

World Inequality Conference 2021

World Inequality Lab, PSE

The Influence of Parental and Grand-parental Education in the Transmission of Human Capital

A. Hector Moreno M.

Université Sorbonne Nouvelle

<https://ahectormorenom.wixsite.com/website>

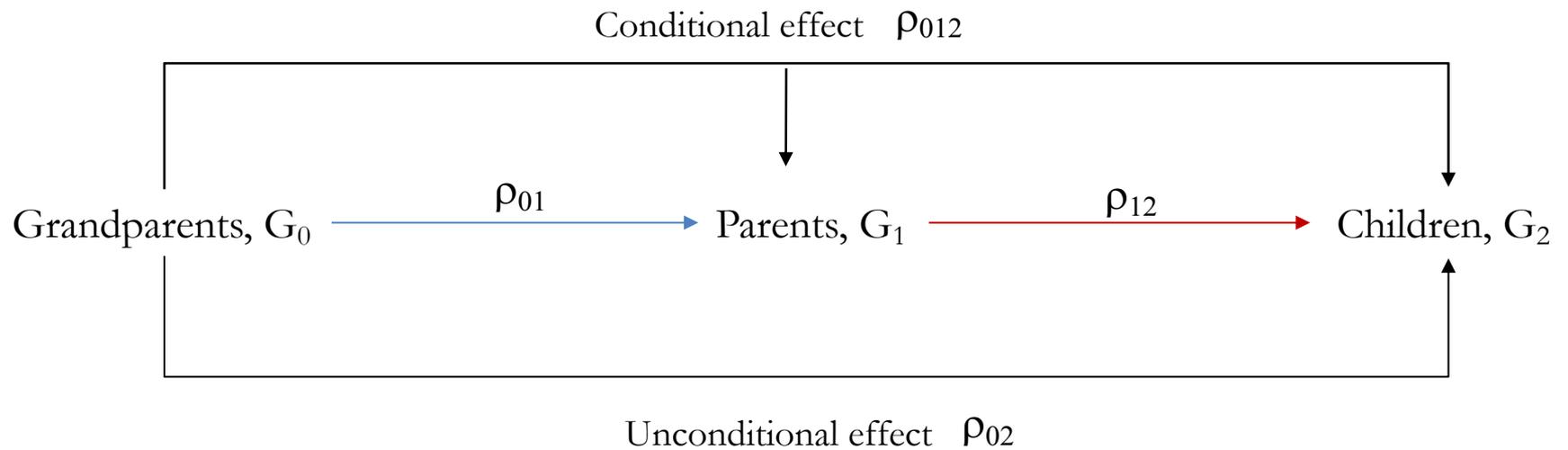
Paris, December 7th, 2021

Overview and motivation

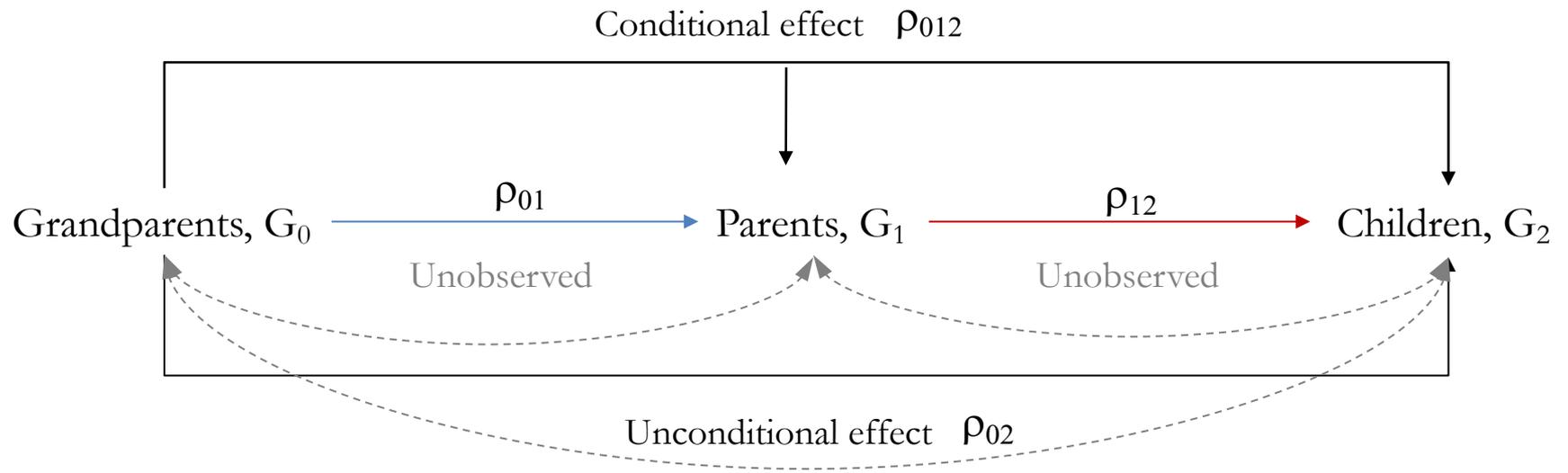
- What is the effect of parental education in their offspring's across three generations?
- What is the *conditional* effect of grand-parental education on their grandchildren?
- This [literature](#) on the multi-generational transmission of education is still in early stages due to data restrictions. Focused on well-developed countries mainly from correlation analysis (OLS).
- Parents not only devote monetary (income) and non-monetary (time) resources on their offspring but also transmit *unobserved* characteristics (ability) to their children.
- This paper exploits a natural experimental set-up from a regional conflict and an instrumental variable (IV) approach to addresses these endogeneity biases.
- The study uses a Mexican survey ([EMOVI](#), 2011) that gathers retrospective information on a national representative sample of adults and their children.

