

Education Serves as a Deterrent to Criminal Behaviour*

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This paper explores the impact of Compulsory School Leaving (CSL) reforms on criminal behaviour, focusing on their role in reducing crime rates, particularly among the youth demographic. Drawing upon empirical evidence, it investigates how CSL reforms incentivize educational attainment, thereby diminishing the allure of criminal activities. The study underscores the significance of education in deterring individuals from a life of crime and advocates for continued research to inform effective policy interventions.

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*Code and data are available at: <https://github.com/rahmabintah/education>

1 Introduction

This reproduction was performed after a replication on the Social Science Reproduction platform: <https://doi.org/10.48152/ssrp-2jxv-qj51>

In the United States, there is legal variation among states. While there are federal laws that apply to the country as a whole, education is at the purview of state governments. Thus, each state can choose to be progressive or conservative and traditional. Compulsory School Leaving (CSL) laws mandate children to attend school to a certain age, we will refer to this as the dropout age. They also create exemptions under certain extreme circumstances and certain states require parental consent. These laws are often reformed as time goes by to accommodate the changing society and norms. They represent a critical juncture in educational policy, with far-reaching implications for societal well-being and crime reduction. By mandating extended periods of schooling, these reforms aim to not only enhance educational attainment but also mitigate the prevalence of criminal behaviour, particularly among vulnerable youth populations. In recent years, a growing body of empirical research has shed light on the intricate relationship between education and crime, highlighting the profound impact that educational opportunities can have on shaping individual behaviour and societal outcomes.

Brian Bell, Rui Costa, and Stephen Machin’s paper, “Why Does Education Reduce Crime?,” examines the reasons behind the observed crime reductions, resulting from state-level dropout age reforms enacted between 1980 and 2010 in the United States. It provides an empirical framework to analyse the mechanisms driving these reductions, highlighting both short-term incapacitation effects and longer-term sustained crime-reducing effects generated by the reforms. Rather than focusing on education improvements, the study finds that the observed crime reduction is primarily attributed to dynamic incapacitation, shedding new light on the impact of dropout age reforms on criminal behaviour. The framework uses data from arrests at the county-level and extrapolates it into the state-level. It uses the data from dropout age reforms at the state-level to highlight the differences before and after the reforms come into effect in each state.

In the following paper, we use the initial analysis from the above paper to produce a reproduction. This paper uses the data provided from the original paper’s replication package to study how effective CSL reforms are in promoting education, and the reasons behind the efficacy of educational interventions in reducing criminal behaviour and enhancing societal well-being. This paper argues that CSL reforms have the ability to keep individuals in school, giving them ample opportunity in society, once they graduate. It improves their socioeconomic standing, and discourages them from committing crimes. We find that these reforms to the laws directly result in a decrease of crimes, specifically violent, or drug-related crimes.

Data for this analysis and the different applications used, will be introduced in Section 2. Section 3 provides results from that analysis and Section 4 consists of a discussion of the results including the analysis’s weaknesses and biases.

2 Data

2.1 Sources

This paper replicates and explores various aspects of the original study for this analysis. It is reproduced using several data sets from the replication package provided with the paper “Why Does Education Reduce Crime?” (Bell, Costa, and Machin 2022). The replication package only holds the cleaned data in multiple files, depending on how they appear on the paper. The figures in this paper are replicated and reproduced from the original paper. Our reproduction aims to address the following two questions: (1) Do CSL reforms deter individuals from criminal activity, and thus decreasing crime rate in youth? (2) Does this reduction reshape criminal behaviour distributions by age?

Bell, Costa, and Machin (2022) do not analyse a single dataset. Instead, we have many different sources provided to us. The ones used to reproduce and compile this paper are as follows:

- Federal Bureau of Investigation Uniform Crime Data
- Westlaw International Database

2.1.1 Arrest Data

`figure1_data.csv`

This dataset contains data for male arrest rate at the county level, calculated from years 2000 to 2010. There’s an arrest rate for every age for young adults (15-39) and each of three crime types. The crime types include violent crimes, property crimes, and drug crimes.

`figure3_data.csv`

This dataset contains the mean of the arrest rate prior to a discontinuity in the arrests after a reform was enforced and discontinuity estimates by age calculated by Bell et al. Note that Texas (1985) is excluded from the estimation given that it showed a decrease in dropout age.

2.1.2 Reform Data

`dropout_age.csv`

The dropout age for each of the states in the country during the years 1980 and 2010 in one dataset. The authors of the original paper stated they had analysed each states reforms in regards to the education required attendance to record in this dataset (Bell, Costa, and Machin 2022).

2.1.3 United States Shapefiles

`maps_d.csv`

The centerpoint of each state according to the longitude and latitude of its location was provided in the dataset, along with the specific state identification number.

