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## Compulsory schooling and geographic distribution on voluntary education

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# Compulsory Schooling and Geographic Distribution of Voluntary Education

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# Compulsory Schooling and Geographic Distribution of Voluntary Education

Alpay Filiztekin\* and Can Karahasan†

## Abstract

Compulsory schooling increases average level of education in a country and provides other benefits, its effect on geographical distribution is, however, not obvious. We explore the effect of a sudden change in compulsory schooling in Turkey, that increased mandatory years of schooling from five to eight years, on spatial distribution of educational attainment. Using data on two cohorts, the cohort that had affected by the change and the immediate cohort that had not, we show that an increase in the dispersion of the shares of people with voluntary education across space. We find that that an increase in years of compulsory schooling makes local conditions that already generate heterogeneity more important to shape the distribution.

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# 1 Introduction

The years of compulsory education increased from five to eight years in Turkey in 1997. The immediate effect was a jump from 80% to 85% in net enrollment rate in the first eight grades in one year. Ten years later the net enrollment rate of the relevant population stood above 97%. While the change in the law increased average years of schooling nationwide, little is known about its impact on spatial distribution of educational attainment within the country.

Compulsory schooling has been a common policy all around the world in the second part of the twentieth century. Murtin and Viarengo (2011), investigating the practice in Western Europe, argue that increases in years of compulsory schooling is mainly driven by the fact that education has decreasing returns. Countries with lower level of education benefited more from extended compulsory schooling and thus able to catch up with more advanced ones. They also provide evidence that countries with higher level of international openness adopted higher levels of compulsory schooling, as rising globalization forced countries to be more competitive in global markets, and compulsory schooling fosters competitive workforce. Applying the same arguments to regions within a country, one would expect that regions with lower level of educational attainment and better access to markets should benefit more from an increase in compulsory years of schooling. However, Machin et al. (2012) show that there is positive correlation between education and labor mobility. To the extent an increase in compulsory education encourages voluntary education (degrees earned beyond required level), it is very likely that labor becomes more fluid and agglomeration forces may cause a divergence in educational attainment across regions.

There are a number of research on the effects of compulsory schooling, mostly in developed countries. These studies have shown that compulsory schooling produced a wide range of outcomes, from reduction in drop-out rates (Angrist and Krueger, 1991), increase in higher educational attainment (Brunello, 2009) and significant improvements in wages in the order of 10%-15% (Acemoglu and Angrist, 2001; Oreopoulos, 2006, 2007) to non-pecuniary benefits, such as reduction in the crime rates (Lochner and Moretti, 2004) or increases in average health status (Albouy and Lequien, 2009; Lleras-Muney, 2005).

Among very few studies investigating the effect of compulsory schooling in developing countries, both Spohr (2003) and Tsai et al. (2009) find a positive effect of an increase in mandatory years of schooling on average educational attainment in Taiwan, though the former study reports differential outcomes for gender. The only study that investigated the effect of the change in the law in Turkey is by Kirdar et al. (2014) who focus on the differential impact across gender and urban-rural residence. They find that the change in the policy did not improve the gender gap, in fact, even widened the gap in urban areas in post-compulsory schooling, while the policy produced an equalizing effect of urban and rural children substantially. However, to our knowledge, there are no studies looking into the effect of a change in compulsory schooling on regional distribution of human capital.

There is now a consensus based on extensive theoretical and empirical research that human capital is one of the most important determinants of well-being and economic growth. There is also ample evidence on regional disparities in income levels within countries. While we have better information about the distribution of educational attainment, as a proxy for human capital, at international level (Barro and Lee, 2010), aside a few exceptions (e.g., the analysis of regions in Europe by Rodríguez-Pose and Tsellios, 2011), we know little about its distribution within a country. In another paper we discuss the distribution of educational attainment in Turkey, a country with substantial regional disparities. In that paper we target individuals who are between ages 25 and 64 and who are not affected by the change in the law. Our findings show regional heterogeneity in educational attainment, and indicate convergence of average years of schooling, particularly by the younger generations, but divergence in the share of individuals with a university degree.