Outline

Four relationships

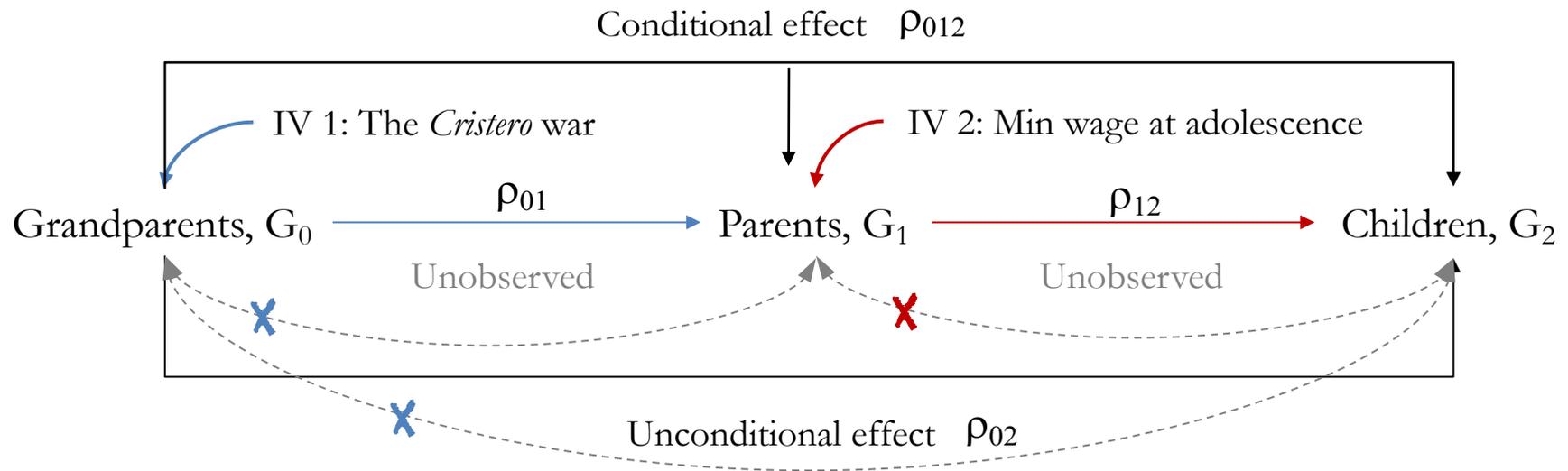


Endogeneity



Empirical strategy

The endogeneity of parental schooling is addressed by the use of a natural experiment and an instrumental variable approach.



1. A regional civil war provides a natural experimental set up to instrument the grandfathers' (G₀) education.
2. Labour market information is used to instrument the parents' education (G₁), which in turn is used to examine its effect on their children's (G₂) education.

Outline

- Related literature
- Data and sample selection
- Traditional evidence
- Causal evidence from a natural experiment
 - The *Cristero* Conflict and schooling of *grand-parental* education
 - Labor market indicators and schooling of *parental* education
- Final remarks

Related literature (1/2)

The Becker & Tomes Model

Provide a model for the father-son persistence

OLS with 2 generations:

$$\text{Children_educ} = \nu + \rho_1 \text{Parental_educ} + \varepsilon$$

With 3 generations:

$$\text{Grand_children_educ} = \nu + \rho_1 \text{Parental_educ} - \rho_2 \text{Grand-parental_educ} + \varepsilon$$

The negative sign on the grandparental coefficient has given rise to further research



Solon (2018) argues that while the model may be correct the sign may simply suggest that the model is incomplete due to:

- The grandparental transmission of *cultural inheritance*,
- Omitted variables-bias* (the presence of group effects like racial discrimination), and
- Measurement *errors*.

A1. Related literature

1. Early studies. Sociology (Occupation and class) & Economics (Income, wealth, class, Educ.)
Becker & Tomes (1986), Solon (1999), Piketty (2000).

Jäntti, Markus & Jenkins (2015)

Björklund & Salvanes (2011)

Black & Devereux (2011)

Holmlund, Lindahl & Plug (2011)

1. Income, class or occupation
2. OLS and/or correlation analysis
3. Two generations (father-son linkage)
4. Nordic or well-developed countries
5. Recent shift to causal analysis.

2. Multi-generational studies: +3 generations

Møllegaard & Jæger (2015) | 3 Gen. | Denmark | OLS.

Celhay & Gallegos (2015) | 3 Gen. | Chile | OLS.

Kroeger & Thompson (2016) | 3 Gen. | USA | OLS.

Hällsten (2014) | 4 Gen. | Sweden | OLS.

Lindhahl, et. al (2015) | 4 Gen. | Sweden | OLS.

Celhay & Gallegos (2015) | 3 Gen. | Chile | OLS.

Kundu & Sen (2020) | 3 Gen. | India | OLS.

3. Identification strategies to *address endogeneity in parental education* (2 generations)

Maurin & MacNally (2008) | 3 Gen. | France | IV: 1968 student riots.

