The Crime Reducing Effect of Education

Steve Machin (UCL), Oliver Marie (Maastricht) &
Sunčica Vujić (Antwerp)

suncica.vujic@uantwerpen.be

The National Confederation of General Insurance,
Private Life and Pension and Supplementary Health Fund - CNseg
The 7th Bi-Annual Conference on Insurance Consumer Protection
15-17 September 2015
Sheraton WTC Hotel, São Paulo

Overview of the Presentation

- Introduction
- Recent Literature
- Summary of MMV (2011) & (2012) papers
- Data Description
- Estimations Results
- Discussion & Conclusions

Introduction

- Generating policy levers to reduce crime has been a key question for social science researchers and policymakers for a long time.
- There are a number policy tools available to reduce crime (C) which work by influencing the incentives of potential offenders.
- Becker (1968) model of criminal participation decision–making:
  - *Probability of being caught:* P (e.g., more police) $P \uparrow = C \downarrow$
  - *Severity of punishment:* S (e.g., tougher sentences) $S \uparrow = C \downarrow$
  - *Gains from illegal activity:* $W(i)$ (e.g., crack, car theft) $W(i) \uparrow = C \uparrow$
  - *Gains from legal earnings:* $W(l)$ (e.g., higher wages) $W(l) \uparrow = C \downarrow$

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- Policy tools available to reduce crime (C) can be categorised as:
  - Expenditures on crime fighting resources
  - Specific targeted policies
  - Characteristics of criminals
- One key characteristic of criminals that does offer policy leverage – education.
- Education (E) has been clearly shown to improve future labour market opportunity, so natural theoretical extension: $E \uparrow = C \downarrow$
  - Early school leavers have higher probability of committing crime and being in prison (Freeman 1996, 1999; Harlow 2003; Lochner 2004; MMV 2011; MMV 2012)
  - Low wages and high unemployment increase crime (Grogger 1998; Raphael and Winter-Ebmer 2001; Gould et al. 2002; Machin and Meghir 2004)

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Why Education May Have an Effect on Crime?

- Income effect ($\uparrow$ wages $=$ $\downarrow$ crime)
  - Grogger (1998), Levitt & Lochner (2001), Lochner & Moretti (2004), Lochner (2004)
  - Machin & Meghir (2004): "Improvements in human capital accumulation through the education system or other means... enhancing individual labour market productivity... would be important ingredients in reducing crime."
- Time availability ($\downarrow$ time $=$ $\downarrow$ crime)
  - 'Self-incapacitation' effect
  - Tauchen *et al.* (1994), Hansen (2003), Jacobs & Lefgren (2003), Luallen (2006), Hjalmarsson (2008), Anderson (2010)
- Patience and risk aversion ($\uparrow$ education $=$ $\downarrow$ discount rate)
  - Lochner & Moretti (2004), Lochner (2004), Frederick et al. (2002)
  - Oreopoulos (2007): "Young people who drop out of school tend to be *myopic* (more focussed on immediate costs from schooling), they lack abstract reasoning skills and are more predisposed to risky behaviour."

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But, There Are Two Issues...

1. Data availability
   - Most admin data on crime does not contain information on the characteristics of criminals (eg, offences recorded by the police).
2. Endogeneity
   - The issue of the direction of the crime-education relationship.
   - Education-crime relationship is plagued by the endogeneity of the individual choice to participate in both activities, hence it is empirically difficult to prove.
   - In other words, correlation does not imply causation.

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Recent Literature on Education & Crime

A number of recent papers have overcome this problem by exploiting exogenous educational shocks to estimate causal impact on crime.

1. First approach looks at cohort level effects of school leaving age (SLA) reform on the crime rate of the same cohort after completing education:
   - Lochner and Moretti (2004) study variations across US states of SLAs.
   - Machin, Marie, and Vujić (MMV) (2011) exploit the 1973 change of SLA in the UK.
   - Both papers point to very strong effect with no qualifications elasticity of close to 1 on offending and point toward external (social) benefits of education.

Recent Literature on Education & Crime

2. Recently researchers have used micro-level data to study the relationship:
   - Åslund et al. (2015), Hjalmarsson et al. (2011), and Meghir et al. (2011) look at Swedish school reforms.
   - Marie et al. (2012) compare arrests for Dutch students born across the year.
3. Quasi-experimental evidence:
   - Machin, Marie, and Vujić (MMV) (2012) consider important education expansion reform in the UK.
   - Nordin (2015) looks at the tertiary education eligibility in Sweden.

MMV (2011): Summary

THE ECONOMIC JOURNAL

The Economic Journal, **121** (*May*), 463–484. Doi: 10.1111/j.1468-0297.2011.02430.x. © 2011 The Author(s). The Economic Journal © 2011 Royal Economic Society. Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