In this paper we focus on the effects of compulsory schooling on geographic distribution of educational attainment. Our analysis is based on district level data from 2010 for two cohorts of individuals: a young cohort, those who are between the ages 22 and 24 in 2010 and affected by the change in the law, and an older cohort, those who are between ages 25 and 29 and not affected by the change. We focus on the proportion of individuals who had more than required eight years of education. Our analysis shows that increased years of compulsory schooling magnifies the importance of local conditions that already generate heterogeneity across districts.

In the next section we provide a brief description of Turkish education system. Then we provide evidence that the geographic distribution of those with voluntary education is much dispersed than the older cohort. We then explore whether conditions in districts that were prevailing when both cohorts were still at a young age can explain the observed differences.

## 2 Turkish Education System

Before the change in compulsory schooling law in 1997, Turkish education system was based on four tiers, a five-year primary school, attendance to which was mandatory, a three-year upper primary school followed by another three-year highschool and finally university education. As of year 2000, average years of schooling of the population aged between 22 and 64 was 6.2 years, with 17% of the population not having a five-year primary school diploma, implying that not everybody complied with the rule. The share of population with an eight-year primary school diploma was 9.0%, the shares of highschool and university graduates were 15.5% and 8.7%, respectively.

There had been several attempts to increase compulsory schooling to eight years before. National Education Council's suggestion in 1946 and a partial change in schooling law in 1961<sup>1</sup> could not be implemented at all. A couple of experiments in a few selected schools in 1971 and 1981 requiring selected students to have eight years of education has also been abandoned shortly on the account of insufficient infrastructure to extend the policy to all students.

The change in the compulsory schooling law in 1997 that combined the two primary levels and increased mandatory schooling to eight years was politically motivated and sudden. A conservative and Islamic oriented government is forced to resign under the pressure from the Turkish Military and the first act of the new government was to change the compulsory schooling law. The new policy was a response to rising popularity of religious schools, particularly at upper primary level, and rising Islamic tendencies in politics.

The change in the law affected individuals who are born in 1986 or later. The number of students in the first eight grades increased from around 8.5 million in 1996-1997 to 10 million in 1999-2000 education year. The Ministry

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<sup>1</sup>The law required everyone to have a five year education provided by primary schools and a three additional years of complementary, mostly vocational, training.

of National Education reacted to the challenge of rising number of students by bussing students from rural areas to schools in urban areas and constructing new boarding facilities at selected centers, instead of building new schools, particularly in rural areas where only schools with the first five grades were available<sup>2</sup>. Indeed, through consolidation of available buildings, the number of schools at the primary level decreased from 56 thousand (47 thousand of which were schools with first five grades) to 47 thousand in the first year of implementation.

Average years of schooling of the same age group increased to 7.7 years in the next ten years. The share of those with eight-year education was 19.1%, the share of highschool and university graduates were, 22.9% and 12.5%, respectively. Part of the increase can be explained by higher demand for education over time. However, as we demonstrate below, the new policy and improvement in access also play an important role.

We have shown in an earlier paper that there are significant differences in educational attainment across regions in Turkey, especially regions in the east had much lower average years of schooling. Our interest here is whether the change in compulsory schooling has decreased the gap. More years of mandatory schooling is expected to cause convergence of average years of education across regions, despite defects of compliance with the law. A further consequence is, however, that it increases the demand for voluntary education as the sunk cost, additional three years of mandatory education, increases. The benefits of more education exceeds the costs only if the economic conditions are suitable. In regions where economic prospects are dim, either students leave school early or those who acquire higher level of education migrate. The agglomeration of skills in certain centers means increasing inequality both in human capital and in economic well-being. Therefore, compulsory education may result in regional divergence to the extent it encourages higher levels of education. The outcome of such a change is, then, an empirical issue and that is the main focus of the current study.

