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# Do guns displace books? The impact of compulsory military service on educational attainment

Thomas K. Bauer

*Rheinisch-Westfälisches Institut Für Wirtschaftsforschung*

Stefan Bender

*Institute for Employment Research*

Alfredo R. Paloyo

*University of Wollongong, apaloyo@uow.edu.au*

Christoph M. Schmidt

*RWI Essen*

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## Publication Details

Bauer, T. K., Bender, S., Paloyo, A. R. & Schmidt, C. M. (2014). Do guns displace books? The impact of compulsory military service on educational attainment. *Economics Letters*, 124 (3), 513-515.

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# Do guns displace books? The impact of compulsory military service on educational attainment

## **Abstract**

To estimate the causal effect of conscription on the probability to obtain a university degree, we use a regression-discontinuity design associated with the introduction of conscription in Germany. There is evidence that conscription increased the likelihood of completing higher education.

## **Keywords**

educational, service, military, attainment, compulsory, do, impact, books, displace, guns

## **Disciplines**

Business

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# Do guns displace books? The impact of compulsory military service on educational attainment

Authors	Thomas K. Bauer <sup>a</sup> Stefan Bender <sup>b</sup> Alfredo R. Paloyo <sup>c</sup> Christoph M. Schmidt <sup>d</sup>
Affiliations	<sup>a</sup> Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI), Ruhr-Universität Bochum (RUB), Forschungsinstitut zur Zukunft der Arbeit (IZA) <sup>b</sup> Institut für Arbeitsmarkt- und Berufsforschung (IAB) <sup>c</sup> University of Wollongong and RWI; corresponding author: <a href="mailto:alfredo@paloyo.net">alfredo@paloyo.net</a> ; +61 2 4221 3687 <sup>d</sup> RWI, RUB, IZA, Center for Economic Policy Research (CEPR)
Date	11 May 2014
JEL Classification	I28, J24
Keywords	regression discontinuity, conscription, career interruption, skill atrophy, TS2SLS

## ABSTRACT

Conscription typically drafts young men when they are at the height of their learning ability. It can depress the demand for higher education since skill atrophy and delayed entry into the civilian labor market reduce the returns to human-capital investments. To estimate the causal effect of conscription on the probability to obtain a university degree, we use a regression-discontinuity design associated with the introduction of conscription in Germany. There is some evidence that conscription increased the likelihood of completing higher education.

## 1 INTRODUCTION

Conscription into the armed forces is still actively enforced in many countries. Typically, men are called around the time they are 18 years old for a medical examination, after which they can either be declared fit to serve in the armed forces or exempted (temporarily or permanently). The selected individuals serve in the armed forces for a specified period of time. Military service can therefore be construed as a disruption of the human-capital-acquisition process of young men.

In Germany, national service was compulsory until June 30, 2011 for men either in the form of military service (*Grundwehrdienst*) or civilian service (*Zivildienst*) for conscientious objectors. When Germany was allowed to rearm itself after becoming a member of NATO in 1955, men born on or after July 1, 1937 had to undergo mental and physical examinations upon coming of age to determine whether they were fit to serve in the German armed forces (*Bundeswehr*).

However, those born earlier were exempted from CMS. Colloquially, they are called the “White Cohort” (*weißer Jahrgang*) because they neither served in World War II nor in the new German armed forces. We use the White Cohort as a control group to which we can compare the educational outcomes of those facing a positive probability of being drafted.

## 2 DATA CONSTRUCTION AND DESCRIPTION

We use two datasets for our empirical analysis. The first dataset (“Pension Data”) contains information on the service status of men and their dates of birth, which allows us to compute the probability of serving in the armed forces as a function of one’s date of birth. The second data source (“IABS”) consists is provided by the

Institute for Employment Research (IAB).<sup>1</sup> Except for some special groups, the dataset contains the total German population that was gainfully employed for at least one day for the period 1975–1995.

The following observations were removed from both datasets: females, East Germans (defined as having at least one employment spell in East Germany), persons who had an employment spell outside West Germany at any point (including foreigners and ethnic German immigrants), persons born before January 1, 1934, persons born after December 31, 1940, and professional soldiers. We excluded those people without a tertiary-system-entry certificate (*Hochschulreife*). Since these people were virtually excluded from entering university, their decision to seek out tertiary education is most likely unaffected by the introduction of conscription. For the Pension Data, these sample restrictions leave us with 15,835 men born around the threshold date who, if they performed CMS, served for not more than 12 months. For the IABS, we end up with 320,620 men.