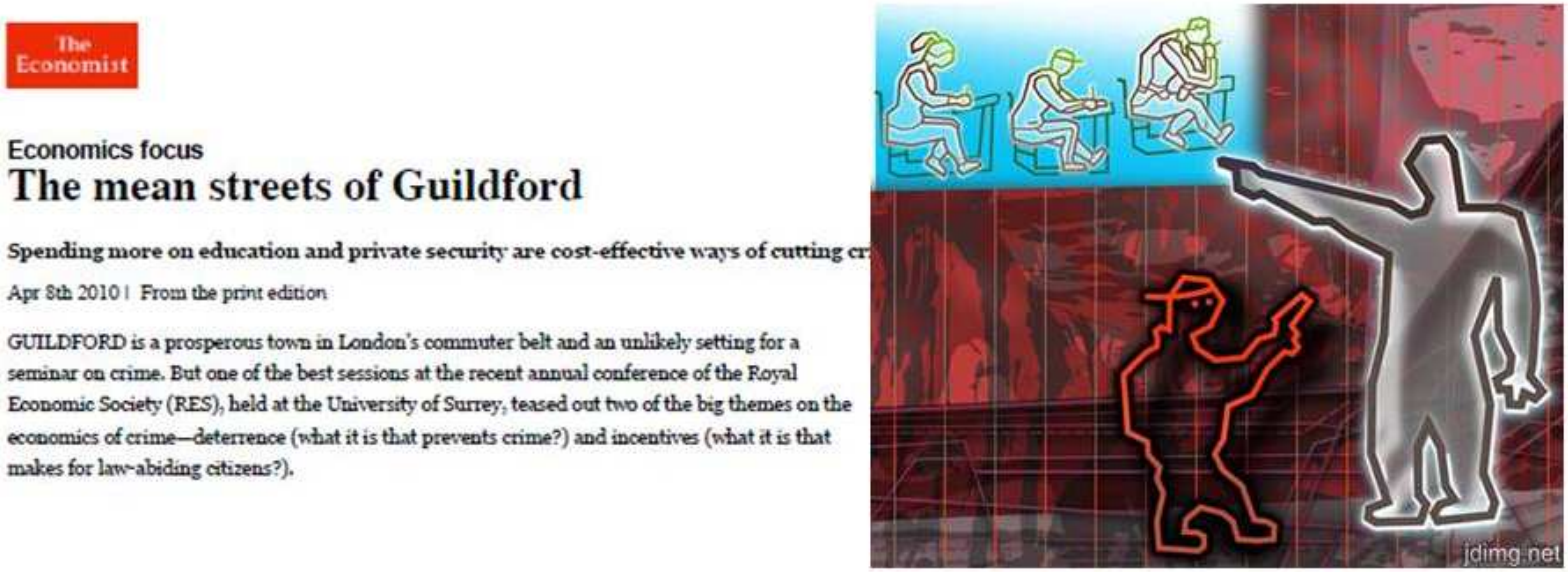
THE CRIME REDUCING EFFECT OF EDUCATION*

Stephen Machin, Olivier Marie and Sunčica Vujić

In this article, we study the crime reducing potential of education, presenting causal statistical estimates based upon a law that changed the compulsory school leaving age in England and Wales. We frame the analysis in a regression-discontinuity setting and uncover significant decreases in property crime from reductions in the proportion of people with no educational qualifications and increases in the age of leaving school that resulted from the change in the law. The findings show that improving education can yield significant social benefits and can be a key policy tool in the drive to reduce crime.

The paper established a causal link between education and crime by looking at the crime rates of school-leavers that were forced to stay on an extra year in British schools because of a legal change to the school-leaving age. This group of students was less likely to engage in criminal behaviour than the previous year cohort. The paper estimates that the cost of a year's extra schooling is outweighed by the benefits in terms of less crime.

MMV (2011): The Mean Streets of Guildford



The Economist

Economics focus

The mean streets of Guildford

Spending more on education and private security are cost-effective ways of cutting cr

Apr 8th 2010 | From the print edition

GUILDFORD is a prosperous town in London's commuter belt and an unlikely setting for a seminar on crime. But one of the best sessions at the recent annual conference of the Royal Economic Society (RES), held at the University of Surrey, teased out two of the big themes on the economics of crime—deterrence (what it is that prevents crime?) and incentives (what it is that makes for law-abiding citizens?).

"The authors calculate that one year of extra education reduces property crimes by 1-2%, and that the cost of the extra schooling is outweighed by the benefits of reduced crime. These results echo a study of American crime by Lance Lochner of the University of Western Ontario and Enrico Moretti of the University of California, Berkeley, which found the biggest benefit from extra education was in fewer violent crimes. That result is not replicated in the newer study, perhaps because there are too few murders in Britain to show up statistically. After all, Guildford is a long way from Los Angeles."

MMV (2012): Summary

German Economic Review 13(4): 366–384

Youth Crime and Education Expansion

Stephen Machin
University College London and
Centre for Economic Performance,
London School of Economics

Olivier Marie
ROA, Maastricht University and
Centre for Economic Performance,
London School of Economics

Sunčica Vujić
University of Bath

The paper presents further evidence on the causal impact of education on crime, by considering a large expansion of the UK post-compulsory education that occurred in the late 1980s and early 1990s. The effect of education expansion (EE) on crime is almost twice bigger than in MMV (2011) paper, because this paper focuses on peak offending period in an individual's life (aged 16 to 21), and it captures the incapacitation effect of spending more time at school (ie, having less time to commit crime). Further, part of the effect of EE on crime will come from its long term effects on income.

