General versus Vocational Education: Lessons from a Quasi-Experiment in Croatia

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Motivation

- Immense literature on returns of education neglects the content of education.
- How to combine general and practical curriculum remains an open question.
- General versus vocational education:
  - Vocational education - acquired skills may ease the transition into the labor market but may later on become obsolete at a faster rate.
  - General education - broader knowledge that can serve as a sound basis for subsequent learning and specialization, skill multiplier.
  - General education is especially important for the fast-changing economy, as individuals can adopt new technologies more quickly (Goldin, 2001; Hanushek et al., 2011).
  - Paper that identify the causal effect of more general education: Malamud and Pop-Eleches (2010), Oosterbeek and Webbink (2007), Hall (2012, 2013).

This paper

- Explores "general education - better adaptation" nexus:
  - Is there a general education labor market premium in post-transition Croatia?
- Identifies causal effect of more general education:
  - Exploits the high school educational reform implemented in 1975 and 1977.
  - Timing of the reform and elementary school entry rules $\Rightarrow$ RDD framework.
- Finds no significant premium:
  - Reform increased high-school dropout incidence $\Rightarrow$ **unintended** reform effects.
  - This upsets whole identification strategy making estimates upwards biased.
  - Given the potential upward bias no effect seems even more surprising.
  - Selection in the type of program is driving differences.

Structure of the talk

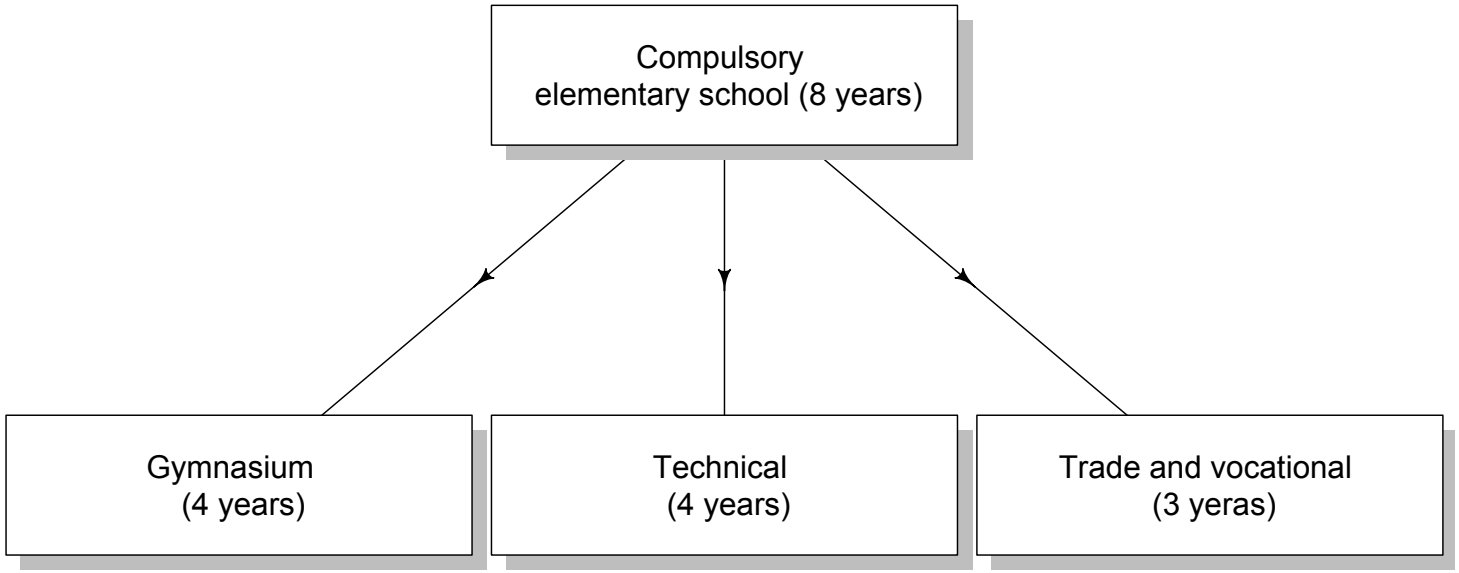
- More on the educational reform.
- Data and metrics.
- Results:
  - Educational decision change $\Rightarrow$ **unintended reform effects**.
  - More general education and the labor market.
- Conclusions.