Figure 1 plots the share of conscripted men by month of birth. Figure 2 shows the percentage of men who obtained a university degree over the sample cohorts. In general, one can observe that the completion rates for tertiary education are increasing over time, which generally corresponds to the easing of the access to higher education over the same period. About a year after the threshold date, the share of men with a university degree is much higher than the corresponding year before the threshold date. The overall mean for each side of the cutoff point clearly indicates that the non-White Cohorts generally have a higher educational attainment than the White Cohorts.

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<sup>1</sup> See Bender, Haas, and Klose (2000) for details. A new version of the IABS is available for researchers via the Research Data Center of the German Employment Agency in the Institute for Employment Research (RDC–IAB). See [http://fdz.iab.de/en/FDZ\\_Projects/BASID.aspx/](http://fdz.iab.de/en/FDZ_Projects/BASID.aspx/).

[FIGURE 1]

[FIGURE 2]

### 3 ESTIMATION STRATEGY AND RESULTS

The White Cohort was exempted from conscription. Let  $N_i$  be equal to 1 if individual  $i$  does not belong to the White Cohort and 0 if he does. The treatment status is represented by  $M_i$ , which is equal to 1 if individual  $i$  was eventually called to serve in the military and 0 otherwise. Let  $\bar{B}$  represent the threshold value at which point the conditional probability of receiving treatment jumps. The White Cohort is exempted from conscription so that  $E[M_i | B_i < \bar{B}] = 0$ ; for those born on or after  $\bar{B}$ , the probability to be drafted is a function of a vector of individual characteristics  $\mathbf{x}_i$ , i.e.,  $E[M_i | B_i \geq \bar{B}] = f(\mathbf{x}_i)$ .

We implement a two-sample two-stage least-squares (TS2SLS) approach (Angrist and Krueger 1992; Inoue and Solon 2010). The reason is that we can observe  $B_i$  in both datasets but only  $M_i$  in the Pension Data and only  $Y_i$ , an indicator of having a university degree, in the IABS.<sup>2</sup> The sequential system of equations is

$$\begin{aligned} M_{i1} &= \alpha_1 + f(B_{i1}) + \delta N_{i1} + \varepsilon_{i1} \\ Y_{i2} &= \alpha_2 + g(B_{i2}) + \tau \hat{M}_{i2} + v_{i2}, \end{aligned}$$

where the second subscript indicates which dataset is used (1 = Pension Data; 2 = IABS). The variable  $\hat{M}_{i2}$  denotes the cross-sample fitted values, which are computed

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<sup>2</sup> In Bauer et al. (2012), individuals were matched from both datasets. However, for this paper, we obtained the whole sample of men from the IABS, not all of whom are available in our original dataset. Therefore, we had to rely on TS2SLS to retrieve the required estimates, as explained in a previous footnote.

by using the parameter estimates obtained from the first stage based on the Pension Data but using the observations in the IABS. We apply the restriction  $f(B_{i1}) = g(B_{i2})$  so that the system can be estimated via two-sample two-stage least-squares.

Table 1 presents the first-stage results using the Pension Data; Table 2 shows the results of a regression of a binary variable indicating completion of a university degree on the instrument based on the IABS. All regressions include the control function  $f(B_i)$  with varying degrees of the polynomial order. Table 1 shows that the probability of being drafted is positively related to one's date of birth. For the cohort of men born in 1937, we recover an estimate of 11.72 percentage points.

[TABLE 1]

Table 2 presents the reduced-form estimates based on the IABS. Here, we highlight the fact that, without instrumenting conscription, we obtain a statistically significant relationship for two subsamples (Cohorts 1935–1939 and 1937) between one's date of birth, again as captured by the binary instrumental variable for being part of the White Cohort or not, and the probability of having a university degree.

[TABLE 2]

Table 3 shows results using the TS2SLS. Our estimates indicate that conscription had a positive impact on the probability of obtaining a university degree. Although the statistical significance of our estimates depend on which cohorts we use, the estimate is significant for precisely that subsample for which the validity of the RD estimate is most credible. We calculate that conscription raised the probability of having a university degree by about 15 percentage points. That being said, the fact

that both the statistical significance and the magnitude of the effect change over the subsamples does not make the resulting estimates more compelling.

[TABLE 3]

#### **4 DISCUSSION AND CONCLUSION**

Similar to previous country-specific studies (Card and Lemieux 2001; Maurin and Xenogiani 2007), we find uncover evidence indicating that the introduction of conscription increased the demand for post-secondary investments in human capital. We estimate the effect of this introduction to be 1.7 percentage points. We attribute this to the fact that enrollment in an educational institution is an effective method to avoid the draft. Note, however, that this is not the effect of military service but rather the reduced-form impact of being draft-eligible.