`maps_c.csv`

The borders for each states according to the longitude and latitude of its location was provided in the dataset, along with the specific state identification number.

In general, these datasets provide us with a way to graph the arrest rates against the age for various crime type, compare the change in dropout ages as time passes, and see arrest rates prior and post to the reforms. We have omitted an in-depth examination of the discontinuity estimates for conciseness. Our analysis with this data provide us with information of the real world to help policy makers make decisions on future educational interventions.

2.2 Methodology

The language and environment used for this analysis is R (R Core Team 2023), alongside the `tidyverse` (Wickham et al. 2019), `dplyr` (Wickham et al. 2023), `haven` (Wickham, Miller, and Smith 2023), `ggplot2` (Wickham 2016), `sf` (Pebesma and Bivand 2023), `gridExtra` (Auguie 2017), and `patchwork` (Pedersen 2024) packages.

We downloaded, cleaned, and wrote csv files to make it R friendly. We have classified it into three categories, arrest data, reform data, and United States shapefiles. There are many more datasets in the package, but we chose to only focus on these three. An explanation of these choices will be given in Section 3.

3 Results

In this paper, we have replicated the results found by the authors (Bell, Costa, and Machin 2022) to convey the following important findings. CSL reforms causes reductions in criminal activity and reshape criminal behaviour distributions by age.

The authors categorised the arrest data from the FBI into three categories. As mentioned earlier in Section 2, these categories are violent, property, and drug related crimes. The FBI’s UCR program consists of data from more than 18 000 city, university, college, country, state, tribal, and federal law enforcement agencies. (FBI, n.d.). According to the UCR program, the categories we mentioned are the crimes most committed by young adults (FBI, n.d.). They are also the crimes that are most consistently reported by law enforcement agencies (Bell, Costa, and Machin 2022). We have found that criminal justice agencies, law enforcement and social service providers often analyse these crimes, likely due to their volume and data availability.

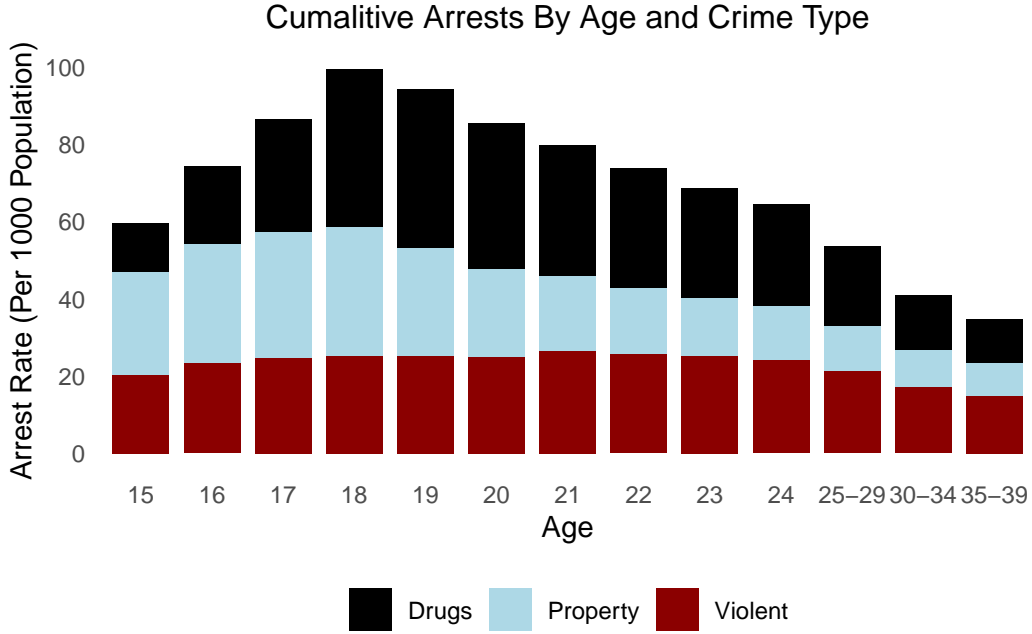


Figure 1: US male arrest rates between the ages 15-24 from FBI Uniform Crime Reporting data

In analyzing Figure 1, we can see a jump in male arrests for ages 15 to 18. The arrests peak at 18 and then fall gradually thereafter. These are the ages individuals are typically meant to be in high school. Within this figure, we can see how arrest rates vary across different age groups. An analysis can tell us the consistency across age cohorts. The types of crime driving the trend, is of particular interest to us. We observed there is an increase in drug-related crimes for individuals in this age range and is more pronounced than the other two types of crimes. It prompts further investigation and we provide some insight to this in Section 3.

Note that we examined county level data rather than state level data. This is due to the fact that counties rarely report their data even in a 5 year window. Thus, we focused on one that reported their data and use it to talk about state wide reforms (Bell, Costa, and Machin 2022).