Educational reform in Croatia

- Prior to the educational reform in 1970s:
  - Education in Yugoslavia was regulated at the federal level by the General Law on Education from 1958.
  - Children started eight-year compulsory elementary education at the age of seven.
  - Depending on their elementary school performance and aptitude, they could enroll: gymnasium, art school, technical school, trade or vocational school, teacher's school and military secondary school.
  - Duration ranged from three years for trade or vocational schools for skilled workers to five years for teachers, but averaging around four years.
  - After successfully finishing high school and earning a diploma, pupils could enroll a higher educational institution or enter the labor market (Georgeo, 1982).

Educational reform in Croatia

Figure: Secondary education before the 1975/76 and 1977/78 reform



UNESCO (1977.) - *The Development of Education in Yugoslavia*

Educational reform in Croatia

Educational reform in 1970s:

- On the tenth Congress of the League of Yugoslav Communists in 1974 the basis for so called "directed" education was established.
- Objectives of the reform were:
  - More equal distribution of students from various socio-economic backgrounds enrolled in secondary schools of various types.
  - Greater emphasis on the development of specific occupational skills with the goal of easier school to work transition.
  - Promotion of greater equality of access to education and employment opportunities.
  - Closer integration of the schooling system with the needs of social system an self-management.

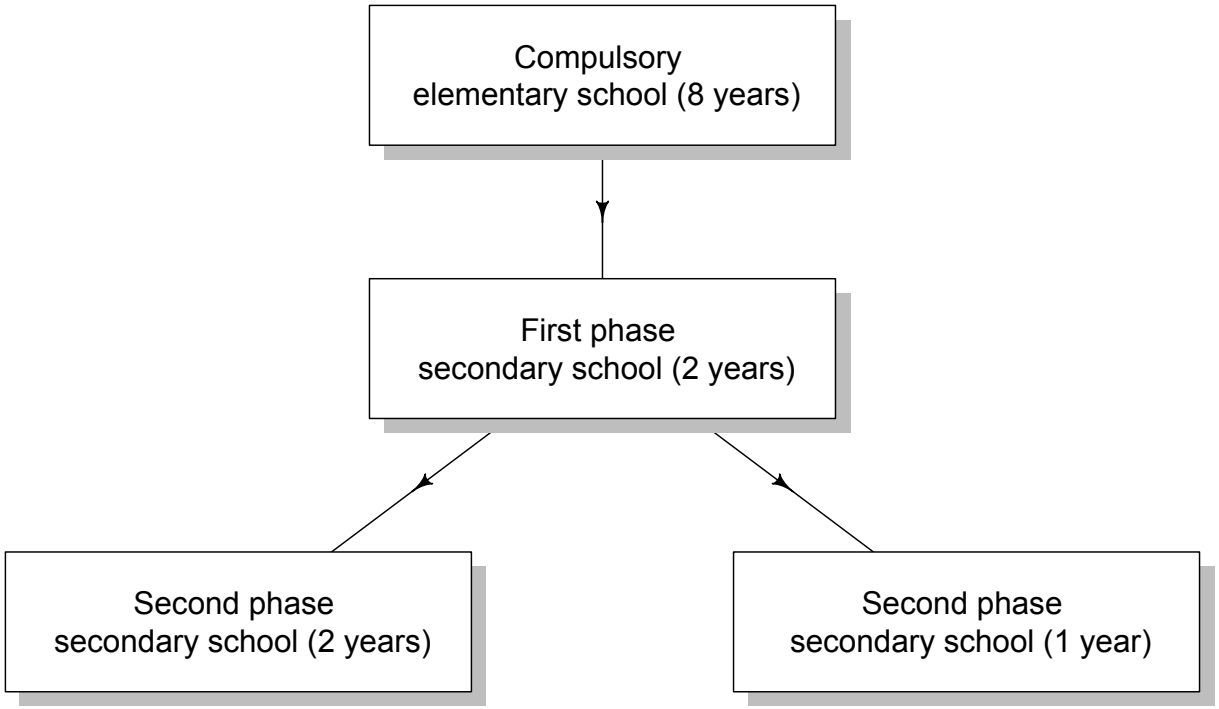
Educational reform in Croatia

After the educational reform in 1970s:

- Reform was aimed at secondary education.
- High school was split in two phases:
  1. First phase, two years, general preparation:
     - Languages, chemistry, biology, physics, geography, mathematics and history.
     - After the first phase students could enter the labor market or continue to the second phase.
  2. Second phase, one or two years, vocational preparation:
     - Each program for particular occupation.
     - Programs for general education were still available (gymnasium) but they were also given vocational or paraprofessional context.

