

The impact of a minimum wage increase on employment and school enrollment: evidence from Turkey

Ozan Bakis ¹ Mehtap Hisarciklilar ² Alpay Filiztekin ³

¹TUSIAD-Sabancı Uni. Competitiveness Forum, bakis@sabancıuniv.edu

²Staffordshire Uni., M.Hisarciklilar@staffs.ac.uk

³Sabancı Uni., alpayf@sabancıuniv.edu

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Outline

- 1 Introduction
- 2 Model
- 3 Data and methodology
- 4 Results
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Outline

① Introduction

② Model

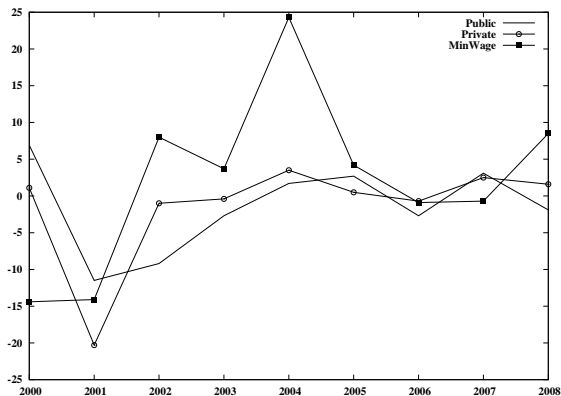
③ Data and methodology

④ Results

⑤ Conclusion

Motivation I

Figure: Percentage changes in net real wages: 2000-2008



Source: State Planning Org., <http://www.dpt.gov.tr/>

Motivation II

- In 2004, minimum wage raised by 24.3% in Turkey
- Goal of minimum wage increase: to decrease income inequality and to increase the living conditions of low-wage workers.
- Potential effect on school vs. work choice : **price vs income** effect
 - price effect: opportunity cost of being in school and wage premium between skilled and unskilled
 - income effect: the effect of minimum wage increase on family income. Stronger if borrowing (credit) constraints are binding.
- schooling \rightsquigarrow human capital \rightsquigarrow economic growth and development
- particularly important given the relatively high share of youngs in Turkish society.

Main result I

Using micro-level data obtained from TurkStat's Household Budget Surveys, we apply a nonlinear difference-in-difference (D-i-D) specification and find:

the rise of minimum wage in 2004 has encouraged young people (aged 15-19) to enroll in schooling and to reduce their labor supply.

Related literature I

- Neumark and Wascher (1995a, 2003): minimum wage increase leads to a decline in enrollment rate and an increase in the ratio of teenagers neither employed nor enrolled in the USA.
- Landon (1997) confirms Neumark and Wascher's findings for Canada.
- Chaplin *et al.* (2003): negative effect of minimum wage increase on enrollment in states where one can drop out at age 17 or earlier in the USA.

Related literature II

- Pacheco and Cruickshank (2007): in New Zeland, a minimum wage **increase** has
 - no effect on enrollment rates of 16-24 year olds; but
 - a negative effect for 16-19 year old youngs.

However, the **introduction** of minimum wage has a positive and statistically significant effect on enrollment rates for both 16-19 and 16-24 age groups.

- Stewart (2002) is the closest paper to ours (low- and high-impact regions and the D-i-D estimator): He does not does not find any significant negative effect of the introduction of the minimum wage on employment growth, for both 18-21 and 18+ age groups.

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Simple model of investment in schooling I

- Two-period overlapping generations model.
- Labor supply is inelastic; each agent has one unit of time endowment.
- Assume that there are two wages in the economy. The unskilled workers are paid w^L which represents the minimum wage set by government. Skilled workers get w^H , where we expect $w^H \geq w^L$.
- Each parent has one child that is birth in the beginning of the second period.
- Every child is characterized by the same ability in order to focus on the role played by family income and borrowing constraints.

Simple model of investment in schooling II

- Parents utility function depends on their own consumption in the first period (c) and the gift they make to their offspring in the second period (x).

$$U(c^i, x^i) = \log c^i + \log x^i$$

- The cost of the school f is constant and indivisible as in Galor and Zeira (1993).

Simple model of investment in schooling III

- The consumer i 's maximization program:

$$c^i + s^i = b^i - ef$$

$$x^i = s^i R + ew^H + (1 - e)w^L$$

$$s^i \geq 0$$

- b^i is the bequest that children get from their parents. It is likely that this bequest will be a function of family income; w^H and w^L are, respectively, skilled and unskilled wages;
- s^i is saving which is required to be non-negative;
- e is a discrete choice variable: it is equal to 1 if parents decide for schooling and 0 otherwise.