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<sup>2</sup>Most schools were providing education only half a day. Creating two shifts, one in the morning, the other in the afternoon, increased the utilization of school buildings.

### 3 Data

The data we use are obtained from Address Based Population Records in 2010. The unit of our analysis is districts, the smallest administrative unit for which we have data. Some provinces, upper level administrative units, are quite large in size<sup>3</sup> and our initial analysis shows that the variation in average years of schooling within provinces is as high as between provinces. For each of 876 districts<sup>4</sup> we have information on the number of individuals with the latest degree earned by age group and gender.

We focus on individuals who are at the age between 22 and 24 in 2010<sup>5</sup>, the first three-year cohort affected by the change in the law. These individuals are expected to have earned an eight-year primary school diploma and could have earned at least a high school diploma by 2010, if they choose to<sup>6</sup>. Our comparison group is the immediate cohort that consists of individuals born between 1981 and 1985 and was exempt from the change in the law.

Table 1: The Share of Population with Highschool and More Education

	Weighted Mean	Unw. Mean	Min.	Max.	p75-p25 Difference
Ages 22-24					
Total	58.1	51.1	11.4	88.9	21.5
Males	63.3	57.9	19.0	90.1	18.9
Females	53.0	44.2	4.5	88.0	25.6
Ages 25-29					
Total	48.9	41.5	11.5	78.1	17.4
Males	54.8	50.0	16.1	86.4	17.9
Females	43.1	32.7	5.1	76.4	19.2

<sup>3</sup>The province Konya, for example, covers an area of over 40 thousand square kilometers and is larger than Switzerland.

<sup>4</sup>Our districts are based on 2000 division. We have originally 923 districts, however we have aggregated metropolitan areas in large cities.

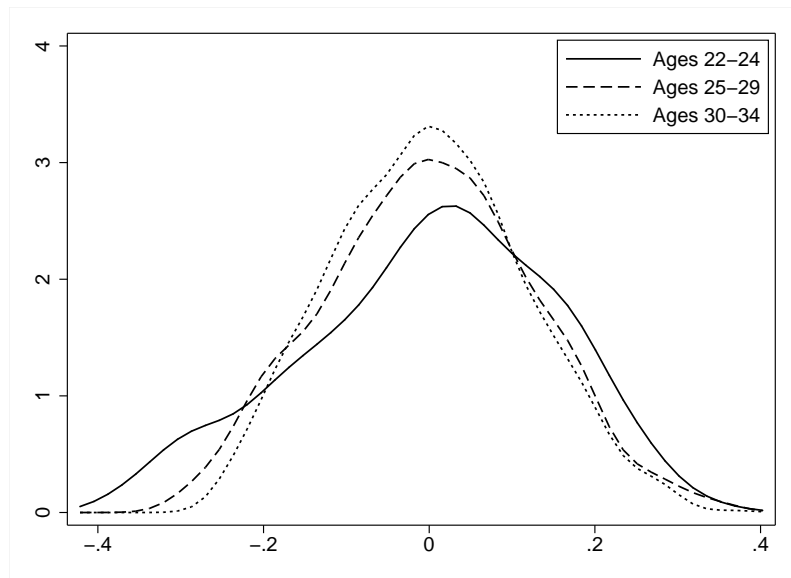
<sup>5</sup>Data provided by the TurkStat are not available by single ages.

<sup>6</sup>These individuals should be able to earn at least a high school degree in 2010, if they comply with the law and do not repeat certain grades more than four years. Note that, the procedure in the Turkish education system is rather peculiar. It is not possible to drop-out in the primary school under the age of 17 which is the legal minimum school leaving age. Even if students do not attend classes, it is not possible to repeat or drop-out at this level. In the secondary education, however, repeating and dropping out is possible but a rare event.



