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Gun Laws and Crime: An Empirical Assessment

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Abstract

This paper deals with the effect of gun laws on crime. Several empirical analyses are carried to investigate the relationship between five different crime rates and alternative law variables. The tests are based on cross-section data from US sates. Three different law variables are used in the analysis, together with a set of control variables for income, poverty, unemployment and ethnic background of the population. Empirical analysis does not lend support to the notion that crime laws would affect the crime rates. The results seem to be the same for all five crime categories that are analyzed in the paper.

Keywords: crime, gun laws, crime data

JEL -code: K42

1. Introduction

Recently, gun laws have been subject to much controversy especially because of several shooting in schools and other public places. There have often been large numbers of victims involved, so that the media coverage is more extensive than is the case for incidents of a mere statistical nature. Moreover, because almost all the killings have been done using some (semiautomatic or automatic) type of gun, the immediate reaction has been a (proposal to) change the gun laws. Partly this is surely because there are not many obvious policy instruments to prevent this kind of incidents and when politicians face pressure to do something (to respond to the outcry “for Christ sake, do something”) the choice falls to the most immediate alternative.

Probably a typical example is Finland where the first school shooting took place in small town of Jokela in 2007 and caused an immediate change in guns laws in Finland. After that several other more or less similar incidents have taken place. After all of them, several proposals have been made for even stricter gun laws (a typical remark is the following put forward by the chairman of the investigative commission of the first Finnish shooting incidence Mr. Pekka Sauri “By far, the best way of preventing this kind of incidents is to restrict the purchase of guns and to control the possession of guns (May 30, 2012)). The problem is that in most cases the proposals are motivated only by subjective opinion, or experience from single incidents, not by careful scrutiny of previous research results and/or empirical evidence.

It is obviously very difficult to evaluate the role of gun laws in terms of such incidents because luckily these have been rare events, and this makes statistical testing quite tedious.[1] Combining global evidence might help but then we would face really tedious measurement problems. Thus, it may be better to focus on more conventional crime and ask whether gun laws can decrease crime rates especially with crime where firearms are customary used (say murder and robbery). The problem with the gun laws is the fact that they change very infrequently so that time series evidence is not very helpful. With cross-section evidence we have difficult measurement problems at least in terms of legislation but also in terms of controls. The case of United States provides a quite unique solution for the data problems: the crime data are compiled in more or less similar manner and there several indexes or classification of crime laws (for different states) which can be used in empirical analyses. Luckily the states also differ enormously from each other both in terms of crime rates but

[1] See, however, a micro data study by Chandler et al. (2011). The study did not, however, consider legal issues.

also in terms of legislation (and other controls of crime). This can be seen from Figure 1 which illustrates the crime rates in five main categories in different states[2].

Thus, we arrange a test where estimate a set of crime rate models for these five crime categories and scrutinize the performance of the alternative law variables. Obviously, we have to use several control variables to see "true" impact of gun laws. Needless to say, several robustness checks are required. Here that is done by using three alternative indexes for gun laws and using data not only for conventional "total" crime rates but also for rates of crime made by firearms.

In the US, there is a large amount of literature on gun laws. The problem is that it is very difficult to summarize the literature mainly because the topic appears to be so controversial and opinions are very polarized. Basically the arguments are the following: (1) Loose gun laws increase the number of guns and easy access to guns leads to large number of criminal actions. Put very simply: More guns, more crime and violence. (2) The opposite story says that larger number of guns has a deterrence effect (in the similar ways as apprehension and punishment). Again, put simply, that is because criminals know that potential victims may use guns for preventing the criminal actions.[3]

The US debate was very much inspired by a study of Lott and Mustard (1977) which arrived at quite affirmative results favoring the permissive concealed-handgun carrying (so-called "shall-issue") laws. The results of the Lott and Mustard (1977) study were challenged by e.g. Black and Nagin (1998) that suggested that the results it this study were not robust and concealed-handgun carrying laws had in fact no (negative) impact on violent crime. Also a study by Ludwig (1998) which basically uses a "differences in differences" approach arrives at a result that permissive concealed-handgun carrying laws have rather increased crime. Finally, one may refer to a more recent study of Rubin and Dezhbakhsh (2003) that made use of county-level panel data from the US. Their analysis suggests after taking into account the county level heterogeneity of various background variables the effect of (the introduction of handgun) laws were relatively small and of mixed sign of impact.