The estimates range from about 9 to 15 percentage points, with the higher bound exhibiting the highest level of statistical significance within our range of estimates. Since our estimate is much higher and less robust than the reported effects in other studies, we emphasize caution in generalizing this estimated effect to the rest of the population, especially considering the sample exclusion criteria that were used as well as the fact that the identification in the RD design rests on differences in a small neighborhood.

We posit two reasons to explain our findings. The first reason can be indirectly attributed to skill atrophy. Human capital—in particular, that part of one's stock that is not used in the armed forces but is rewarded in the civilian sector—tends to depreciate while on active duty. Replacing lost human capital requires additional education on the part of the former conscript.



Second, post-conscription human-capital acquisition allows men to catch up with the rest of their cohort in terms of earnings. It is well known that the experience–earnings profiles are dissimilar by educational attainment. While, on average, earnings increase as a function of labor-market experience, the slope of this function is much higher for university graduates than for non-graduates. Furthermore, the age–earnings profile of a university graduate would exhibit a longer flat region before reflecting a positive slope, indicating the fact that the person has spent more years in the school system before entering the civilian labor market. This flat region would be even longer for conscripts, which could induce them to resort to university training after their service in the hopes of quickly matching the earnings of their non-conscripted peers.

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## Tables

TABLE 1  
First-stage estimates (Pension Data)

	Cohort			
	All	1935–1939	1936–1938	1937
Non-White Cohort	0.0998*** [0.0204]	0.1236*** [0.0148]	0.1193*** [0.0120]	0.1172*** [0.0165]
Polynomial degree $J$	3	2	1	1
$F$ -statistic	317.81	84.49	57.13	41.71
Adjusted $R^2$	0.1526	0.0500	0.0404	0.0533
Observations	15,835	11,099	6,668	2,171

NOTES. The dependent variable is having served in the armed forces. The regressions include a constant term. Bracketed numbers are the standard errors.

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

SOURCE. Authors' own calculations.

TABLE 2  
Reduced-form estimates (IABS)

	Cohort			
	All	1935–1939	1936–1938	1937
Non-White Cohort	0.0121 [0.0075]	0.0129* [0.0071]	0.0106 [0.0069]	0.0170** [0.0080]
Polynomial degree $J$	3	2	1	1
$F$ -statistic	100.83	45.74	13.27	2.46
Adjusted $R^2$	0.0028	0.0014	0.0050	0.0001
Observations	320,620	225,233	132,121	43,197

NOTES. The dependent variable is having a university degree. The regressions include a constant term. Bracketed numbers are the standard errors. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

SOURCE. Authors' own calculations.

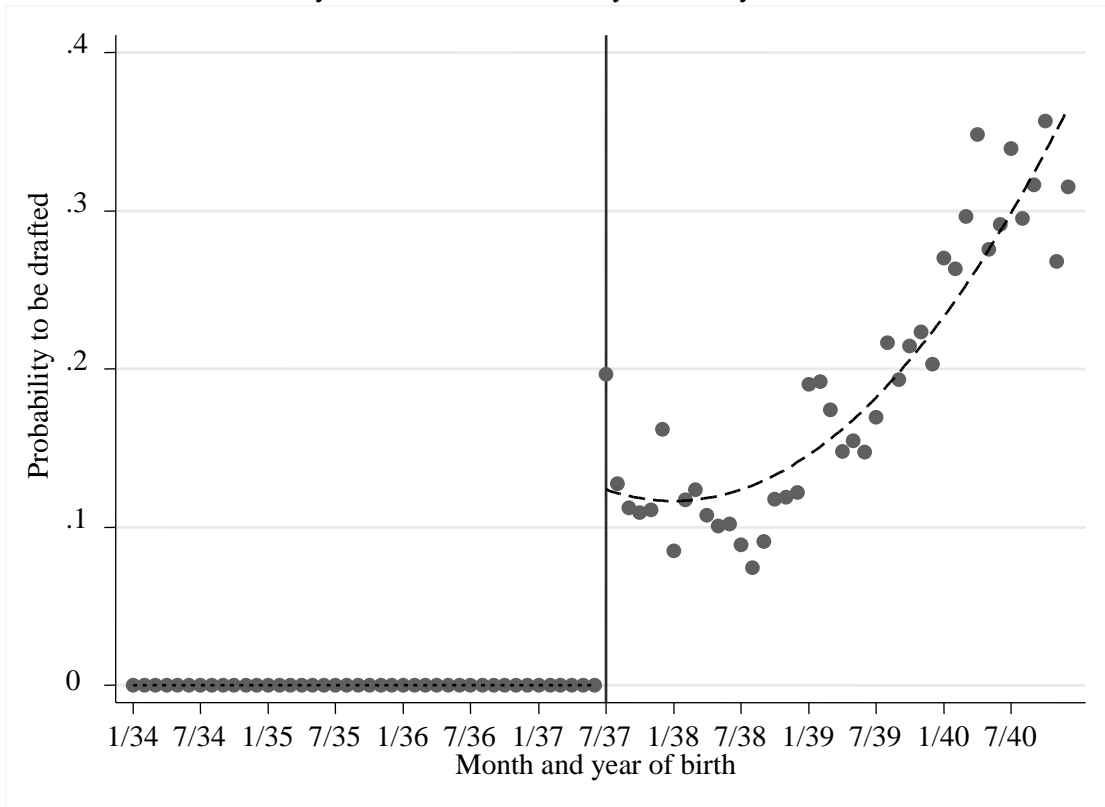
TABLE 3  
Impact of CMS on university education