The variable of interest is the share of individuals who have at least a high school degree, enabling us to measure the extent of voluntary schooling beyond mandatory years in each district. The first column of Table 1 provides nationwide averages. The cohort that was subject to change in the law has nine percentage points more individuals with a highschool and above degree. There is an increasing trend of educational attainment over generations, yet the difference between the cohort ages 25-29 and an older cohort ages 30-34 was 5.7%, indicating that the increase in compulsory schooling may have given an additional boost to attainment.

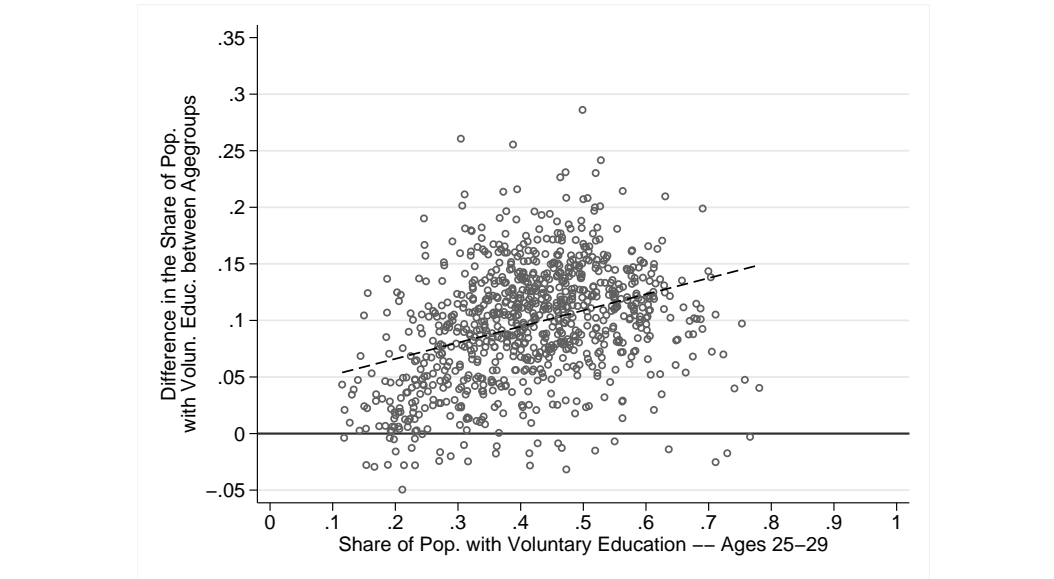
Figure 1: Kernel Density Estimates, Shares of Population with Highschool or more Educational Attainment



Note: Deviations from National Average.

We are, however, interested in regional differences. Mean share over districts reported in the second column was 41.5% for old cohort and 51.1% for the young cohort. Both figures are smaller than national average due to more populous districts having higher share of educated people. While the change is similar to nationwide average, the range of shares has increased, especially at the upper end of the distribution. The interquartile range, provided in the last column, was 17.4% for age group 25-29; over half of the districts had between 32.6 percent and 50.0 percent highschool or higher degree earners. The difference between districts that are at the 75th percentile and at the 25th percentile was 21.5 percent for the young cohort.

Figure 2: Change in Attainment Across Cohorts



The widening of the distribution can be more easily seen in the density estimate in Figure 1, where we provide the distribution of the deviation of shares from national average across districts. The median is very close to zero for the old cohort, but it is 1.3% for the young. The distribution for the young cohort is also skewed to the right and has significant tails while the distribution of the old cohort is much closer to a normal distribution.

The figure also provides distribution for an older cohort to emphasize that the geographic distribution of shares changed after the increase in the years of compulsory schooling. All moments of distributions of previous two cohorts are very similar and Kolmogorov-Smirnov test for equality of distribution fails to reject the hypothesis that the distributions for ages 25-29 and ages 30-34 are different, whereas the hypothesis is rejected for the young cohort with a p-value of 0.029.