In this paper we will not concentrate on this specific form of gun laws but focus instead on the whole spectrum of laws and their impact on different forms of crime. Thus, we use three different measures of law which emphasize a different legal issues and practices. Some alternatives are also used in measuring the crime rates and in estimating the models. The results are presented in the following section 2, and some concluding remarks are presented in section 3.

2. Estimation Results

In the model, the dependent variable is the crime rate. Five different crime rates are used: for murder, robbery, rape, aggravated assault and property crime. To explain these we use a simple linear model.

The model has two types of right-hand-side variables: the law variables and the controls. Three law variables are used, all measuring the strictness of gun laws in different US states (for details, see the footnote of Table 1). The three law variables are illustrated in Figure 2. Comparison is a bit difficult because the construction is so different but Figure 2 suggests that in spite of these differences, the variables follow the same pattern over individual states. The average correlation between these three measures is 0.8 which is after all rather high.

As for the controls, we have quite basic controls such as the ethnic background of the population, the level of income, the distribution of income, unemployment and distribution of wealth. If we followed the "crime and punishment tradition of Becker (1968) we ought to have also such as the severity of punishment rates the apprehension rate as controls. Unfortunately, it is bit difficult to get "theory consistent data" on these variables because especially the severity of punishment is difficult to measure due to different forms of punishment.[4]

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[2] Here we consider the following five categories: murder, robbery, rape, aggravates assault and property crime. Obviously, they do not cover the area but still they are perhaps the most interesting examples. Moreover, their data are relatively easily available.

[3] An easy way out to summarize the US debate is to refer to the following Wikipedia article that appears to provide a quite balanced account of the whole US literature. http://en.wikipedia.org/wiki/Political_arguments_of_gun_politics_in_the_United_States

[4] Basically, we should construction a volume index of crime, a severity index of punishment and the corresponding apprehension rate index in the similar way that so-called monetary indexes have been constructed (see Viren (1994) for an application). Such an application would obviously beyond our possibilities in this case. The problem with the "omitted variables" is of course that they create some bias to the estimates. It is obviously very difficult to say what is the direction of this bias but one could speculate the punishment and apprehension

From the econometrics point of view, we face some difficult identification problems. These problems boil down to the question of how to interpret the power of gun laws? What do loose/string gun laws tell about the cultural and political background of the respective population? Can it be so that in very conservative states, where gun laws are relative loose, attitudes towards crime are very strict? Thus, the overall tolerance of crime is very small, crime laws are strict and a lot of resources are used in crime prevention? Or, does it go in other way around? These relationships may be possible although casual scrutiny of the data does not give immediate support to these notions. In any case, for practical reasons, deeper analysis of the background of the law variables cannot be given in this paper.

The estimates results are presented in Tables 1, 2 and 3. Table 1 includes the basic estimates for different crime categories. Table 2 represents, in fact, a continuation of Table 1 in the sense that includes detailed test values for different law variables. Table 3, in turn, uses alternative data in a sense that the crime rates represent cases where firearms have been used in making the crime. Unfortunately, for this issue, we have data only for murders, robberies and assaults. We have tried for provide a summary of the results by arranging them in a panel data format (not in terms of time but in terms of crime categories). Thus we use the fixed effects specification for scaling purposes for the different crime categories. We could have used genuine panel data also by having observations from periods (years). The problem is that laws change so infrequently that we could get any additional information by adding more years (of course, the degrees of freedom would look better but they would not reflect genuine additional information).

The message of Tables 1-3 is quite clear: the crime rates are mainly determined by the ethnic background and to lesser degree the level of income and the indicator of poverty (obviously all these are correlated with each other). The coefficients of the income and poverty variables cannot be estimated very precisely even though the coefficient signs are quite systematically correct. Adding other controls would not improve the situation, as a rule they are significant (cf. the last column of Table 1).