Educational reform in Croatia

Figure: Secondary education after the 1975/76 and 1977/78 reform



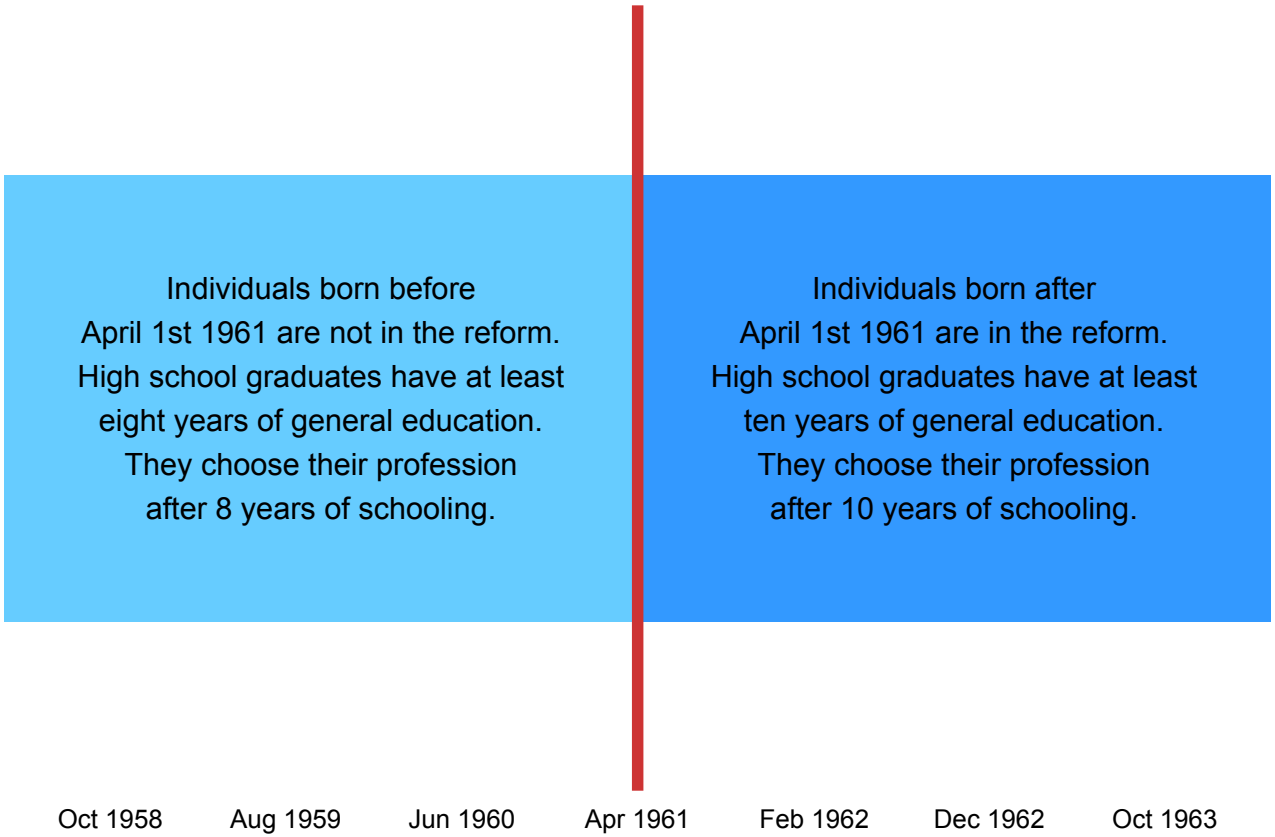
UNESCO (1977.) - *The Development of Education in Yugoslavia*

Educational reform in Croatia

- Students were prevented to enter vocational training straight after elementary school.
- Instead, they needed to go through two additional years of general education before specializing for a particular vocation.
- Both phases could have been attended at the same school (so called "school centers").
- Selection into first and second phase was based on grades in previous two years of school.
- The reform was announced in 1974 and implemented in 1975/76 and 1977/1978 in all high school in Croatia.