	Cohort			
	All	1935–1939	1936–1938	1937
Non-White Cohort	0.1212 [0.0748]	0.1042* [0.0573]	0.0891 [0.0577]	0.1455** [0.0679]
Polynomial degree $J$	3	2	1	1

NOTES. Bracketed numbers are Murphy–Topel (1985) standard errors. The regressions include a constant term. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .  
SOURCE. Authors' own calculations.

Figures

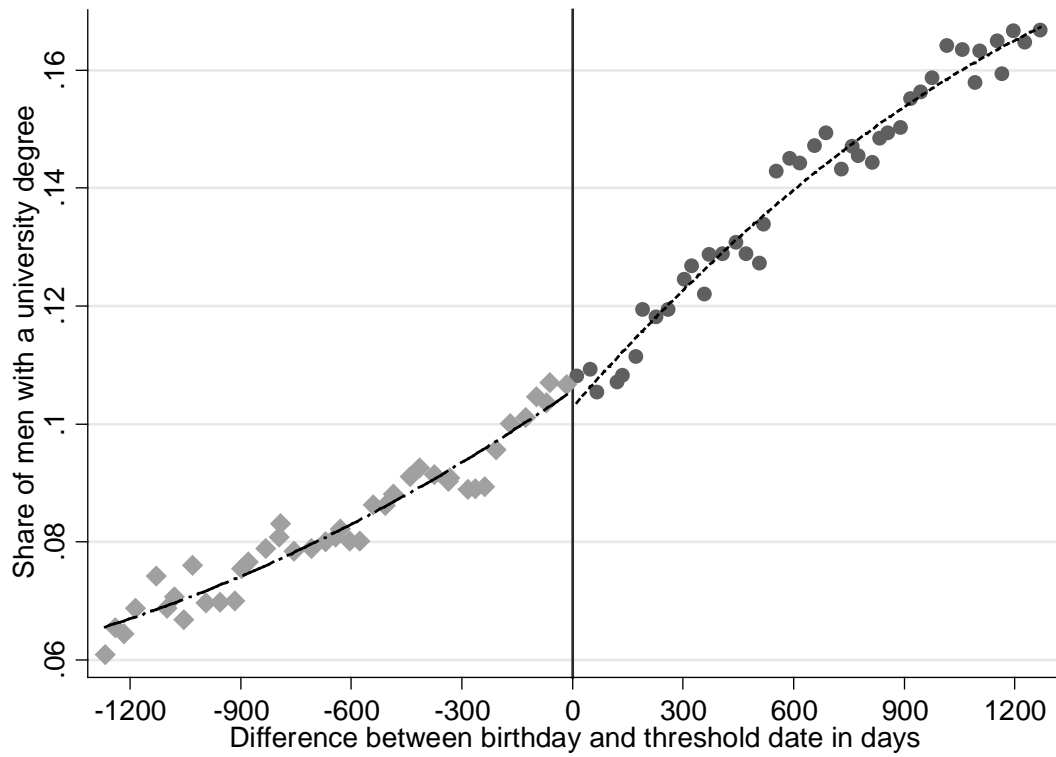
FIGURE 1  
Probability to be drafted for military service by month of birth



NOTE. Dashed lines represent quadratic fits over White Cohort and non-White Cohort observations.

SOURCE. Authors' own illustration based on Pension Data.

FIGURE 2  
Share of men with a university degree by date of birth



NOTE. Dashed lines represent quadratic fits over White Cohort and non-White Cohort observations.

SOURCE. Authors' own illustration based on IABS.