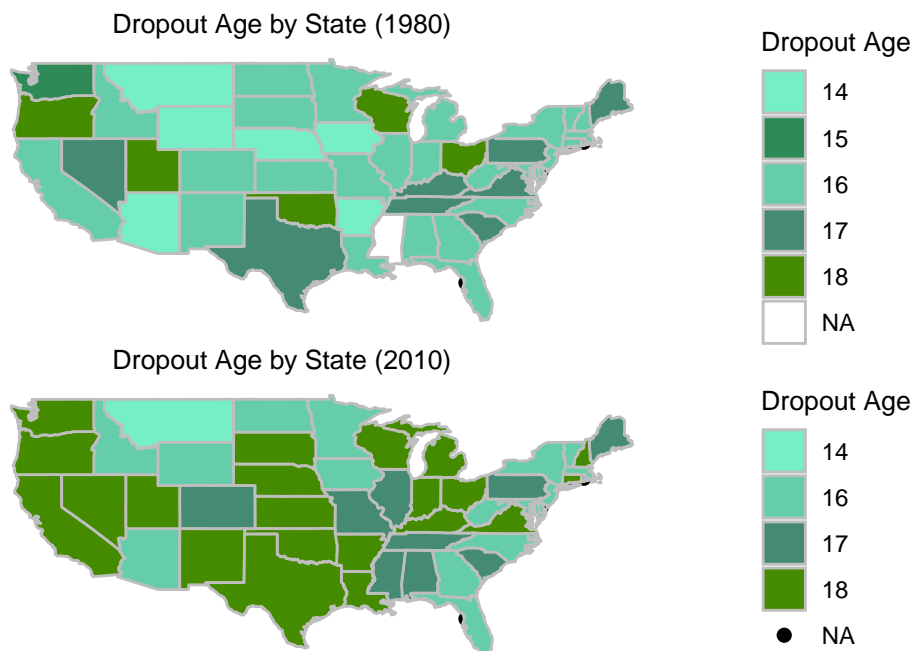


Figure 2: Change in dropout ages designated by state law between 1980 and 2010

In terms of CSL reforms, Figure 2 illustrates the age individuals are required to be in school until they can dropout. This dropout age is shown for each state, starting at 14 until 18. Initially, in 1980, there was significant variability among states for the dropout age. 16% of states set the age under 16, 54% of the states set the age at 16 and 26% at ages 17-18. However, by 2010, we saw a notable shift in the mandatory dropout ages. Only one state, Montana, had the dropout age under 16 and 62% of states set the age to be 18. As you can see, there was a significant increase in educational interventions, in the form of CSL reforms, between the years 1980 and 2010. This reflects a broader societal emphasis on the importance of education and its impact on various social outcomes such as crime rates.

Figure 3 displays the comparative analysis of the arrest rate per crime type before and after the reforms were implemented. This is demonstrated using the mean of the arrest rate prior to a discontinuity in the arrests after a reform, with discontinuity estimates calculated by the researchers of the original paper (Bell, Costa, and Machin 2022). These estimates quantify the change in rates before and after the reform, focusing on a transition between ages 15 to 24. We used the same discontinuity estimates to reproduce Figure 3.

Prior to the reforms, the line representing the mean arrest rate per crime type consistently rests