There is also heterogeneity across districts of the effect of compulsory education. In Figure 2 we plot difference of the shares between two cohorts against the share of 25-29 year old population with highschool or more education. The figure indicates divergence with a statistically significant slope coefficient of 0.14. The regression R-squared is, however, 0.12. While in some district the share of young population with voluntary education was more than 20% higher than their immediate older cohort, in others the share has actually declined.

The data reveal that the increase in the years of compulsory schooling had

an impact on geographic distribution of educational attainment and that the effect is not uniform across districts. In the next section we explore differences in the initial conditions that might have a bearing onto the final distribution of education.

Before pursuing further, it should be noted that in Turkey women have typically less education and participate less in the labor force. A common argument to explain this fact is that traditional values in Turkish society prevent them to obtain more education and participate in labor market. In Table 1 we also provide statistics by gender. The share of women with voluntary education was ten percentage point less than males for both cohorts. Similarly, the labor force participation among women was 27.6% in 2010 as opposed to 70.8% for males. The gap closes as women have more education. The labor force participation rates among those who have highschool or more education is 47.4% and 77.7% for women and men, respectively. Hence, it is possible the factors that explain the decision to continue with education and/or migrate could be different for females. In the next section we differentiate with respect to gender.

## 4 Empirical Model

Our aim in this section is to explore conditions that helped some districts to attract more educated people using an empirical model. As we lack data on migration, our model is unable to identify the true mechanism behind the observed divergence, whether increase in mandatory years of schooling increased demand in some districts but not in others, or in all districts demand has increased, yet individuals with higher education migrated to benefit from external economies. Machin et al. (2012) show that mobility increases with education and the effect of an increase in mandatory schooling increased migration rates in Norway. The aggregate statistics on migration in Turkey also show individuals with more education are more mobile. Thus, it is very likely that the observed differences is partly due to increased migration rate.

The empirical model is then formed to predict the spatial structure of educational attainment. The dependent variable is the share of population with highschool or more education in each cohort. We pool data for both cohorts and interact all explanatory variables with a dummy variable for the

young cohort to identify differential effects. The independent variables are obtained from 2000 Population Census Tables and correspond to the year when the old cohort was between ages 15 and 19 and the young cohort was just starting or finishing their mandatory eight years of education.

The new economic geography models, e.g. Redding and Schott (2003), predict that the distance from economic activity is detrimental to human capital accumulation. Empirically López-Rodríguez et al. (2007) have shown that it is the case in the European Union. Therefore, the first variable we use is a measure of market access computed as the (great circle) distance-weighted sum of population,  $m_{jt} = \sum_i \frac{P_{i,t}}{d_{i,t}}$  and normalized to  $M_{j,t} = \frac{m_{j,t}}{\bar{m}_t}$ .

Berry and Glaeser (2005) argue that clustering of skilled people in certain areas is driven by the tendency of skilled entrepreneurs to employ other skilled people. Our empirical specification includes share of managers, to be more specific the share of employers and professionals, as an explanatory variable. While we do not have information what percentage of these have higher education at district level, at national level more than two thirds of these individuals have a university degree.

We also control for district level economic activity by using employment rate as a proxy. To measure job availability we use unemployment rate. Sectoral composition could also be an important determinant of clustering of more educated people as some sectors do not require high skills. We have also included shares of agriculture and manufacturing employment as explanatory variables. Other controls include the size of the district measured as logarithm of population, urbanization rate, whether the district is located at a sea coast and a set of province level dummies.

The decision to continue education also depends on outside alternatives; if there are not many job opportunities people may choose to continue with their education. To control for the cost of attending school, we included the unemployment rate of those at the ages of 15 to 19 in our specification. We expect this variable to be negatively correlated with our dependent variable, particularly for the older cohort who had to make the decision whether to attend highschool or not.