The role of law variables is also quite marginal, only in the case of assaults the coefficients make sense and (in one case) the t-values exceed the conventional levels of significance. Otherwise, these results do not allow any affirmative comments on the role of gun lows except for the one that the laws do not appear to be of crucial importance from the point of crime rates (either total rates or crime-with-firearms rates).

The share of crime that has been done with firearms seems to vary quite a lot over states in the three crime categories that we scrutinize in this paper: murder, robbery and aggravated assault (see Figure 3). But the shares do not seem to depend on the law variables we have in our data. Thus, the R^2 of share variables in a regression where all law variables are on the right hand side is 0.04 with murders, 0.02with robberies and 0.04 with assaults[5]. In other words, there appears to be no regression relationship between the law variables and the firearms share variables (F tests statistics clearly fail to exceed the conventional levels of significance). The results is somewhat puzzling because we would expect that gun laws have some effect on number of firearms and hence also the "use" of firearms.

3. Some Concluding Remarks

Even though the above-presented results appear to be quite clear several caveats should be kept in mind. First, our list of control variables is far from complete. Second, the law variables may not be fully exogenous. One might expect that they reflect both the controls and the crime rates. In other words, legislation may react to the level of crime. But even so, policy reaction (elections) may take time so that the relationship is probably not simultaneous. In practice, we know that gun laws are not changed frequently. Hence it is not easy to say, or model, how the policy feedback functions.

Anyway, this paper has hopefully shown that the issue of gun laws is not as simple as many seem to think. Crime may not be solved simply by making gun laws stricter. We probably need a more qualified response as regards legislative changes: the importance of different laws (in terms of e.g. possession, purchase and transportation of guns) may be very different. Had we also data on major legislative changes for some countries/states, we could utilize the "differences in differences" approach to estimate the impacts.

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variables could capture some of the explanatory power of the law variables and hence it could be that our estimates represent some sort of upper values for the respective coefficients.

[5] In the case of murders, the shares are significantly and positively related to level of crime (in different states), but with assaults and robberies such a relationship does not seem to exist.