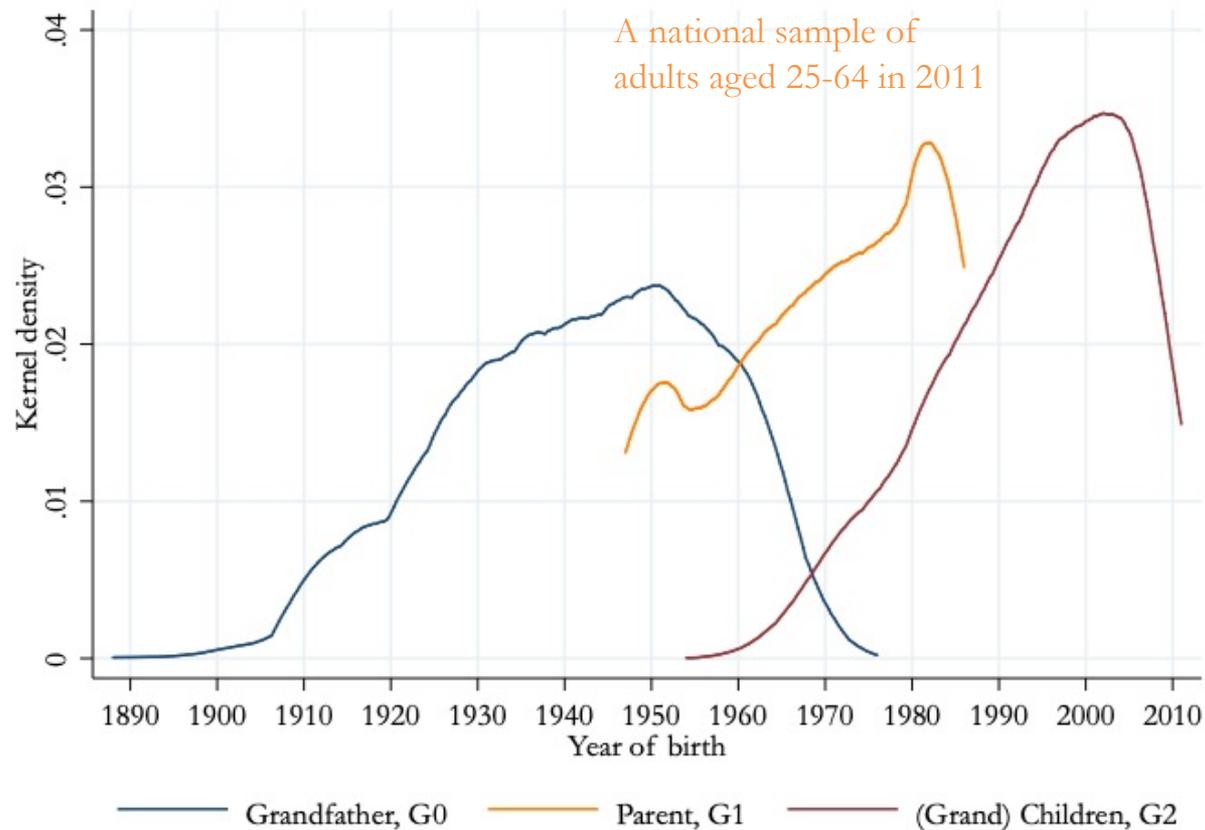
Carneiro, Meghir & Paredy (2013) | 2 Gen. | USA | IV: Tuition, distance & labor mkt.

Havari, Peracchi (2018) | 2 Gen. | Europe | IV: exposition to World War II

Data

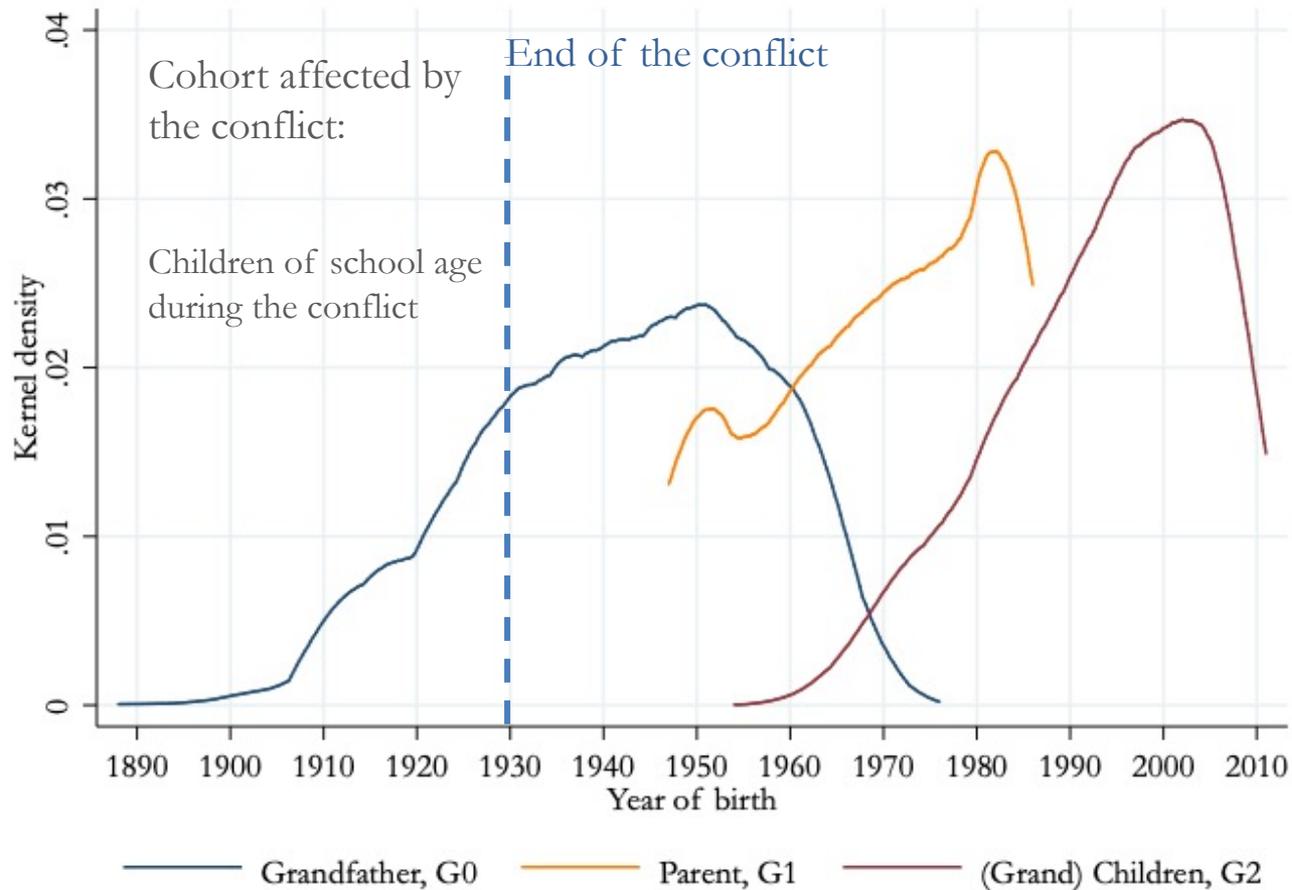
“Encuesta de Movilidad Social Inter-generational” (EMOVI) Mexico (2011)

- The survey’s goal: determine the extent to which parents’ resources influence their offspring’s.
- Contains **retrospective** information of a random sample of **respondents** and their **children**.