The government response to rising number of students was to buss those residing in rural areas to urban centers or to built boarding facilities. While most of the burden was on the state, we included a variable measured as

Table 2: Impact of Local Conditions on Voluntary Education

Dep. Variable Sh. of Pop. with Voluntary Education		
Indep. Variables are values at 2000.		
	Age 25-29	Interaction with Age 22-24
Mrkt. Potential	0.083*** (0.030)	0.016 (0.014)
Sh. of Managers	1.527*** (0.404)	0.401** (0.157)
Emp. Rate	0.248* (0.139)	-0.028 (0.030)
Unemp. Rate	-0.426** (0.199)	-0.233** (0.099)
Sh. of Agr. Emp.	-0.265*** (0.090)	0.096*** (0.034)
Sh. of Man. Emp.	-0.483*** (0.088)	0.073 (0.045)
Unemp. Rate (Ages 15-19)	0.192*** (0.034)	-0.057*** (0.019)
Cost	0.011 (0.011)	-0.014** (0.006)
Prov. Center	-0.013 (0.013)	-0.011* (0.007)
Urb. Rate	0.155*** (0.053)	0.051** (0.025)
ln(Pop.)	-0.012 (0.016)	0.015* (0.008)
Coastal District	0.013 (0.013)	0.004 (0.006)
R-squared	0.567	

Robust standard errors in parentheses are corrected for the potential clustering of the residuals at province level. Regressions include province level dummies.  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

the product of number of students at the age of 12-14 in rural areas in 2000 and average distance within a district measured as  $0.66\sqrt{\frac{area}{\pi}}$ , to make sure that whether a ‘cost’ had an impact on the decision about further education, particularly for younger cohort.

Finally, our model includes dummies for district that are provincial centers where the presence of the government is stronger and businesses usually have their headquarters. More importantly, in year 2010 some individuals within the young cohort may be attending universities which were almost always located in provincial centers and may cause a clustering of more educated of this cohort in such districts.

Estimation results are given in Table 2. The first column reports estimated coefficients for the old cohort. Market potential has a positive and significant effect on the share of voluntary education confirming the prediction of new economic geography models. Districts that have more access to larger markets tend to attract more people with higher education. The coefficient of the share of managers is also positive and significant, a one percent increase in the share of managers increases the share of voluntary educated people 1.5%. Berry and Glaser's (2005) argument that there is higher demand for skilled people in skilled cities is also valid for the Turkish case.

As expected there is positive relationship between employment rate and share of high educated individuals, but the relationship is weak. In contrast the effect of unemployment rate is significantly negative. We find more of highly educated people in districts where there is significant economic activity but not an excess supply of labor. The coefficients of the shares of agriculture and manufacturing are both negative indicating that both sectors are not very skill-intensive. More urbanized districts also tend to attract educated individuals.

The opportunity cost of attending school measured as the unemployment rate of those at ages 15-19 comes out to be an important determinant of voluntary education. The evidence is when job opportunities are limited students choose to continue with their education. Being a provincial center does not make a district more attractive once other factors are controlled for.

The second column of the table shows the coefficients of interaction terms. In general, all factors that are significant to determine the distribution of voluntary education of the older cohort are also significant for the younger cohort, but the magnitude of some of the coefficients differ. Voluntary educated young cohort is more likely to cluster in districts that have higher share of managers and more responsive to the unemployment rate.