MMV (2011): Data Description

- Most admin data on crime does not contain information on the characteristics of criminals (eg, offences recorded by the police).
- Need to find 'historical' data where we have information on offenders' characteristics...
- The Offenders Index Data (OID)
  - Court appearances by year *but* no education level...
  - Offending rates (per 1000 pop) using Office for National Statistics (ONS) population data
    - By age cohort/year (cohort approach!)
    - Separately for men and women
    - Separately for property and violent crimes
      (**property** = burglary and theft and handling stolen goods; **violent** = violence against the person and robbery)
- Cohort education from General Household Survey (GHS)
- Sample: people aged 18-40, born between 1946 and 1970, across the 1972 to 1996 time period.

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MMV (2011): Instrumental Variables (IV) Approach

- The key problem in estimating the effect of education on criminal involvement is that unobserved characteristics affecting schooling decisions are likely to be correlated with unobservables influencing the decision to engage in crime.
- In other words, education-crime relationship is plagued by the endogeneity of the individual choice to participate in both activities, hence it is empirically difficult to prove.
- Use instrumental variables (IV) approach ("statistical trick").
- Use raising of the minimum school leaving age (RoSLA) from 15 to 16 in 1973 to account for the endogeneity of education.

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MMV (2011): School Leaving Age (SLA) Laws

- The first increase, from 14 to 15, occurred in 1947, further increase in the SLA, 15 to 16, occurred in 1973.
- We only consider 1973 law – no data on crime for young enough people before and after the 1947 increase.
  - SLA = school leaving age change dummy (15 to 16); individuals who entered their 15th year from 1972 onwards and faced a minimum SLA of 16.
- Both law changes well covered in literature:
  - Education & earnings: Harmon and Walker (1995), Oreopoulos (2006), Devereux and Hart (2010), Grenet (2010)
  - Parental income & education of children: Galindo-Rueda (2003), Chevalier (2004), Chevalier *et al.* (2005)
  - Education, health (mortality) & happiness: Doyle *et al.* (2007), Oreopoulos (2007), Clark *et al.* (2008), Jürges *et al.* (2009), Lindeboom *et al.* (2009)

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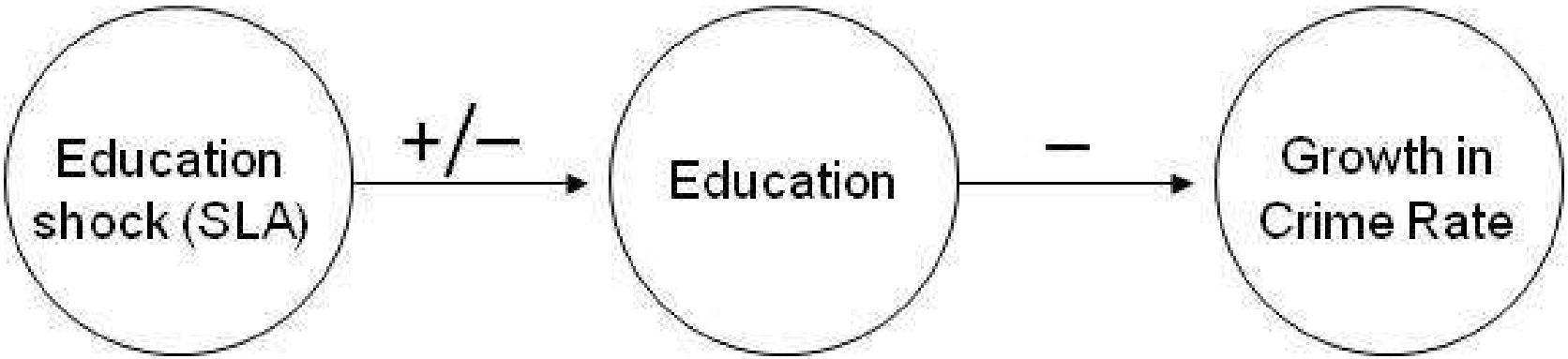
MMV (2011): Instrumental Variables (IV) Approach

- Logic of the instrumental variable in this paper:
  - EXOGENOUS: Legislation which raised minimum school leaving age (SLA) from 15 to 16 in 1973 cannot be correlated with the unobserved determinants of crime rate changes.
  - RELEVANT: Or...the only reason raising of SLA is related to crime is because this law affected 15-year-old pupils to stay at school one extra year.



- Measures of education:
  - Age left school
  - No qualifications (more appropriate in the LATE context; see later)

MMV (2011): LATE

- The variation induced by the instrument is *local* in nature: it has an impact at the bottom of education distribution and not at the top.
- People near the top would have stayed on after the compulsory SLA anyway and the change would not affect them.
- The effect that our empirical approach estimates is the *local average treatment effect* (LATE) among those who alter their treatment status because they react to the instrument.

