension of the past work by incorporating differential policy intensity in the identification strategy. Using the reform as a source of exogenous variation in schooling, we obtain causal estimates of the effect of education on religiosity.

Overall, we find the reform had a significant impact on female education and religiosity, but had no similar influence on outcomes for males. Specifically, the reform increased the probability that young girls would complete 8 years of schooling and report lower religiosity later in life. The effect of the reform was limited to increasing junior high school completion rates. There appears to be little spillover to higher educational attainment, suggesting that those who complete more than 8 years of education would aspire to higher education levels regardless of the compulsory education law.

The lack of an effect on males potentially implies an imbalance in the experience of young males and females within households. The reform was successful in closing the gender gap in

educational attainment, and through increased female education potentially alter their roles in society. In the absence of the reform, males would still attain roughly the same level of education. In contrast, the reform raised the completion rates for females as their barriers to education were mainly cultural. Exploring heterogeneity of the effect further, we find that the effects are not homogenous across all females. Rather, they are present mainly for females from strongly religious or relatively poor backgrounds. Whether intentional or not, the reform affected these sub-groups that would be disadvantaged otherwise and potentially affords them opportunities to overcome labor-market barriers and close the inequality gap.

Our results partially agree with those of Cesur and Mocan (2018), who also examine the Turkish education reform and find evidence of effects mainly for females currently residing in urban areas (as opposed to the conditions experienced at the time of the reform), which could be an endogenous choice and an outcome of the reform. Looking at the wider literature, a decline in religiosity due to increased education is a common finding in studies controlling for confounding factors. Although generalization across countries is tempting, the lack of heterogeneity in analyses and different contexts make comparisons challenging (Hungerman, 2014; Mocan and Pogorelova, 2014; Becker et al., 2017; Masura, and Yudhistira, 2020). Indeed, correlational studies yield mixed evidence suggesting endogeneity may bias such results (Arias-Vazquez, 2012; Dilmaghani, 2019; Gruber, 2005).

Finally, our religiosity outcome measures are subjective and self-reported, making it risky even to draw inferences even on the wider religiosity of Turkish society. This is important as our causal estimate is the local average treatment effects relevant for educational reform compilers and not average individuals (Imbens and Angrist, 1994). Hence, while the Turkish educational reform seemed to have an effect on those most in need, one should be cautious about generalizing these findings to other contexts or outcomes.

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