Sample (natural experiment)

- The conflict exposition (1926-1929) as a natural experiment



Sample

Table 1: Descriptive statistics, EMOVI (2011)

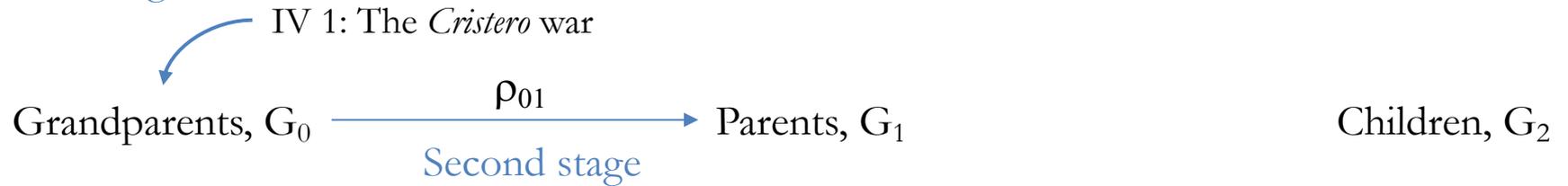
Variables by generation	Obs	Mean	Std. Dev.	Min	Max
Panel A: Grandparents (G0)					
Grandfather's schooling	774	2.2 ←	3.4	0	24
Grandfather's number of children	837	5.6	3.2	1	16
Grandfather's year of birth	837	1922	5.3	1911	1929
Grandmother's schooling	641	1.7 ←	2.9	0	16
Grandmother's number of children	683	5.4	3.1	1	16
Grandmother's year of birth	647	1921	7.0	1891	1956
Panel B: Parents (G1)					
Parents' schooling	833	6.3 ←	4.5	0	23
Parents' number of children	837	2.9	1.7	1	13
Parents' male	837	0.5	0.5	0	1
Parents' year of birth	837	1955	6.7	1947	1980
Panel C: Grandchildren (G2)					
Grandchildren's schooling	2116	9.8 ←	3.9	0	23
Grandchildren's Male	2116	0.5	0.5	0	1
Grandchildren's year of birth	2116	1984	8.4	1957	2004

Source: own estimates with EMOVI (2011).

Empirical strategy

A two-step least squares (2SLS) approach.

First stage



La Cristiada (Cristero war) and grand-parents education



Meyer (1973b, 1973c, 2014), Buttler (2013), Andes (2014), Ramon Jrade (1985), and Aspe (2015)

The *Cristero* conflict: 1926-1929

The major conflict between the Catholic Church and the Mexican State in the last century.

- A massive *rural* rebellion in the *western and central* states of Mexico after the enforcement of anticlerical laws that emerged from the Constitution of 1917.
- The identification strategy relies on the effect of this insurgency on the grandparents' education determined by 3 characteristics:



- 1) *The geographical distribution of the conflict:* Presumably larger in states directly engaged in the conflict defined by: the incidence (areas in conflict) and the intensity (# combatants).
- 2) *The affected cohort:* The effect is expected to be larger on children in school age corresponding to primary education.
- 3) *The rural areas:* The effect is expected to be larger in areas where the *Cristero* troops were able to engage in guerrilla war.

1. The conflict and the grandparents' generation

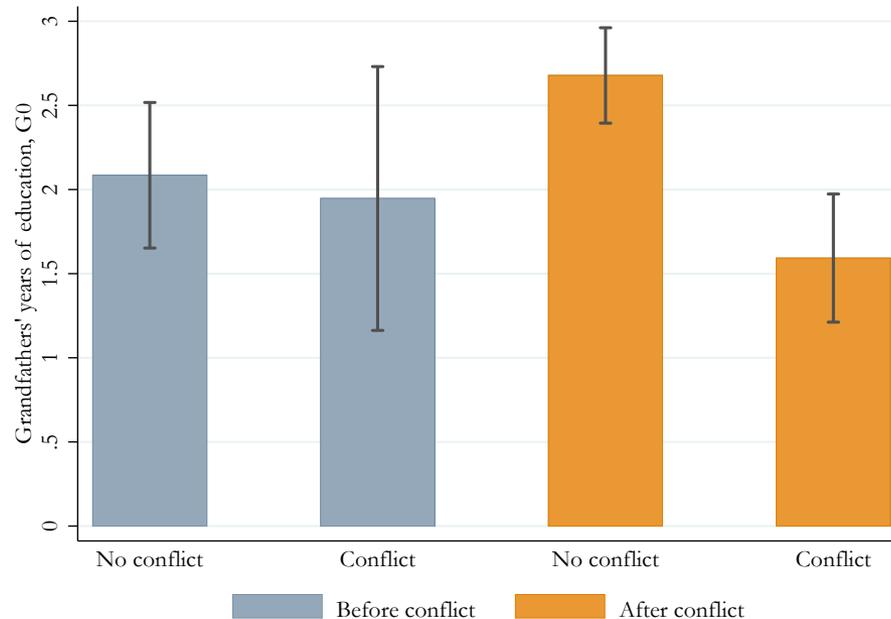
The **first stage** is:

- 1) The geographical distribution of the conflict (**c**)
- 2) The rural areas (**r**),
- 3) The affected cohort (**t**): children of school age

} Diff-in-Diff-in-Differences
(DDD)

$$\hat{S}_0 = \beta_0 + \beta_1 \mathbf{crt} + \beta_2 c + \beta_3 r + \beta_4 t + \beta_5 tc + \beta_6 tr + \beta_7 cr + X_\tau' \beta + \varepsilon$$

Average years of education by conflict exposition



2. The effect of G_0 on G_1 and G_2

The second stage

The impact of the grandparent's education (S_0) on their offspring's outcome (S_τ):

$$S_\tau = \alpha + \rho_0 \hat{S}_0 + X'_\tau \hat{\beta} + v$$

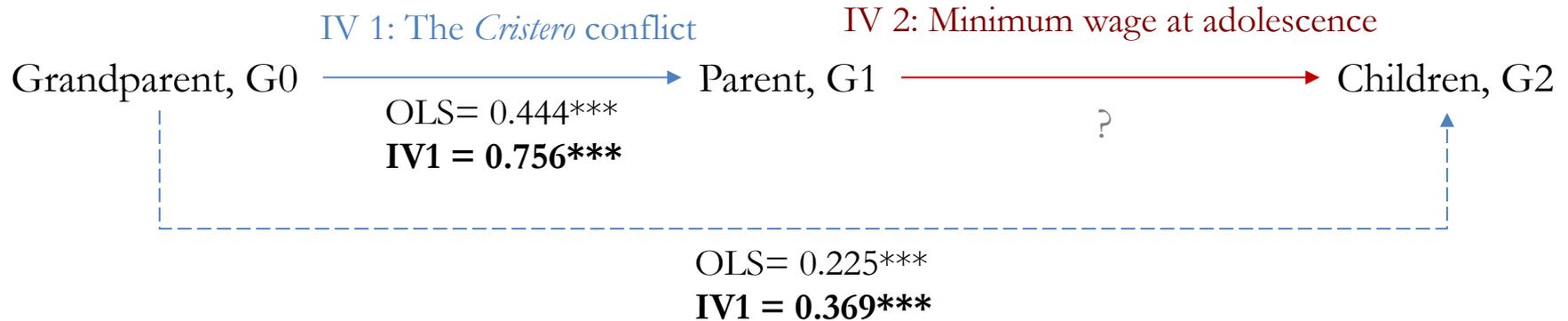
Where: S_τ is the outcome for the children (G1) or grandchildren (G2) respectively.

Table 3: OLS and IV regression of parents' education (G1) on grandfathers' education (G0)

Dependent variable:	(1)	(2)
Parental education (G1)	OLS	IV
Reduced form		
Grandfather education (G0)	0.444***	0.756***
	(0.031)	(0.127)
Observations	777	777
R-squared	0.330	0.241
First stage		
Cristero*Rural*Cohort	-	-1.384***
	-	(0.464)
R-squared	-	0.153
F-stat	-	10.55
Endogeneity & overidentification tests		
Wu's score	-	8.207
Wu p-value	-	0.004
Durbin's score	-	8.500
Durbin p-value	-	0.004
Robust-score Chi2	-	7.273
Chi2 p-value	-	0.007
Wooldridge's score	-	4.738
Wooldridge p-val	-	0.578
Sex of G1	Yes	Yes
Birthyear of G1	Yes	Yes
State of residence of G1 at age 14	Yes	Yes

Note: Robust standard errors in parentheses clustered by family. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Education refers to standardized years of education. Sample of grandfathers born during or before the *Cristero* conflict (1926-1929) with out-of-school grandchildren. Each estimate represents the coefficient from a different regression. Using the regional variation of the conflict to instrument grandparental education. First stage includes main effects (c, r, t) and interactions (cr, tc, tr) where c, stands for *Cristero* region, r for rural, and t for the cohort of school age respectively.

2. The effect of G_0 on G_1 and G_2



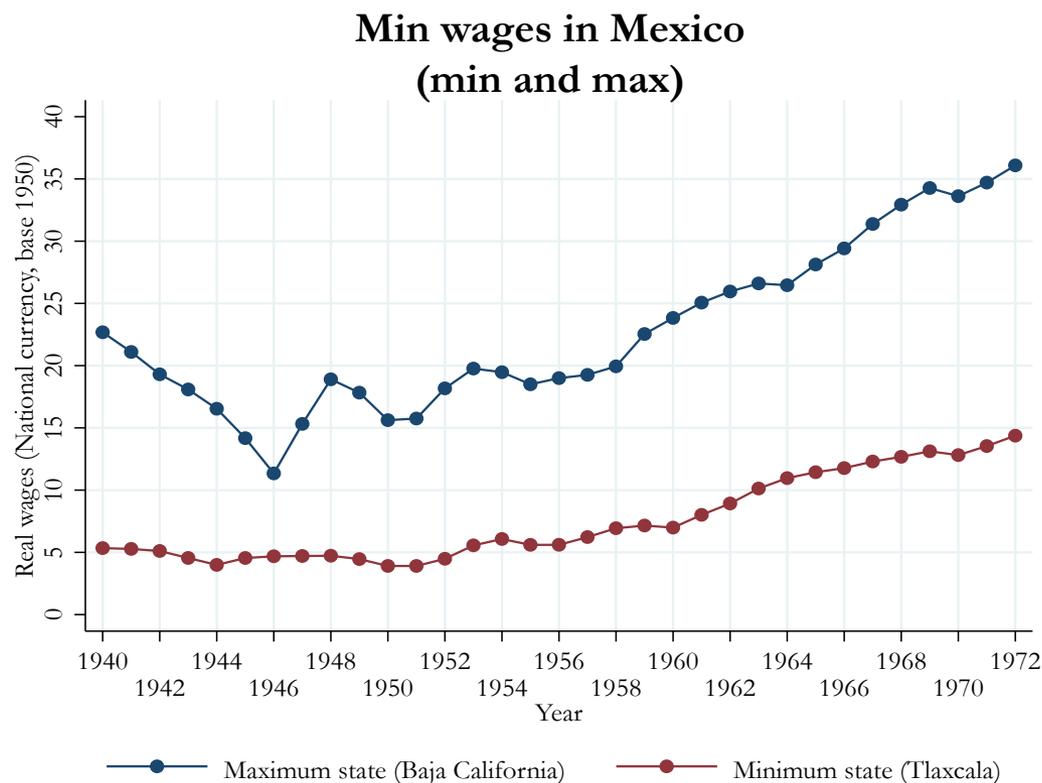
1. More persistence than traditional estimates ($\rho_{OLS} < \rho_{IV}$).
2. The unconditional effect of grand-parental education on grand-children is positive (and significant)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3. Minimum wages at adolescence and parents generation (G1)