Identification strategy

Figure: Date of birth discontinuity in the reform coverage



Metrics

- Exploiting the date of birth discontinuity in the reform coverage, we use regression discontinuity design (RDD) (Lee i Lemieux, 2010).
- Using pooled Labor Force Survey (LFS) 2000 - 2012, and restricting analysis on non-gymnasium high school graduates, we estimate:

$$y_i = \beta' X_i + f(c_i) + \delta AFTER_i + \nu_i \tag{1}$$

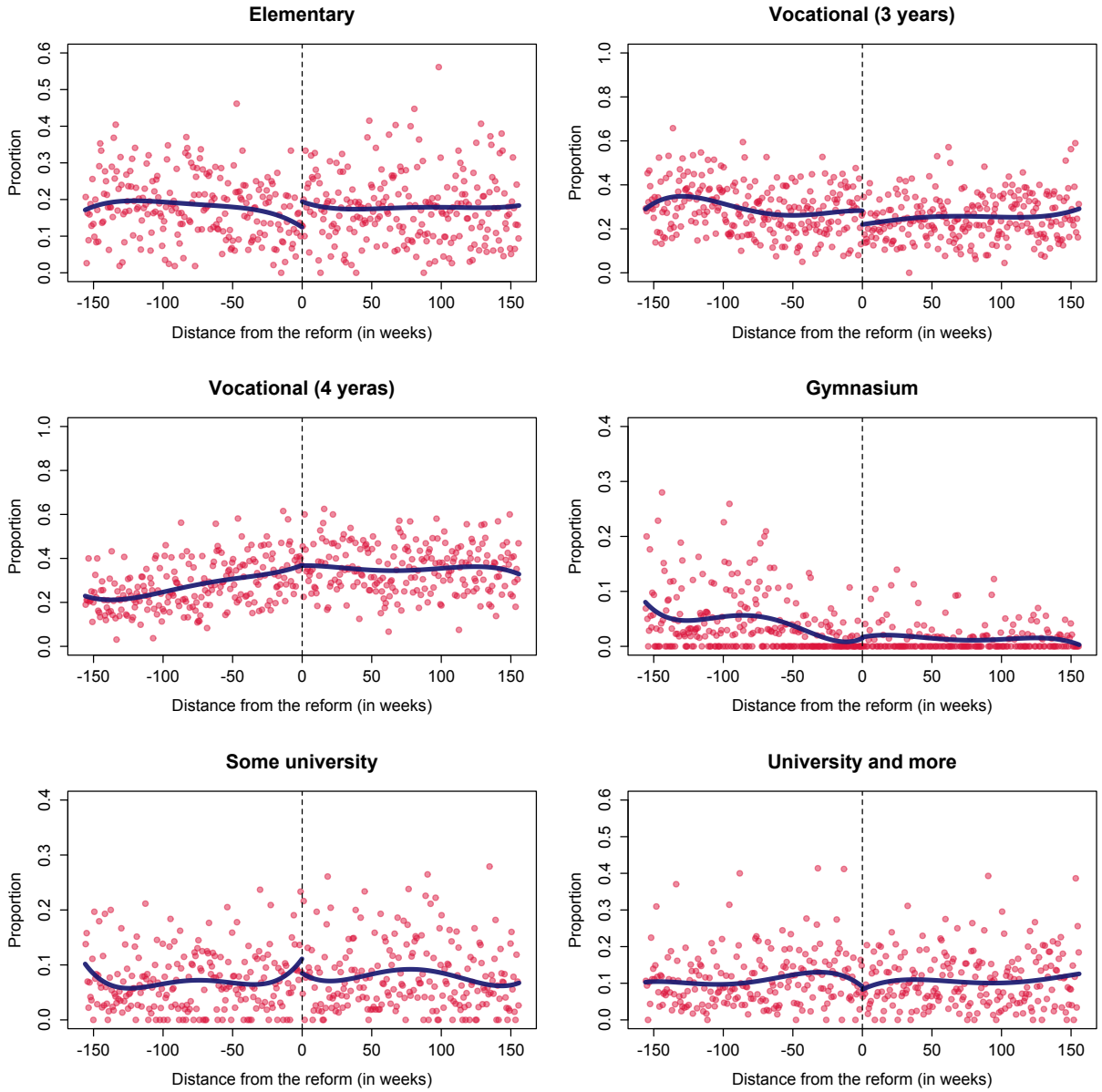
- where y_i is labor market outcome of individual i: log hourly wage, years of work, indicator for employment and indicator for non-activity.
  - X_i is vector of predetermined covariates of an individual i, gender: and nationality.
  - $f(c_i)$ is a function of date of birth.
  - $AFTER_i$ is an indicator taking value 1 if an individual i was born after April 1st 1961, and 0 otherwise.
- Equation (1) is estimated parametrically and non-parametrically.