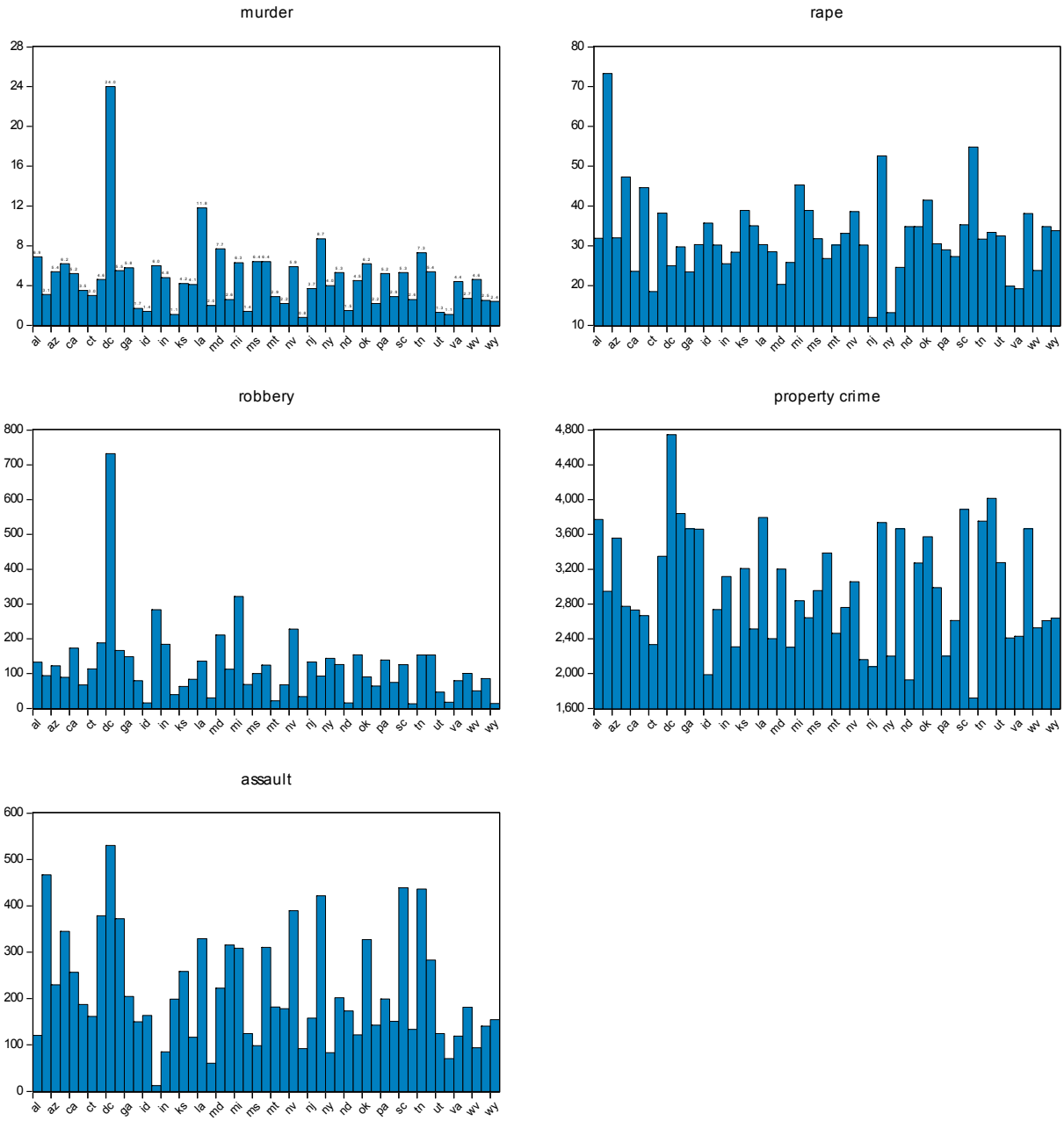

Figure 1. Crime in the different states in the US

All values are expressed in relation to population.