The interaction terms for sectoral share variables are positive, though only

Table 3: Impact of Local Conditions on Voluntary Education by Gender

Dep. Variable Sh. of Pop. with Voluntary Education				
Indep. Variables are values at 2000.				
	Males		Females	
	Age 25-29	Interaction with Age 22-24	Age 25-29	Interaction with Age 22-24
Mrkt. Potential	0.095** (0.038)	0.016 (0.012)	0.056* (0.033)	0.027 (0.023)
Sh. of Managers	1.408*** (0.382)	0.122 (0.196)	1.765*** (0.368)	0.764*** (0.186)
Emp. Rate <sup>a</sup>	0.114 (0.126)	0.006 (0.044)	0.152 (0.102)	-0.056** (0.025)
Unemp. Rate <sup>a</sup>	-0.303 (0.197)	-0.067 (0.081)	-0.249 (0.196)	-0.359** (0.149)
Sh. of Agr. Emp.	-0.264*** (0.082)	0.100 (0.034)	-0.278*** (0.072)	0.062 (0.042)
Sh. of Man. Emp.	-0.476*** (0.080)	0.075 (0.047)	-0.414*** (0.101)	0.173*** (0.059)
Unemp. of Young <sup>a</sup>	0.182*** (0.038)	-0.055** (0.022)	0.083*** (0.021)	0.001 (0.017)
Cost	0.013 (0.011)	-0.012* (0.007)	0.016 (0.012)	-0.018** (0.008)
Prov. Center	-0.016 (0.014)	-0.017** (0.008)	-0.007 (0.013)	0.000 (0.008)
Urb. Rate	0.152*** (0.056)	0.036 (0.028)	0.063 (0.052)	0.009 (0.027)
ln(Pop.)	-0.023 (0.016)	0.022** (0.009)	-0.013 (0.016)	0.010 (0.010)
Coastal District	-0.003 (0.014)	0.011* (0.006)	0.036*** (0.013)	-0.002 (0.009)
R-squared	0.672		0.774	

Robust standard errors in parentheses are corrected for the potential clustering of the residuals at province level.

Regressions include province level dummies.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

<sup>a</sup> Gender specific values.

the effect of agriculture is significant. This may be due to higher sunk cost, as students spend more years in school, they have chosen to stay even longer in school even when sectoral needs do not require higher skills. Similarly the effect of unemployment rate of the young is less detrimental for further education. These results show that compulsory schooling increased the demand for further education, yet migration is what is driving the final distribution.

We repeat the same regressions for both genders and estimates are given in Table 3. The results are similar to the previous table, again there are differences in magnitudes across genders. Market potential and unemployment rate are of the young more important for males than females. On the other hand, the share of female highschool or more graduates is much larger in districts where there are more managers. The interaction term with the share of managers is positive and significant only for females, younger females with more education cluster in the districts where entrepreneurial capital is higher.

## 5 Conclusion

There is now a consensus that human capital or, in its simplest form, education is an important factor for local development. Therefore any incentive, even if it is an increase in the years of mandatory schooling, to increase the level of education is welcome by many. While such a policy may increase human capital at national scale, its effect on spatial distribution of the stock of education is not clear. In this paper we explored this avenue using data from Turkey.

Mandatory schooling is expected to equalize human capital across space, on the presumption that there are no frictions. Our analysis is based on a comparison of the first cohort that has affected by the change in law and their immediate older brothers and sisters. We have convincing evidence that compulsory schooling increased overall spatial variance of voluntary education.

The geographical distribution of education will be determined by migration of individuals. Our question is not about who decides to acquire more education, but rather, and possibly as a consequence of migration decisions of individuals, about the clustering of more educated people. Our findings show that an increase in years of compulsory schooling magnifies the importance of local conditions that already generate heterogeneity. Two important such



factors are access to large markets and the existence of a large pool of entrepreneurs. While the impact of the former variable does not change across cohorts, compulsory schooling increased the importance of the latter, particularly for women.

While we are not truly able to identify whether more years of mandatory schooling increased the demand for further education, weakening of the importance of certain variables, such as low productive sectors, may imply that it is the case.

From a policy perspective, an increase in compulsory schooling years has many benefits, but geographic inequality is not one of those. If there exist negative externalities of clustering of skilled individuals in certain locations, then other measures to compensate the effect of compulsory schooling needed to be considered.

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