Table: Descriptive statistics

	Whole sample (N=22,367)		Secondary education (N=12,778)	
	Mean	Std. dev	Mean	Std. dev.
Predetermined variables				
Female	0.459	0.498	0.424	0.494
Non-Croatian	0.081	0.273	0.081	0.274
Years of schooling				
$<$ 8 years	0.022	0.147	0	0
8 years	0.169	0.375	0	0
9 years	0.003	0.059	0	0
10 years	0.011	0.104	0	0
11 years	0.209	0.407	0.364	0.481
12 years	0.389	0.488	0.636	0.481
13 years	0.009	0.094	0	0
14 years	0.069	0.253	0	0
15 years	0.007	0.085	0	0
16 years	0.088	0.283	0	0
$>$ 16 years	0.023	0.150	0	0
Education level				
No elementary	0.022	0.146	0	0
Elementary	0.179	0.383	0	0
Vocational (3 years)	0.275	0.446	0.464	0.499
Vocational (4 years)	0.315	0.464	0.536	0.499
Gymnasium	0.028	0.165	0	0
Some university	0.074	0.262	0	0
University and more	0.108	0.310	0	0
Field of education*				
General programs	0.228	0.420	0	0
Teacher training	0.037	0.189	0.006	0.080
Humanities	0.011	0.106	0.006	0.080
Foreign languages	0.001	0.101	0.000	0.015
Social sciences	0.200	0.300	0.240	0.427
Life sciences	0.019	0.136	0.020	0.141
Biological sciences	0.001	0.030	0.000	0.018
Physical sciences	0.010	0.101	0.013	0.115
Mathematics	0.001	0.036	0.001	0.029
Computer science	0.003	0.055	0.003	0.051
Computer use	0.000	0.019	0.001	0.023
Engineering	0.317	0.465	0.474	0.499
Agriculture	0.029	0.167	0.035	0.183
Health care	0.054	0.227	0.061	0.239
Services	0.104	0.306	0.157	0.364
Labor market outcomes				
Log hourly wage	2.950	0.767	2.980	0.623
Years of work	22.7	6.02	23.2	5.64
Employed	0.793	0.405	0.825	0.380
Non-Active	0.014	0.116	0.013	0.115

Note: Both samples are restricted to individuals born between April 1 1958 and April 1 1964. Secondary education sample is restricted to non-gymnasium high school graduates. * question regarding field of finished education is available in Labor Force Surveys 2004 onwards; sample size of whole sample is $N = 16,642$, while for the secondary education sample is $N = 9,548$.