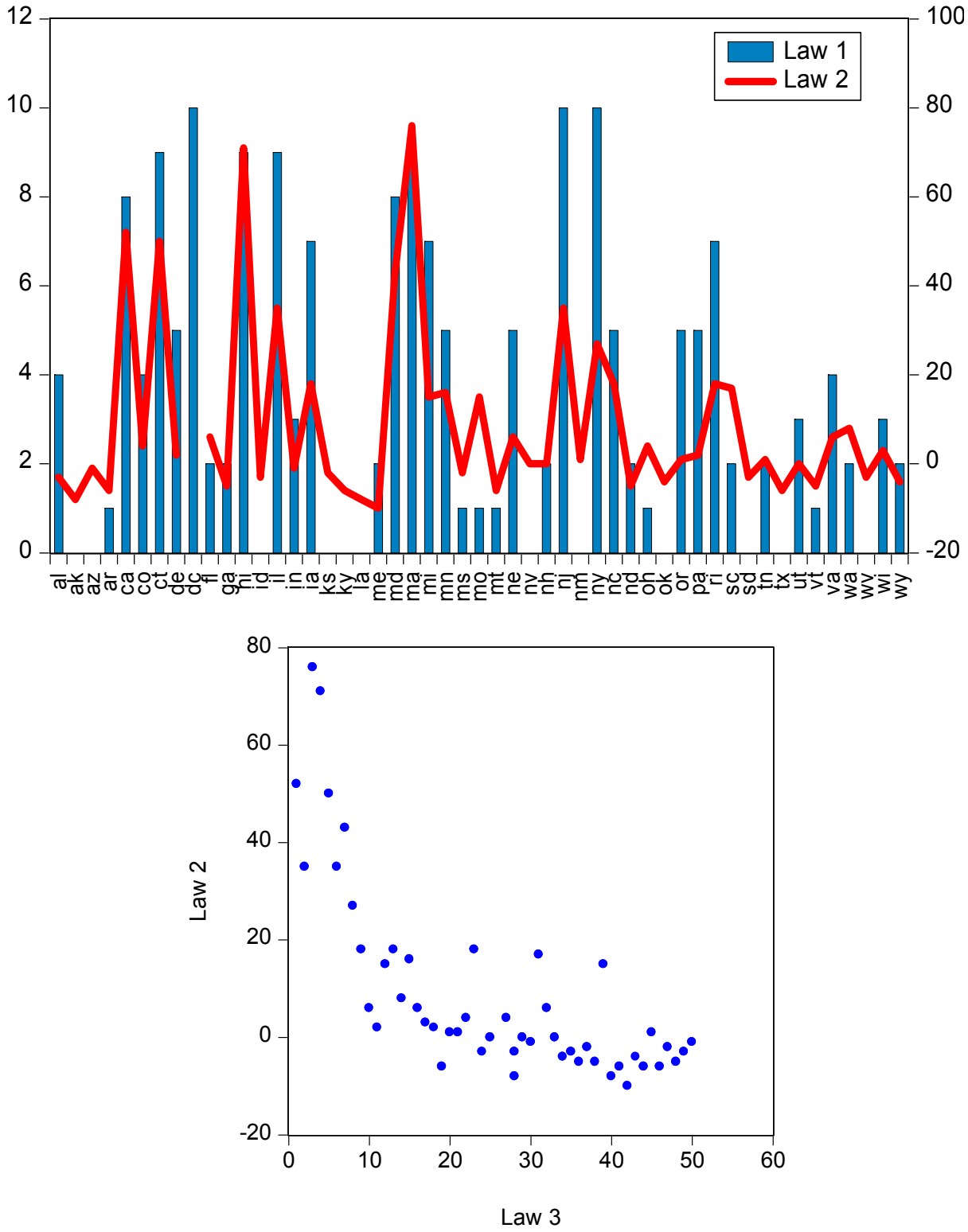

Figure 2. Relationship between different gun laws

See Table 1 for the definition of laws.