Minimum wages (MW) in Mexico were first defined in the Constitution of 1917.

To be set by each municipality through local councils.



The identification strategy relies on both: time-series and cross-sectional variation in the real minimum wage

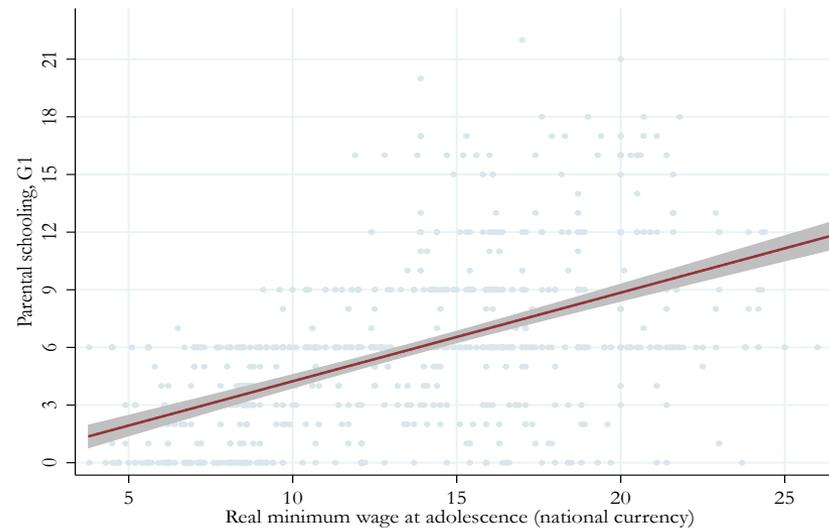
3. Minimum wages at adolescence and parents generation (G1)

The **first stage** is:

$$S_1 = \delta_0 + \delta_1 MWA_{s,y} + X'_1 \delta + \epsilon$$

Where: **MWA_** Minimum wages at adolescence in state (s) at year (y),
X_ exogenous sociodemographic characteristics

MW at adolescence & parental education



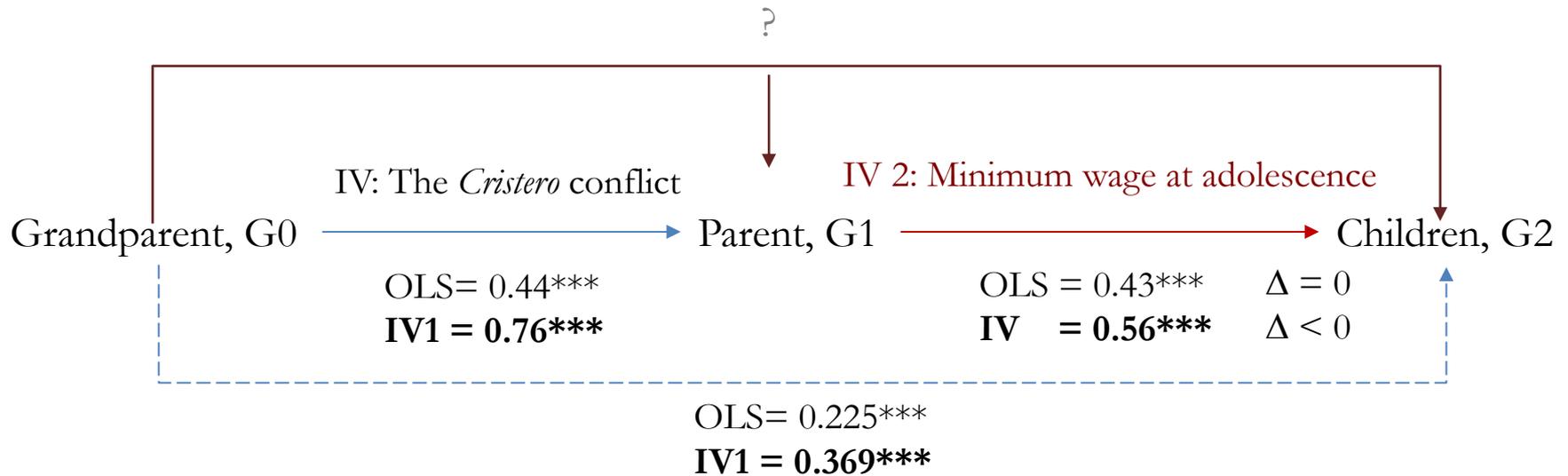
Strong and significant association between parental education and minimum wage at adolescence

Table 5: OLS and IV regression of children's education (G2) on parents' education (G1)