Unintended reform effects

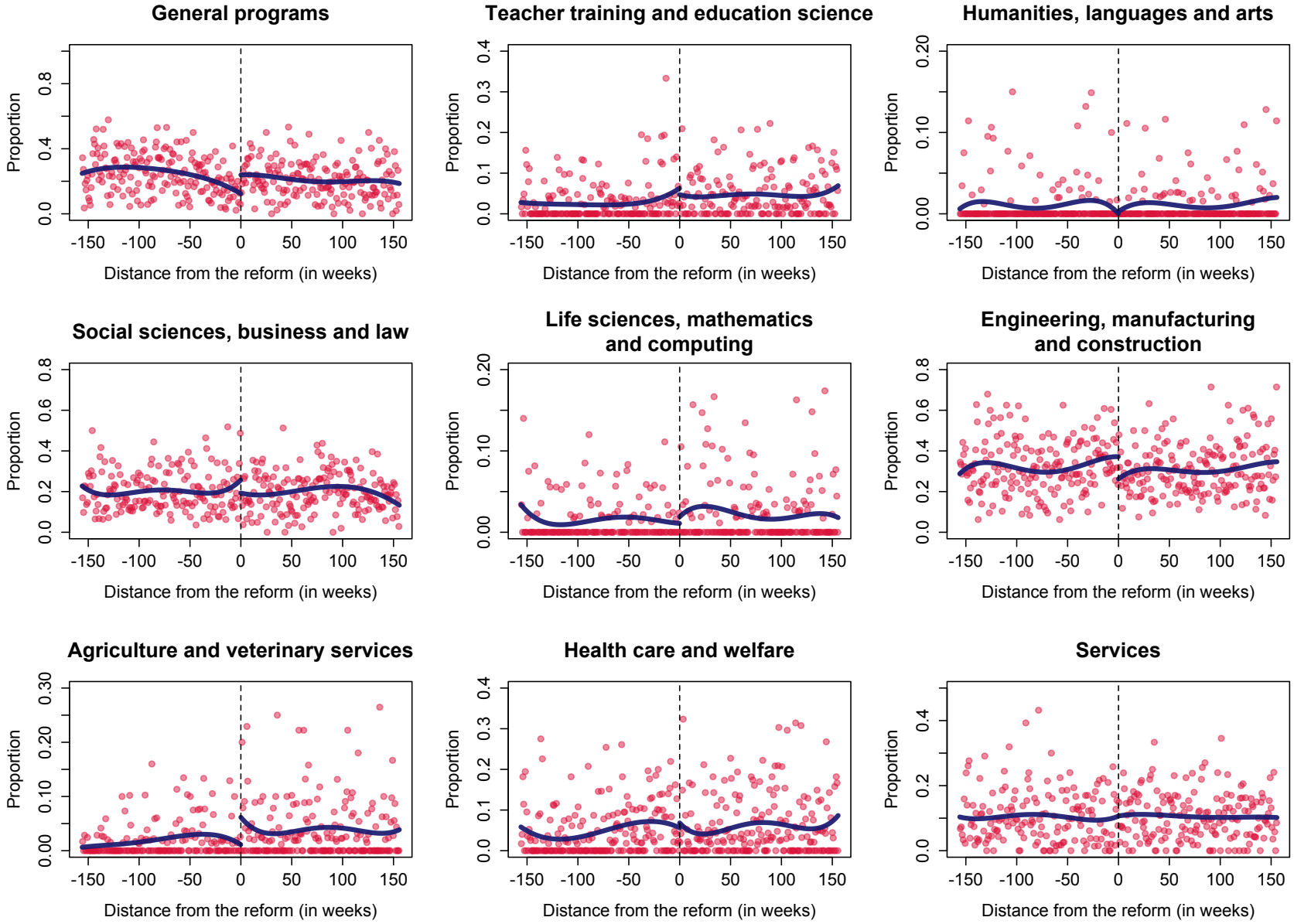


Unintended reform effects

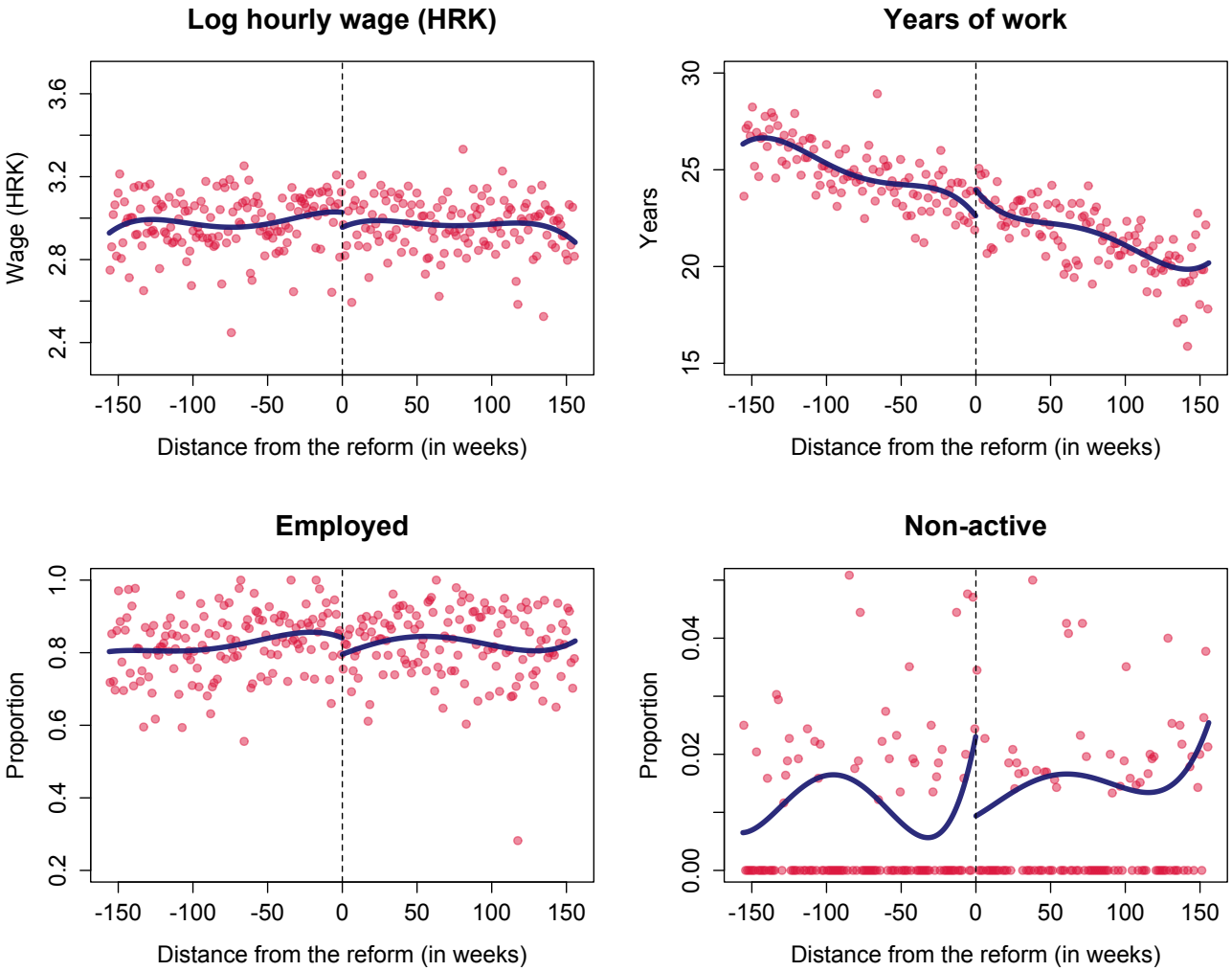
	Finished education					
	Elementary	Vocational (3 years)	Vocational (4 years)	Gymnasium	Some university	University and more
3 year window (N=22,367)						
Linear spline	0.021	−0.019	−0.0003	0.005	0.007	−0.023
	(0.016)	(0.018)	(0.021)	(0.006)	(0.011)	(0.014)
Quadratic spline	0.047**	−0.037	−0.004	0.020**	−0.023	−0.019
	(0.023)	(0.025)	(0.031)	(0.008)	(0.016)	(0.021)
Cubic spline	0.055*	−0.090***	0.021	0.028***	−0.019	−0.015
	(0.030)	(0.032)	(0.039)	(0.010)	(0.022)	(0.025)
Quartic spline	0.072**	−0.064*	−0.004	0.003	−0.028	−0.007
	(0.036)	(0.037)	(0.042)	(0.012)	(0.026)	(0.030)
2 year window (N=15,094)						
Linear spline	0.032*	−0.027	−0.006	0.017**	−0.011	−0.019
	(0.019)	(0.021)	(0.025)	(0.007)	(0.014)	(0.017)
Quadratic spline	0.055*	−0.076***	0.023	0.023**	−0.019	−0.023
	(0.028)	(0.029)	(0.037)	(0.010)	(0.020)	(0.024)
Cubic spline	0.061*	−0.069*	−0.003	0.004	−0.023	0.002
	(0.034)	(0.036)	(0.042)	(0.012)	(0.025)	(0.029)