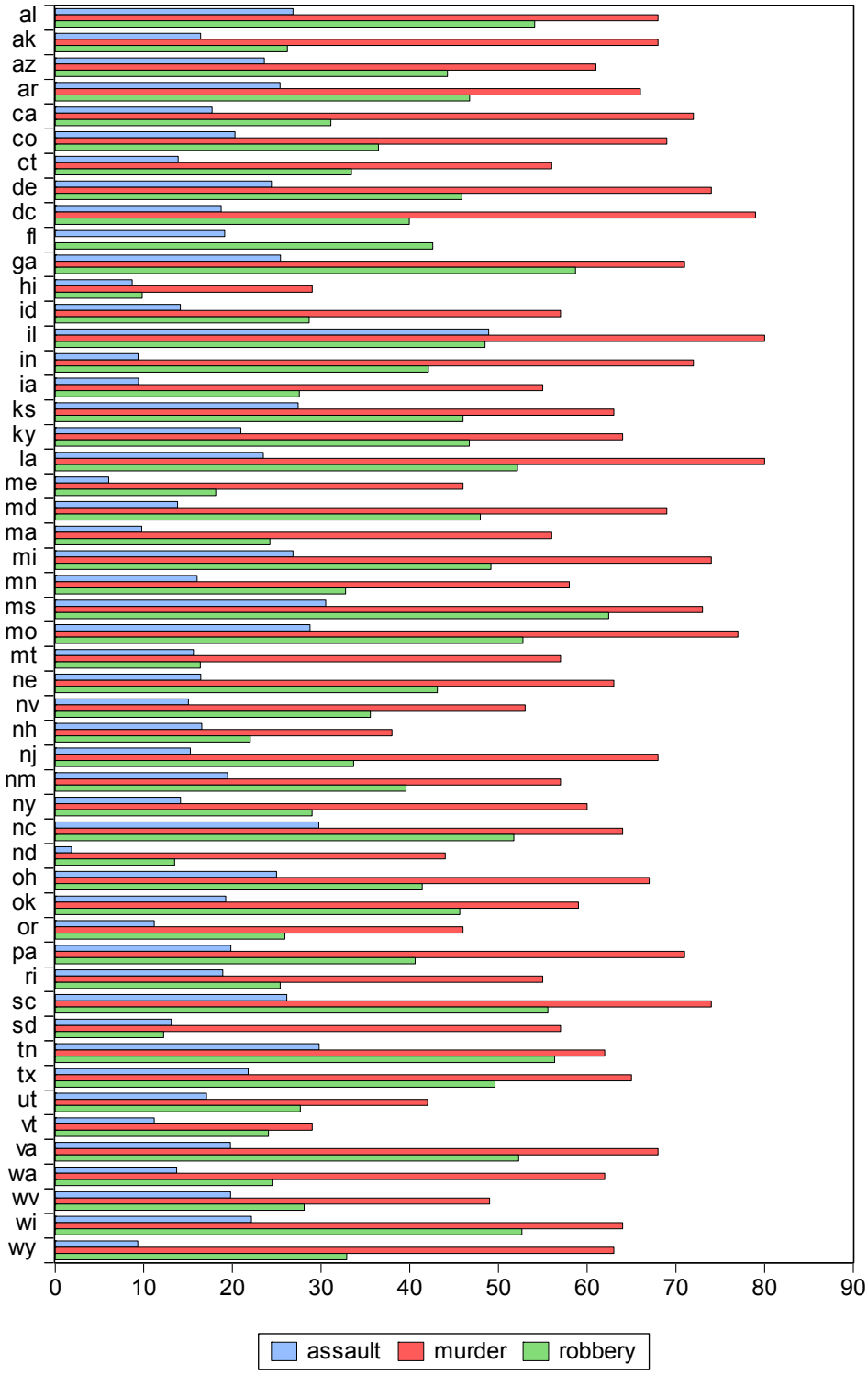

Figure 3. Use of firearms in different crimes (percentage share)

Data source: Guardian (2011)

Table 1. Estimation results for the crime model with the US data

	murder	robbery	rape	property	assault	panel	panel	panel	panel	panel
constant						570.9	575.3	576.4	588.6	5376.0
						(17.13)	(13.53)	(20.56)	(23.18)	(11.50)
white	-.648	58.97	29.04	2153	134.9					
	(0.58)	(1.67)	(4.68)	(7.84)	(2.18)					
black	23.33	846.4	1.812	5466	616.7	667.8	653.9	421.6	409.5	665.2
	(3.42)	(3.13)	(0.13)	(6.17)	(3.98)	(5.02)	(6.21))	(5.73)	(5.40)	(6.02)
mexican-american	10.96	348.1	53.28	5135	739.5	386.8	418.8	289.3	300.4	456.0
	(3.42)	(2.47)	(3.77)	(5.67)	(4.88)	(5.05)	(5.75)	(5.42)	(5.19)	(4.24)
income	-.267	.655	-1.790	-64.50	-1.467	-4.131	-5.322	-1.871	-3.650	-4.061
	(1.80)	(0.12)	(4.00)	(1.97)	(2.51)	(1.34)	(1.41)	(0.68)	(1.32)	(0.87)
poverty	.233	-5.853	.837	32.43	.112	-.552	-.408	1.289	2.901	-8.598
	(1.62)	(1.23)	(1.28)	(1.00)	(0.02)	(0.13)	(0.08)	(0.38)	(1.00)	(0.56)
unemployment										3.054
										(0.41)
low income										1051
										(0.62)
wealth										927.1
										(0.81)
Law 1							-1.360			-2.772
							(0.42)			(0.74)
Law 2								.178		
								(0.57)		
Law 3									-.848	
									(1.62)	
R^2	0.721	0.550	0.234	0.466	0.294	0.944	0.945	0.948	0.948	0.945
SEE	1.954	76.81	9.54	500.0	105.6	0.972	0.973	0.959	0.959	0.980
data	cross-section data by states					panel data by states and five crime categories				