Figure 1a. Discontinuities around SLA Increase

No Educational Qualifications

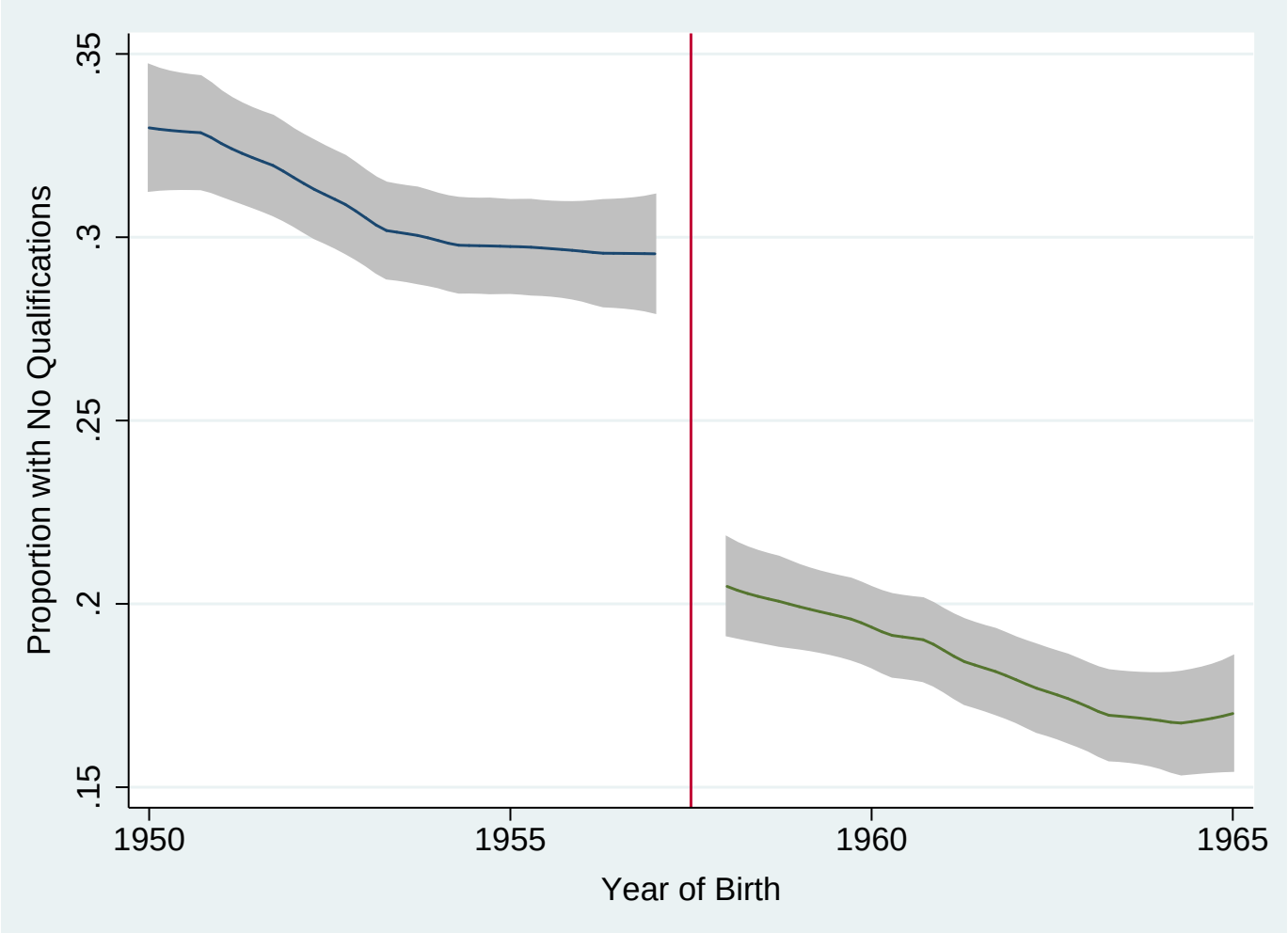


Figure 1b. Discontinuities around SLA Increase

Age Left School

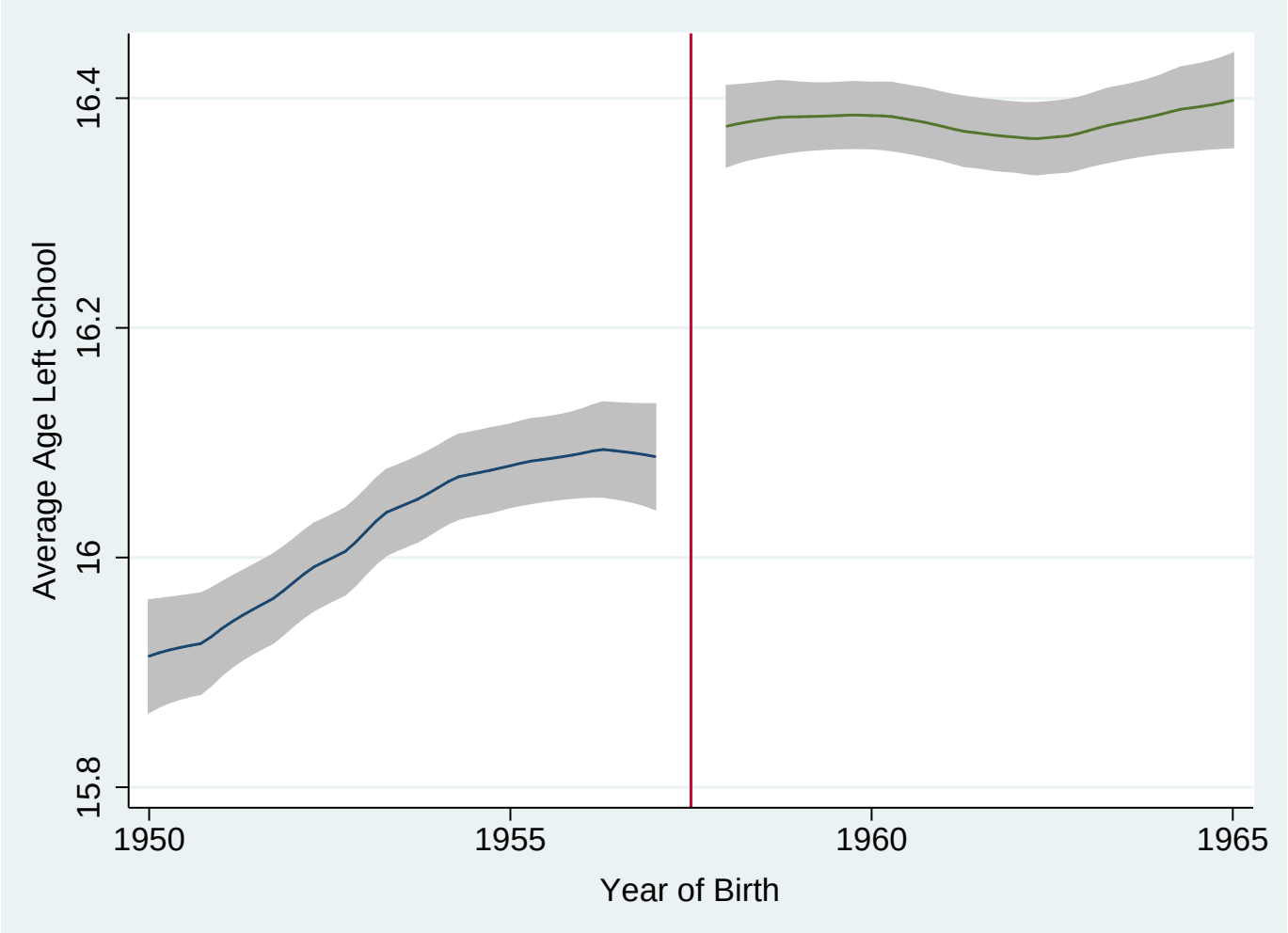


Figure 2. Discontinuities around SLA Increase

Conviction Rate

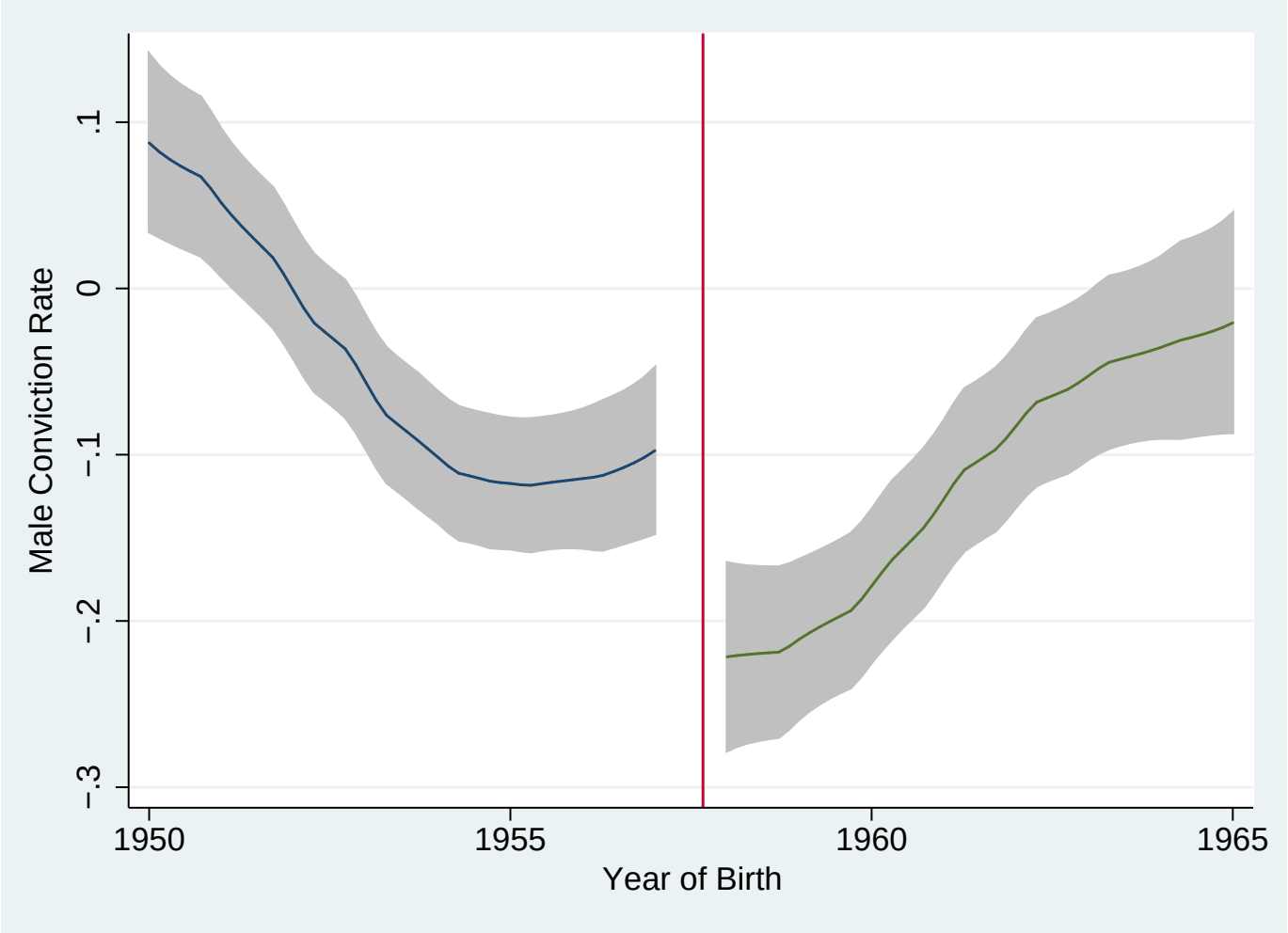


Figure 3. Crime-Age Profiles

Property Crime Conviction Rate

MMV (2011): Baseline Estimates (Property Crimes)

Men, Aged 18-40, Born 1953-1961, Discontinuity Sample

Table 4a: *The Causal Effect of Education on Crime, by Broad Types of Crime:*

Log(OID Property Convictions Per 1000 Population)

A. Population Weighted		No Qualifications		Age Left School	
	(1) Crime Reduced Form	(2) Education Reduced Form	(3) Crime Structural Form	(4) Education Reduced Form	(5) Crime Structural Form
SLA Increase	−0.096	−0.113		0.375	
	(0.039)	(0.019)		(0.055)	
No Qualification			**0.851**		
			(0.370)		
Age Left School					−0.257
					(0.108)
F-test	*F*(1,117)	*F*(1,117)		*F*(1,117)	
	=6.02	=36.34		=46.13	
	[*p*=0.016]	[*p*=0.000]		[*p*=0.000]	
B. Inverse Distance Weighted		No Qualifications		Age Left School	
SLA Increase	−0.135	−0.135		0.445	
	(0.037)	(0.021)		(0.058)	
No Qualification			**0.999**		
			(0.306)		