Simple model of investment in schooling IV

- If there were no borrowing constraints, the schooling decision would depend only on the difference between wage premium and schooling cost.

$$\frac{w^H - w^L}{R} - f$$

- But if there are borrowing constraints not only the university wage premium but also the level of family income matters for the decision to go to the school or not. We can show that the schooling investment decision is made only if

$$b^i \geq b^*, \quad \text{where } b^* = \frac{fw^H}{w^H - w^L} \quad (1)$$

Simple model of investment in schooling V

- A minimum wage increase affects both sides of the above inequality.
 - $db^*/dw^L > 0$ which implies that the number of children who would like to invest in schooling decreases when minimum wage increases (for a given income distribution). The wage gap between skilled and unskilled workers decreases, and the opportunity cost of education increases with w^L .
 - To the extent that the family income of poor households increase with minimum wage, this is $db^i/dw^L > 0$, one expects that the number of families (or children) able to invest in schooling goes up when minimum wage goes up. This is the usual income effect.

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Methodology I

- Since enrollment and employment decisions of individuals are not independent from each other, both activities should be modeled together.
- Most of the previous literature (e.g. Neumark and Wascher, 1995a, 1995b, 2003) uses conditional/multinomial logit modeling. This amounts to treating the outcome as a result of single decision making among distinct alternatives.
- This study utilizes bivariate probit modeling rather than multinomial choice modeling. This allows us to model enrollment and employment choices as two separate, but related decisions.

Methodology II

- The main idea behind the D-i-D specification is the comparison of control and treatment groups before and after a change. We try to see if the *difference between t and t'* of the treatment group is statistically different from the *difference between t and t'* of the control group.
- A very important point for the identification of the treatment effect is whether or not we can control for **other factors that are likely to change in one group but not the other at the same time as the treatment**. This would bias our results because the assumed counterfactual may not be true anymore.
- Identification of these two groups has not been straightforward for this study since the minimum wage change was introduced all across the country.

Methodology III

- Following the arguments developed in Card (1992), and the empirical approaches of Stewart (2002) and Khamis (2013), we use the extent to which regions are affected by minimum wage increase to determine our treatment and control groups.
- **IDEA:** An increase in minimum wage will mainly affect the enrollment and labor supply decisions of the teenagers from low income households/regions but would hardly make any difference for the decisions of teenagers from high income households/regions.
- As a result, low- and high-impact groups are specified according to the **percentage of people earning at or lower than the minimum wage level** in each region.

Methodology IV

- Empirical model

$$Y_{irt} = \beta_0 + \beta_1 T_t + \beta_2 HI_r + \beta_3 T_t \times HI_r + \beta_4 Z_{irt} + \beta_5 X_{rt} + u_{irt}$$

Y_{irt} : a binary variable showing the employment or enrollment outcome.

T_t : time dummy which is 1 for $t \geq 2004$ and 0 for $t < 2004$.

HI_r : a dummy variable for the high-impact (treatment) group.

Z_{irt} : individual characteristics and family background variables.

X_{rt} : other regional and time specific variables susceptible to affect work-school arbitrage such as number of students per teacher, regional unemployment rate.

- The parameter of interest is β_3 , which would be the estimator of the treatment effect if we were to estimate a linear regression model.

- Since the above explained model is estimated by bivariate probit modeling, the treatment effect is not constant across the treated group and is derived by Puhani (2012) as:

$$\tau = \Phi(\beta_1 + \beta_2 + \beta_3 + \Lambda) - \Phi(\beta_1 + \beta_2 + \Lambda)$$

where $\Lambda = \beta_0 + \beta_4 Z_{irt} + \beta_5 X_{rt}$, and $\Phi(\cdot)$ is the cumulative standard normal distribution function.

- Since Ai and Norton (2003) show that the statistical significance of an interaction term in nonlinear models (in our case β_3) cannot be tested for using the usual t -testing procedure we use bootstrapping method (500 replications).

- We use TurkStat's Household Budget Surveys of 2003 and 2004-2006.
- For each Nuts2 region, the percentages of wage earners with a wage income equal to 2003 minimum wage level or lower are calculated using the 2003 data.
- Regions with a ratio lower than 16% are classified as the low-impact group (TR10Ist, Erzu-Erzi-Bay, Ank) and the ones with a ratio above 37% are classified as high-impact group (Sam-Tok-Cor-Ama, S.urf-D.bak,).

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Results I

Table: Percentage dist. of teenagers (15-19): employment and enrollment

Outcome	Control Group		Treatment Group	
	Before	After	Before	After
Not employed, not enrolled (NENE)	27.71	28.16	30.45	32.39
Not employed, enrolled (NEE)	53.34	50.89	35.92	42.67
Employed, not enrolled (ENE)	16.32	17.66	31.04	22.02
Employed, enrolled (EE)	2.64	3.28	2.58	2.92
Total	100	100	100	100

Before: 2003 survey, After: Pooled 2004-05-06 surveys

Change in NEE + EE: Control (-1.8%) vs treatment ($+7.1\%$).