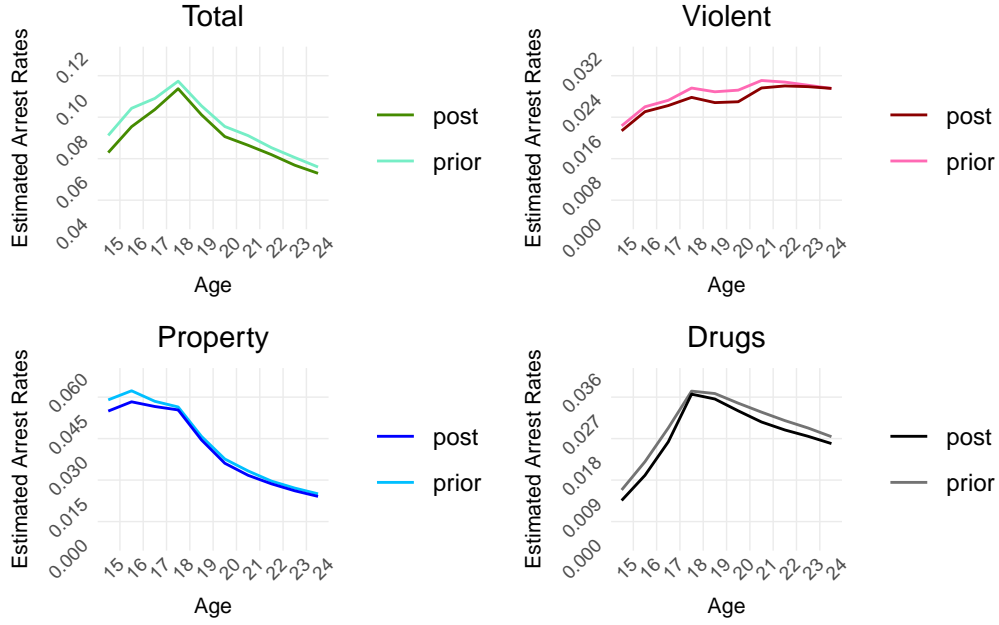


Figure 3: Prior and post reform crime rates for ages 15-24

at a higher level on the graph, indicating a relatively higher frequency of arrest. These observed patterns indicate a significant shift after the reforms were enforced. After implemented, the line resides at a relatively lower level on the graph. This shift indicates the frequency of arrests has decreased. The change is of particular interest, due to the fact that it signifies the consequential impact of policy. The results in this section illustrate a strong negative effect on arrest rates from CSL reforms. This concludes that there is a direct impact.

4 Discussion

4.1 Importance of crime prevention through educational interventions

In Figure 1, we saw drug-related crimes committed by those in high school were higher than the other types. Youth are particularly vulnerable to drug-related crime and thus, preventive measures must be taken early in the individuals life (Drugs and Crime, n.d.). This vulnerability could be due to the peer influence, social pressure, economic incentives, or numerous other reasons. The United Nations Office on Drugs and Crimes holds strong that it's their job is to strengthen youth's resilience to crime, reducing this vulnerability, through education and building skills (Drugs and Crime, n.d.). From Figure 1 and Figure 2, we can see the states that were active in their policy making, in regards to education. Clearly, education plays an important role and we saw this in Figure 2 and Figure 3. The statistical inference drawn from

the data implies that extending the mandatory education period in youth, contributes to a reduction in criminal behaviour among them.

Mandating education, until a later age in life allows individuals to have additional opportunities for personal development and career advancement. This potentially deters them from criminal opportunities as it avoids the risk factor in committing crimes. The pattern of decreased arrest rates across numerous crime types further strengthens our finding. Our findings highlight the role of education and allow us to look for benefits of educational interventions. This can help with further policy development, as discussed below in Section 4.2.

4.2 Policy Implications

We have outlined the benefit of educational interventions in Section 4.1. The increase in mandatory dropout age by the state, reveals an effort to encourage greater educational achievements for individuals and keep them out of trouble. We can go one step further and consider education initiatives that must be taken. States could prioritise investing in early childhood education. Giving children high-quality education provides them with even better opportunity and builds their confidence and skills to attain bigger goals. Development of their cognitive abilities, and building resilience in children can also decrease the effect of peer pressure, which we had outlined earlier can be related to the vulnerability of youth. If states want to keep youth in school, they must also use their time to promote safe and positive environment. This can reduce the effects of bullying and violence, and ensure youth stay in school.

4.3 Ethical Implications and Bias

Policymakers at the state level need to consider ethical implications and biases in their policies and reforms. If they don't, they run the risk of making the problem they're addressing worse than before. When states increase the mandatory dropout age, they must promote equity and access. This means educational opportunities and high-quality education to all, regardless of demographic characteristics like gender, race, age, social or economic status. States and policymakers also need to consider culture bias. This type of bias can exist when policymakers are not aware of their constituents' backgrounds, beliefs, and values. To address this bias, they should engage with those of diverse backgrounds in the community, and listen to their educational needs for their children.

4.4 Weaknesses and Future Research

In terms of the weaknesses in the analysis of CSLs, they vary by state. They have different exemptions in each state, making it difficult to measure the dropout age. While our estimation is based on widely held opinions on the age, it is important to note the difficulty of measuring the age. Another weakness in this analysis comes from the crime rates taken from the FBI's

Uniform Crime Data platform consisted of male arrests, only. While this was due to a lack of law enforcement agencies consistently reporting their arrests, it is still an issue when looking at the broader issue, as we are looking at youth as a whole. There are also disparities in income level and educational attainment in some states, as compared to other ones in the US. However, we could only look at arrest data in certain states, without considering the income level and educational opportunities in the specific states, to establish conciseness. For our next steps, future research should focus on youth from different socio-economic backgrounds and regions.

In summary, the observed decline in arrest rates following the implementation of educational reforms suggests a highly plausible relationship between extended mandatory education and reduced criminal behaviour among youth. These findings underscore the importance of policy interventions aimed at enhancing educational opportunities as a means of fostering positive social outcomes and mitigating crime rates among young individuals. Further research exploring the causal mechanisms underlying this relationship and assessing the long-term impacts of educational reforms on crime prevention is warranted.

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