Quartic spline	0.108***	−0.057	−0.053	0.013	−0.038	0.008
	(0.040)	(0.043)	(0.046)	(0.013)	(0.030)	(0.033)
1 year window (N=7,534)						
Linear spline	0.043	−0.063**	0.006	0.014*	−0.015	−0.011
	(0.027)	(0.027)	(0.034)	(0.008)	(0.019)	(0.023)
Quadratic spline	0.101***	−0.072*	−0.018	0.013	−0.036	−0.008
	(0.036)	(0.039)	(0.041)	(0.012)	(0.027)	(0.030)
Cubic spline	0.052	−0.007	−0.033	0.008	−0.015	−0.008
	(0.038)	(0.041)	(0.047)	(0.014)	(0.033)	(0.035)
Quartic spline	0.079	−0.006	0.020	0.003	−0.073*	−0.009
	(0.049)	(0.052)	(0.059)	(0.012)	(0.037)	(0.043)

Note: Standard errors clustered at the week of birth are in brackets. Each cell represents different regression and presents the coefficient on variable AFTER which takes value 1 if individual was born after April 1, 1961, and 0 otherwise. Window width denotes $\pm$ years around the cutoff date. Covariates include female and non-Croatian dummy as well as dummy for the survey year.
Significance levels: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Unintended reform effects