Dep. Variable:	(1)	(2)	(3)
<i>Grand</i> -children Ed. (G2)	OLS	IV1	IV2
Reduced form			
Parental education (G1)	0.429***	0.510***	0.556***
	(0.035)	(0.080)	(0.074)
Observations	1,724	1,720	1,720
Adj. R-squared	0.221	0.216	0.208
First stage			
Grandfather education	-	0.441***	-
	-	(0.036)	-
Minimum wage at adolescence	-	-	0.097***
	-	-	(0.009)
Adj. R-squared	-	0.314	0.315
F-stat	-	70.79	78.85
Wu's score	-	2.914	7.163
Wu p-value	-	0.088	0.008
Durbin's score	-	2.968	7.276
Durbin p-value	-	0.085	0.007
Robust-score Chi2	-	2.735	8.219
Chi2 p-value	-	0.098	0.004
Sex, G2	Yes	Yes	Yes
Birthyear, G2	Yes	Yes	Yes
State fixed eff., G2	Yes	Yes	Yes

Note: Robust standard errors in parentheses clustered by family dynasty. *** p<0.01, ** p<0.05, * p<0.1. Education refers to standardized years of education. Sample of grandfathers born during or before the *Cristero* conflict (1926-1929) with out-of-school grandchildren. Each estimate represents the coefficient from a different regression. Using the variation from individuals' grand-parental education to instrument parental education (IV1) as a robustness check. Using the regional variation of real minimum wage at adolescence to instrument parental education (IV2).

3. The effect of G_1 and G_2

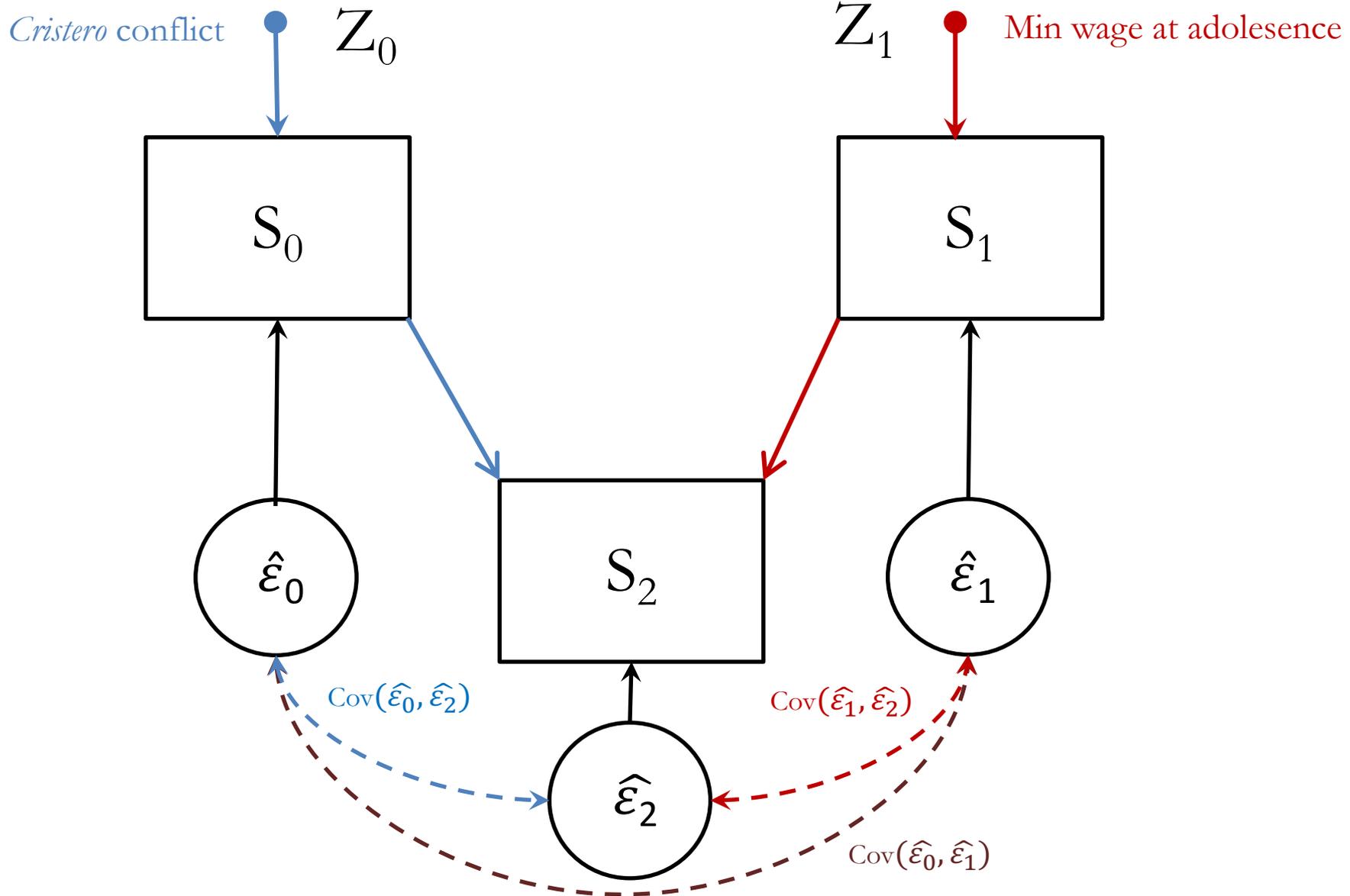


The IV estimate:

1. Confirms more persistence than traditional estimates ($\rho_{OLS} < \rho_{IV}$).
2. Long-run mobility: only detected with IV's (a statistically significant fall: from 0.76 to 0.56).
3. The direct unconditional effect of grand-parental education on grand-children is positive (and significant)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Directed Acyclic Graph (DAG)



4. The conditional effect of G0 on G2

IV - Simultaneous Equation System

$$s_2 = \alpha + \rho_0 \hat{s}_0 + \rho_1 \hat{s}_1 + X' \beta + \varepsilon_2 \quad \text{Grand-children's education}$$

$$\hat{s}_0 = \beta_1 Z_0 + X_{01}' \beta_1 + \varepsilon_0 \quad \text{Grand-parental education}$$

$$\hat{s}_1 = \beta_1 Z_1 + X_{12}' \beta_1 + \varepsilon_1 \quad \text{Parental education}$$