Age Left School					−0.303
					(0.089)
F-test	*F*(1,117)	*F*(1,117)		*F*(1,117)	
	=13.58	=42.14		=58.89	
	[*p*=0.000]	[*p*=0.000]		[*p*=0.000]	

MMV (2011): Interpretation of Results

1. First stage results
   - There is between 11% and 14% fall in the proportion of students with no qualifications.
   - There is an increase of almost half a year (0.4) in the average school leaving age.
2. Reduced form results
   - There is between 9.6% and 13.5% fall in the property crime rate in the years after the education reform.
3. Structural form results
   - 1% fall in the proportion with no educational qualifications reduces crime by between 0.85% and 1%.
   - Increasing the average school leaving age reduces crime by between 26% and 30%.

MMV (2011): Baseline Estimates (Violent Crimes)

Men, Aged 18-40, Born 1953-1961, Discontinuity Sample

Table 4b: *The Causal Effect of Education on Crime, by Broad Types of Crime:*

Log(OID Violent Convictions Per 1000 Population)

A. Population Weighted		No Qualifications		Age Left School	
	(6) Crime Reduced Form	(7) Education Reduced Form	(8) Crime Structural Form	(9) Education Reduced Form	(10) Crime Structural Form
SLA Increase	−0.028	−0.113		0.375	
	(0.057)	(0.019)		(0.055)	
No Qualification			0.251		
			(0.490)		