Change in ENE: Control ($+1.3\%$) vs treatment (-9.0%).

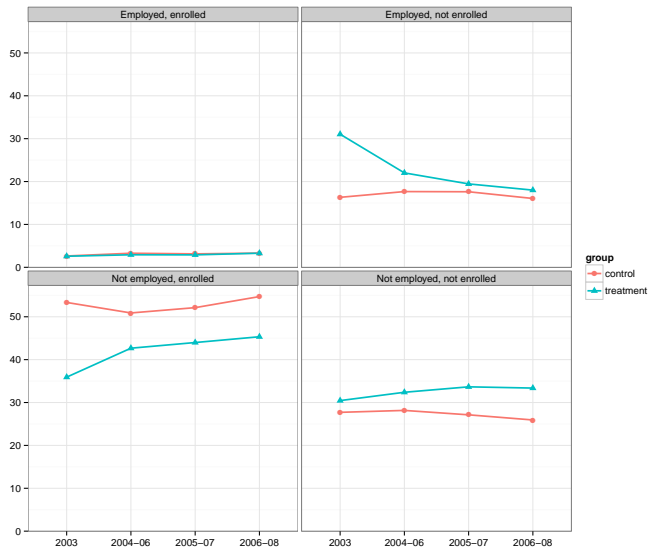
Results II

Outcome	Control Group				Treatment Group			
	Period 1	Period 2	Period 3	Period 4	Period 1	Period 2	Period 3	Period 4
Not employed, not enrolled	27.71	28.16	27.13	25.93	30.45	32.39	33.66	33.37
Not employed, enrolled	53.34	50.89	52.13	54.71	35.92	42.67	43.99	45.34
Employed, not enrolled	16.32	17.66	17.62	16.05	31.04	22.02	19.45	18
Employed, enrolled	2.64	3.28	3.13	3.31	2.58	2.92	2.90	3.29
Total	100	100	100	100	100	100	100	100

Period 1 : 2003, Period 2 : 2004-05-06,

Period 3 : 2005-06-07, Period 4 : 2006-07-08

Results III



Results IV

Table: Bivariate probit estimation results

Variable	Enrollment Regression		Employment Regression	
	Model 1	Model 2	Model 1	Model 2
After treatment	-0.013 (0.058)	-0.052 (0.053)	0.095 (0.066)	0.127** (0.062)
Treatment group	-0.225*** (0.051)	-0.211*** (0.051)	0.178*** (0.066)	0.112* (0.059)
Interaction term [†]	0.205*** (0.069)	0.213*** (0.071)	-0.259*** (0.085)	-0.273*** (0.082)
No of student per teacher (1000)	8.479 (5.545)			
Unemployment rate			-2.077 (2.302)	
Teenage ratio			-6.914*** (1.555)	
OTHER CONTROLS				
Rho [‡]	-0.698*** (0.016)	-0.696*** (0.016)		
Number of observations	5704	5704		
Prob > Wald chi2 (overall model)	0.000	0.000		

Note: Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results V

- Our bivariate probit approach seems relevant given that the rho coefficient (correlation between the error terms of the two regressions) is significant.
- The **interaction term**, is significant in both regressions and is positive for enrollment while it is negative for employment.
- Looking at the breakdown of the treatment effect for binary combinations of all outcomes, our results suggest that the impact of a change in minimum wage is observed as **a shift from “employed, not enrolled” category to “enrolled, not employed.** (Not shown in the presentation)

Results VI

- The enrollment and employment outcomes are derived mostly by similar factors. Therefore most of the individual level regressors in the two regressions are common, except for the inclusion of number of siblings in the enrollment and dependency ratio in the employment regressions.
- The number of students per teacher is included to proxy for the exogenous education supply while the regional unemployment rate and ratio of teenagers aged 15-19 in total population, respectively, proxy for labour demand and labour supply.

Results VII

- **OTHER CONTROLS:** Female dummy, urban residence dummy, father/mother education, single dummy, employment status of household head, number of siblings, dependency ratio (the ratio of number of income earning household members to household size).

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Conclusion I

- This study has examined the impact of a jump in minimum wage on teenage school enrollment and employment in Turkey.
- Using TurkStat's 2003-2006 Household Budget Survey data, we have applied a nonlinear D-i-D specification and estimated bivariate probit models of enrollment and employment outcomes. We use regional regional variation in the share of minimum wage earners to define control and treatment groups.

Conclusion II

- The results suggest that an increase in minimum wage has encouraged teenagers to enroll in schooling and reduce their labor supply.
- This result is compatible with the credit constraints argument: To the extent that an increase in minimum wage ameliorates the household income of credit-constraint families, the financial barriers to education will be mitigated. Thus, people now being able to afford further education, will lower their labor supply.