Displayed numbers are coefficient estimates, numbers inside parentheses are heteroskedasticity-corrected t-values. The dependent variables are crime rates in different crime categories. Equations are estimated from US cross-section data for 2010. The number of observations is 51 (and in the panel 250). The shares of ethnical background variables white, black and mexican-american add up to one. Hence they all cannot be included in the panel regression where the fixed effects for all crime types are included. The panel data models are estimated with the SUR estimator. Income indicates average annual income of a household, poverty = share of poor households of all households, unemployment = the unemployment rate (%), low income = the share of households earning less than 10 000 dollars of all households, wealth = number of top wealth holders in relation to 100000 households. Law 1 = number of key gun laws enacted in the state (the scale runs from 0 to 8; the data source is "Trace the Guns 2010"), Law 2 = an index of the strictness of gun laws in the state (the scale runs from -5 to 100, the data source is "Gun Control in the United States 2000") and Law 3 = rank of the state in terms of the strictness of gun laws (number 1 is the strictest and number 50 is loosest; the data source is "Gun Laws Matter 2010"[6]). Otherwise the data sources are: "The 2011 Statistical Abstract: The National Data Book", United States Census Bureau, U.S. Department of Commerce.

[6] The law variables are a bit difficult to handle because they are based on qualitative assessment and hence the scale is at least partially ordinal. The biggest problem is related to Law 3 variable which is the rank of the state in terms of strictness of gun laws. We used several functional transformations to ensure that the results for this are robust and indeed it is seems that there is qualitative change in results even though we transform the variable (e.g. take logs and use different threshold values). One cannot really do much more with the relatively small data sample which we have.

Table 2. t- test values for the gun law variables in the basic model

	murder	robbery	rape	property crime	assault
Law 1	0.65	1.91	-2.06	-1.75	-1.32
Law 2	-0.52	1.33	-1.86	-0.45	-0.12
Law 3	-0.68	-2.27	0.80	-0.26	0.01

Results are derived by adding one law variable at time to the basic regression equation in Table 1 (columns 1-5) Notice that if we assume that stricter laws deter crime we would expect that the coefficients of law variables 1 and 2 are negative and the coefficient of law variable 3 positive. The critical value of the t-test statistic at the 5 per cent level of significance is 2.02.

Table 3. Estimation results for the crime-with-firearms data

	murder	murder	murder	robbery	robbery	robbery	assault	assault	assault
white	4.100	61.11	47.02	7.518	19.14	13.53	28.89	10.37	3.83
	(0.04)	(1.12)	(0.93)	(0.36)	(1.95)	(1.58)	(1.51)	(0.59)	(0.26)
black	1.829	1290.4	12,86	292.8	190.4	176.1	194.5	146.3	136.7
	(5.51)	(6.68)	(7.07)	(4.26)	(4.59)	(4.65)	(3.60)	(2.79)	(2.47)
mexican-american	610.3	422.5	396.9	126.9	93.33	86.03	128.9	116.1	106.2
	(3.21)	(2.94)	(2.86)	(2.94)	(2.46)	(2.39)	(3.06)	(2.91)	(2.86)
income	1.2060	1.441	2.500	-.200	.867	2.971	-1.211	-2.144	-2.252
	(0.93)	(0.28)	(3.86)	(0.77)	(0.72)	(0.20)	(1.12)	(1.54)	(1.40)
poverty	3.632	3.546	2.8889	-1.122	-1.303	-.591	-.135	1.489	1.734
	(0.35)	(0.56)	(0.43)	(0.58)	(0.99)	(4.62)	(0.05)	(0.66)	(0.71)
Law 1	3.411			.252			-3.051		
	(0.35)			(0.14)			(2.57)		
Law 2		-.303			-1.82			-.178	
		(0.48)			(1.71)			(1.08)	
Law 3			.585			-.010			.121
			(044)			(0.06)			(0.32)
R^2	0.723	0.662	0.663	0.600		0.466	0.385	0.286	0.278
SEE	136.1	92.96	92.91	26.89		17.71	25.78	27.14	27.29

Notation is the same as in Table 1. Here the dependent variable is the crime rates for crime that has been done with firearms. The data source is Guardian (2011).

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