Age Left School					−0.076
					(0.152)
F-test	*F*(1,117)	*F*(1,117)		*F*(1,117)	
	=0.25	=36.34		=46.13	
	[*p*=0.619]	[*p*=0.000]		[*p*=0.000]	
B. Inverse Distance Weighted		No Qualifications		Age Left School	
SLA Increase	−0.067	−0.135		0.445	
	(0.059)	(0.021)		(0.058)	
No Qualification			0.498		
			(0.426)		
Age Left School					−0.151
					(0.131)
F-test	*F*(1,117)	*F*(1,117)		*F*(1,117)	
	=1.33	=42.14		=58.89	
	[*p*=0.252]	[*p*=0.000]		[*p*=0.000]	

MMV (2011): Discussion

- Empirical analysis identifies a robust, causal impact of education on property crime.
- Results on violent crime are more volatile and no clear pattern emerged:
  - Noisier nature of the data
  - Crime reducing potential of education applies more to property than violent crimes
- Vast majority of crimes are property crimes:
  - More than 70% of offences recorded by the police and tried in courts
- Economic importance of estimated effects?
- $\rightarrow$ Calculation of possible social savings that could result from estimated reduction in property crime.

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- Economic importance of estimated effects?
- $\rightarrow$ Calculation of possible social savings that could result from estimated reduction in property crime.