Where:

- Z_τ is the IV for that generation
- X is a set of exogenous control variables (age, sex, state fix effects)

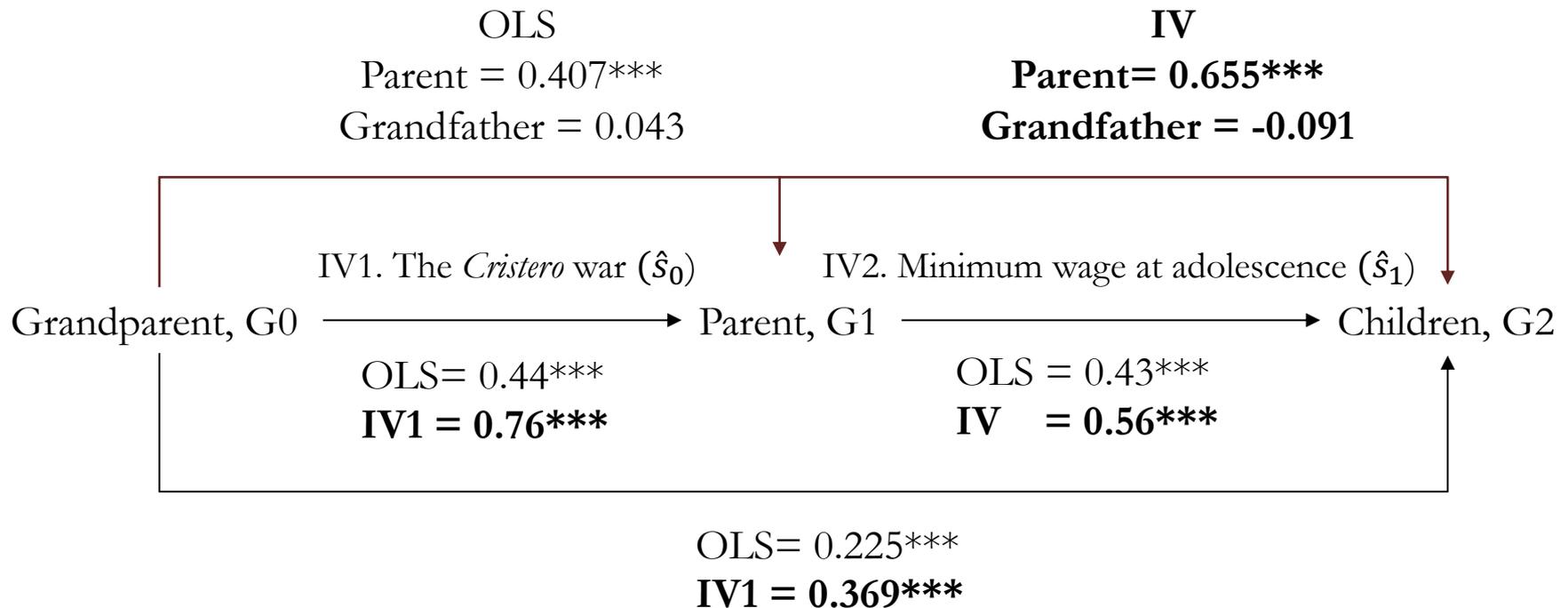
Table 6: OLS and SEM of children's education on parents' and grandparents' education

Dep. Var:	(1)	(2)	(3)	(4)
Grandchildren education (S_2)	OLS	SEM	SEM	SEM
Parental education (S_1)	0.407*** (0.038)	0.407*** (0.038)	0.597*** (0.077)	0.655*** (0.095)
Grand-father education (S_0)	0.043 (0.038)	0.043 (0.038)	-0.021 (0.181)	-0.091 (0.286)
Observations	1,720	1,720	1,720	1,720
Adj. R-squared	0.225	0.201	0.201	0.201
Parents' equation				
Minimum wage at adolescence	-	0.096*** (0.010)	0.096*** (0.010)	0.077*** (0.009)
Observations	-	1,720	1,720	1,720
Adj. R-squared	-	0.417	0.417	0.417
Grand-parents' equation				
Cristero*Rural*Cohort	-	-2.427*** (0.641)	-2.589*** (0.842)	-2.605*** (0.828)
Observations	-	1,720	1,720	1,720
Adj. R-squared	-	0.077	0.077	0.077
cov(ϵ_1, ϵ_2)	-	0.0 -	-0.166*** (0.056)	-0.165 (0.122)
cov(ϵ_0, ϵ_2)	-	0.0 -	0.053 (0.153)	0.021 (0.250)
cov(ϵ_0, ϵ_1)	-	0.0 -	0.0 -	0.332*** (0.049)

4. The conditional effect of G0 on G2

The impact of the grandparent's education (s_0) on their offspring's outcome:

$$s_2 = \alpha + \beta_1 \hat{s}_1 + \beta_0 \hat{s}_0 + X\beta + v$$



The influence of the grandparents' legacy did not remain further away from the first generation.

Conclusions and contributions to the literature

1. Accounting for endogeneity...

- Unveils a larger importance of family background (more persistence) than traditionally observed with OLS.
- Reveals a pattern of long-term upward mobility.
This trend is undetected with statistical associations (OLS).
- The influence of grand-parental education disappears once accounting for parental education.

2. The transmission of human capital between successive generations is so dominant that the legacy of more distant ancestors seems to fade away across multiple generations.

The influence of parental and grand-parental education in the transmission of human capital

A. Hector Moreno M.

THANKS !

ECINEQ working paper

<http://www.ecineq.org/milano/WP/ECINEQ2021-588.pdf>