Labor market outcomes



Labor market outcomes

	Labor market outcomes			
	Log hourly wage	Years of work	Employed	Non-Active
3 year window (N=12,778)				
Linear spline	−0.013	0.528**	−0.024	0.001
	(0.029)	(0.232)	(0.020)	(0.005)
Quadratic spline	−0.044	0.421	−0.051*	0.003
	(0.043)	(0.341)	(0.029)	(0.008)
Cubic spline	−0.055	0.338	−0.066*	−0.011
	(0.061)	(0.450)	(0.038)	(0.010)
Quartic spline	−0.070	1.170**	−0.042	−0.015
	(0.071)	(0.489)	(0.044)	(0.012)
2 year window (N=8,633)				
Linear spline	−0.032	0.328	−0.042*	0.002
	(0.035)	(0.272)	(0.023)	(0.007)
Quadratic spline	−0.038	0.611	−0.055	−0.003
	(0.056)	(0.404)	(0.035)	(0.010)
Cubic spline	−0.091	0.700	−0.046	−0.020
	(0.074)	(0.507)	(0.044)	(0.013)
Quartic spline	−0.074	1.120**	−0.048	−0.017
	(0.079)	(0.548)	(0.049)	(0.016)
1 year window (N=4,414)				
Linear spline	−0.067	0.301	−0.053	−0.002
	(0.049)	(0.393)	(0.032)	(0.009)
Quadratic spline	−0.046	0.962*	−0.043	−0.020
	(0.072)	(0.514)	(0.046)	(0.013)
Cubic spline	−0.026	2.080***	−0.029	−0.025
	(0.078)	(0.538)	(0.049)	(0.019)
Quartic spline	−0.116	2.810***	−0.024	−0.020
	(0.086)	(0.653)	(0.055)	(0.023)

Note: Standard errors clustered at the week of birth are in brackets. Each cell represents different regression and presents the coefficient on variable AFTER which takes value 1 if individual was born after April 1, 1961, and 0 otherwise In all specifications sample is restricted to non-gymnasium high school graduates. Window width denotes ± years around the cutoff date. Covariates include female and non-Croatian dummy as well as dummy for the survey year.
Significance levels: * p<0.1; ** p<0.05; *** p<0.01

	Labor market outcomes			
	Log hourly wages	Years of work	Employed	Non-Active
Local linear regression				
IK bandwidth	−0.645***	0.629	−0.364***	0.063**
	(0.242)	(1.810)	(0.082)	(0.031)
Observations	307	532	242	108
Half IK bandwidth	−0.435***	1.697	−0.399	0.143**
	(0.145)	(1.904)	(0.271)	(0.070)
Observations	155	270	99	73
Double IK bandwidth	−0.472***	1.281	−0.256***	0.072
	(0.155)	(1.270)	(0.098)	(0.046)
Observations	589	1044	490	258
3 year window with ± quarter donut hole (N=11,638)				
Linear spline	0.004	0.594**	−0.023	0.008
	(0.034)	(0.281)	(0.023)	(0.007)
Quadratic spline	−0.025	0.391	−0.076**	0.025**
	(0.057)	(0.507)	(0.038)	(0.012)
Cubic spline	−0.034	−0.317	−0.157**	0.016
	(0.103)	(0.922)	(0.069)	(0.024)
Quartic spline	−0.076	2.197	−0.169	0.040
	(0.171)	(1.585)	(0.114)	(0.041)
3 year window, crisis years (2009-2012) (N=4,428)				
Linear spline	−0.073	0.914*	−0.067	0.010
	(0.060)	(0.478)	(0.043)	(0.012)
Quadratic spline	−0.155*	1.046	−0.098	0.022
	(0.087)	(0.688)	(0.064)	(0.016)
Cubic spline	−0.171	0.668	−0.169*	0.002
	(0.118)	(0.907)	(0.087)	(0.016)
Quartic spline	−0.192	2.042**	−0.134	−0.017
	(0.140)	(0.986)	(0.101)	(0.014)

Note: Standard errors clustered at the week of birth are in brackets. Each cell represents different regression and presents the coefficient on variable AFTER which takes value 1 if individual was born after April 1, 1961, and 0 otherwise. For local linear regressions sample is restricted to non-gymnasium high school graduates. Local linear regressions are estimated using triangular kernel, while IK represents Imbens - Kalyanaraman optimal bandwidth. In 3 year window with ± one quarter donut hole sample is restricted to non-gymnasium high school graduates born between April 1 1958 and April 1 1964, excluding individuals born within one quarter around the cutoff date of April 1 1961. In a 3 year window with crisis years sample is restricted to non-gymnasium high school graduates born between April 1 1958 and April 1 1964 and surveys 2009 - 2012. In all models covariates include female and non-Croatian dummy as well as dummy for the survey year.
Significance levels: * p<0.1; ** p<0.05; *** p<0.01

Conclusions

- We identify the causal effect of two additional years of general education in post-transition Croatia.
- Using high school reform we circumvent the issues of self - selection into the type of high school.
- Reform, on average, reduced the probability of finishing high school as fist-phase dropouts were common $\Rightarrow$ **unintended** reform effects & **upward bias** in RD estimates.
- Two additional years of general education did not significantly affect individuals' labor market prospectives - even with the upward bias.
- Observed general vocational wage differential is mainly driven by self-selection into the type of high school.

Thank you for your attention.