MMV (2011): Social Benefits Calculation

Table 6: *Social Benefits from Decreasing Population with No Educational Qualification by 1%*

Causal Estimate of SLA Change of 1% of Population with No Qualification		**Estimate = 0.851**	**Estimate = 0.999**
Cost in Anticipation of Crime		£174	£174
Cost as Consequence of Crime		£787	£787
Cost to the Criminal Justice System		£407	£407
Total Cost per Crime (Dubourg *et al.*, 2005)		£1,369	£1,369
Number of Male Convictions		91,800	91,800
Estimated Change in Number of Male Convictions		791	917
Estimated Change in Number of Male Crimes		39,525	45,836
(Only 2% of property crimes committed in 2007/8 ended up with a court conviction)			
Average Social Benefits from Crime Reduction		**£54,103,619**	**£62,741,986**
Cost per Student of One Year of Secondary School (Goodman & Sibieta, 2006)		£4,244	£4,244
Number of Pupils in Education at 16		493,000	493,000
Cost of 1% Increase or Extra Year of Education		£20,922,920	£20,922,920
Yearly net social benefit as the number of individuals treated with the extra year of schooling increases over time. Weighting (after 1, 3, 5, and 10) years by the proportion of property crimes by age for each cohorts affected by the SLA.			
Yearly Net Social Benefit from Crime Reduction	**1 Year after SLA**	**−£13,822,842**	**−£12,689,220**
	3 Years after SLA	**−£2,257,534**	**£722,645**
	5 Years after SLA	**£6,705,272**	**£11,116,482**
	10 Years after SLA	**£23,260,601**	**£30,315,091**

MMV (2011): Conclusions

- We use changes in the compulsory school leaving age in E&W to estimate the crime reducing impact of education.
- This paper adds to the small 'causal' literature on education and crime (with L&M for US).
- Estimates show that education significantly reduces property crime convictions.
- There can be significant social benefits from raising education levels in terms of crime reduction.
- The implications of these findings are clear:

Policies that subsidise schooling and HC investment have a significant potential to reduce crime in the longer run by increasing skill levels.

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MMV (2011): Policy Relevance

- This is of particular policy relevance in the UK context where:
  - The compulsory school leaving age is low by international (certainly European) standards.
  - The staying on rate at age 16 is low (and there is a large proportion of NEETs).
  - The school leaving raised to 17 in 2013, and to 18 in 2015.
- Of course, for crime reduction to be effective this does require that:
  - The 1% who could benefit from staying on and getting some qualifications is well targeted and
  - The labour market to absorb more education supply.
- More fully studying interactions with the labour market constitutes an important research question for the future, especially given the problems in the youth labour market in the UK.

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Thank you for your attention!

Sunčica Vujić

suncica.vujic@uantwerpen.be

Comparing UK & US

UK (this paper, 2010)	US (L&M, 2004)
A. Estimated Crime Effects	
* No quals increases male property crime by 85+% * Age left school reduces male property crime by 20-30% * Effects on male violent crime 1/3-1/2 that size (insignificant)	* HS completion reduces property & violent arrests by about 60-80% * Year of school reduces both violent & property arrest rates by 11-12%
B. Social Benefits Calculation	
* 1% increase in no quals reduces property crime by 0.85-1.00% * 40-45,000 fewer offences * Value: £54-£63 million per year (2007-08 £'s) * 10 Years after SLA: £23-£30 million	* 1% increase in HS graduation rates reduces property crime by about 0.60% * About 60,000 fewer offences * Value: $52 million per year (1993 US$) * Adjusting for inflation & exchange rate: £35 million

What About Brazil?

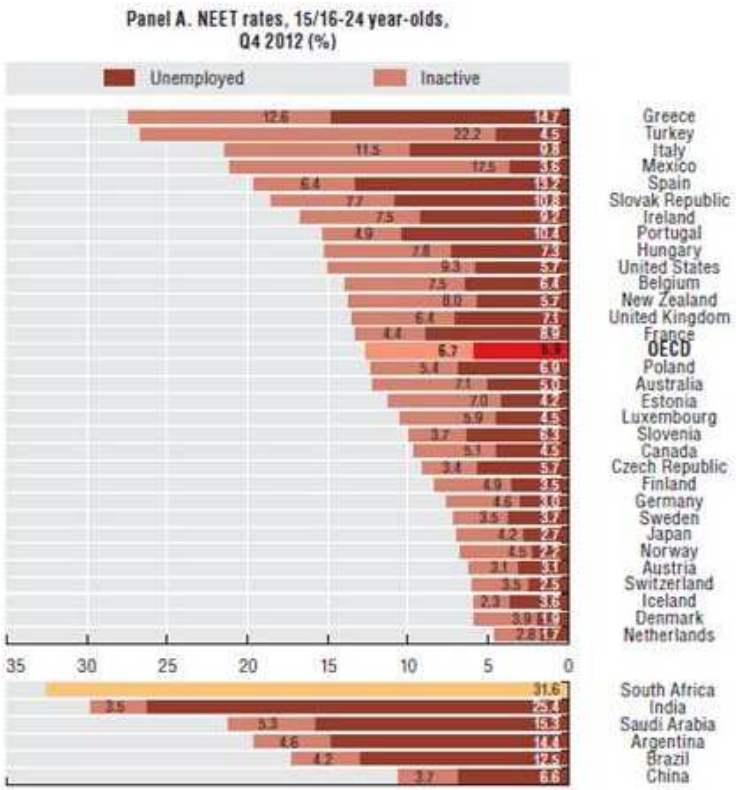
Acknowleding the Importance of Education

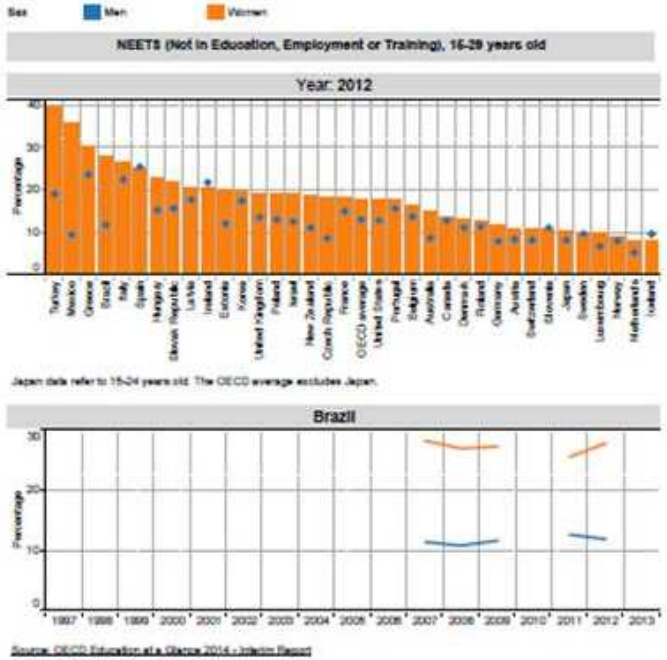
- “Future development of a country depends upon a well-educated workforce and citizens,” (PISA report on Brazil).
- Ambitious goals (Brookings, 2014):
  - Increase public education spending to 10% of GDP within a decade (current 5.7%; OECD average 5.8%); beyond what any developed or developing country has found sustainable. $\longrightarrow$ Importance of equity in the distribution of resources, and creating accountability and setting targets.
  - Raising learning outcomes to OECD levels by 2021 (a year before the 200th anniversary of Brazilian independence).
  - Universalizing access to early childhood education by 2016.
  - ...

What About Brazil?

Education and the NEETs

However...



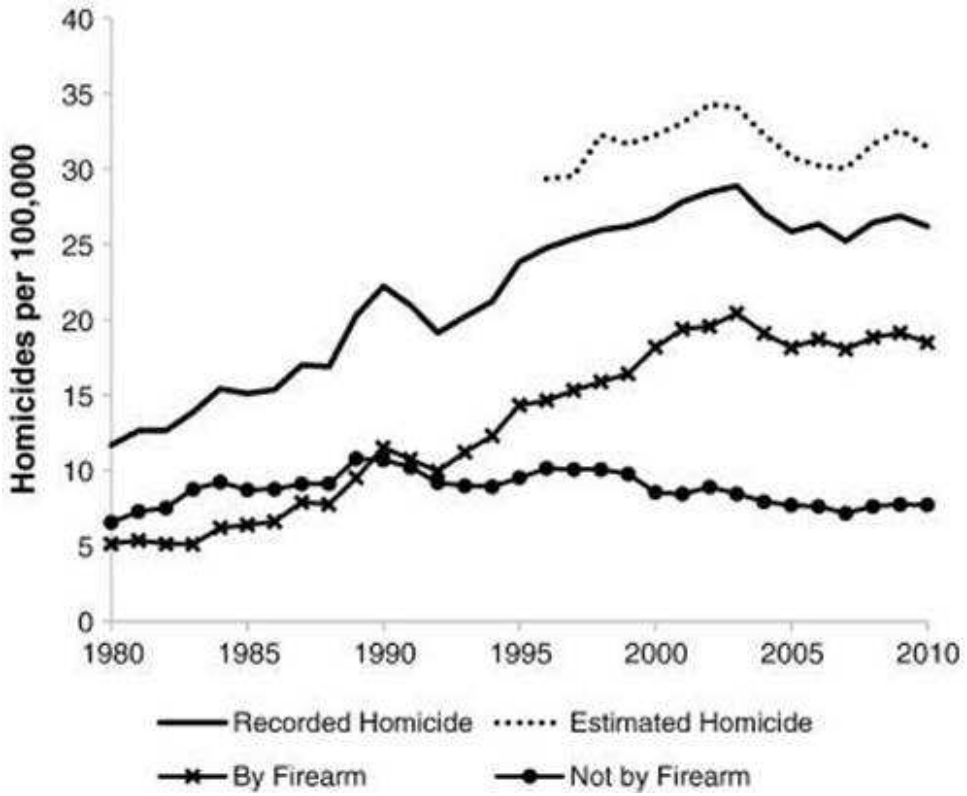


... Brazil NEETs 15-29 years old in 2012 = 12% men and 28% women (OECD average in 2012 = 13% men and 18% women).

What About Brazil?

Violent Crime Trends (Murray et al., 2013)

Violent crime is major area of concern for Brazil.



Enormous escalation in recorded homicide rates in Brazil over the last three decades. The increase has occurred almost entirely among young men (Waiselfisz, 2010). Brazil has the 5th highest rate of murders by youths per capita, with 32.5 per 100,000 of the population.

What About Brazil?

Similar Research?

- Crime data sources?
- Pesquisa Nacional por Amostra de Domicilios (PNAD) - Brazil's main rural and urban household survey.
- Education reforms:
  - In 1996, Brazil adopted radical educational reforms (FUNDEF and later FUNDEB): Increasing school funding; tackling teacher quality; setting curriculum standards; focusing on quality; creating accountability and setting targets.
  - Increasing high school completion: In 2006, 11 years of education became mandatory (this is now 12).