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Guns and Justifiable Homicide: Deterrence and Defense

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GUNS AND JUSTIFIABLE HOMICIDE: DETERRENCE AND DEFENSE

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> ". . . the victims are no doubt better than the wrongdoers, but are at the mercy of their inferiors in the field in which they themselves are inferior, where, that is, they cannot be classed among the good since they have not trained themselves in self-defense. . . . . .But at this stage some have not armed themselves-and the duly armed win the day. Not even a God would have the right to deal a blow for the unwarlike: the law decrees that to come safe out of battle is for fighting men, not for those that pray." Plotinus[1]

1. Introduction

Self-defense may be a more important part of the overall crime control effort than is popularly recognized. In the mass media, it is usually assumed that crime fighting is the exclusive province of the criminal justice system; that is, the police, courts, and corrections organizations. The citizen is relegated to providing information to the police and in court as well as occasionally acting as a juror. It is often recommended by some authorities that the citizen should *not* resist the criminal attacker.[2] It is argued that resistance will provoke the attacker into committing greater injury.[3] It is also argued that the use of a weapon for self-defense, particularly a firearm, is likely to result in greater harm to the victim than would otherwise be the case.[4] It is also argued that the weapon is likely to result in direct harm to the owner when there is no outside attack.[5] For example, the Center to Prevent Handgun Violence quotes A. Kellerman, "A gun in the home for self-protection is 43 times more likely to kill a family member or friend than to kill an intruder".[6]

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1. THE THIRD ENNEAD, GREAT BOOKS OF THE WESTERN WORLD, p. 86-87.

2. *See, e.g.*, Yeager, M.G., J.D. Alviani, and N. Loving, "How Well Does the Handgun Protect You and Your Family" in THE GUN CONTROL DEBATE (1990).

3. *See* Yeager (1990, p. 215).

4. *Id.*

5. *Id.* at 223.

6. Of course, this is a silly metric; the comparison should be between lives *saved* by defensive gun use and lives *lost* by defensive gun use. It is as though one said that a person is much more likely to be injured by their airbag than is the drunk driver out there. This is true, but

On the other hand, there are surveys which indicate that civilians use firearms for predominately self-defense purposes. For example, Kleck and Gertz (1995) found that each year there are some "2.2 to 2.5 million defensive uses of guns of all types by civilians against humans".[7] Additionally Cook and Ludwig (1997) found that there were about 1.5 million defensive uses annually.[8] These surveys are unable to tell us how successful these defenses are, what the effects would be if the defenders did not have guns for defense, or if the defenders are themselves criminals.

The purpose of this study is to look at self-defense actions taken by police and by civilians to see if some inferences can be made about the number of times such actions are taken and how successful they are. Of particular interest will be the numbers of justifiable homicides committed by police officers and by civilians and how many other cases of self defense can be inferred from these. Lastly, statistical tests will be used to show the effect of gun purchases on changes in the crime rates, and see if any changes result.

Potential crimes have several possible outcomes. They may be deterred by the threat of sanctions imposed by the criminal justice (police/court/corrections) system. They may be actually stopped from happening by police action, although this seldom happens. They may be deterred by the threat of sanctions from civilians, particularly armed civilians. They may be stopped by actions taken by civilians, usually the victim. Finally, the crime may be successfully completed. These possibilities are shown in Figure 1. The usual measurements of crime, although typically incomplete, include E. Completed Crimes, B. Stopped by Police, and some of D. Stopped by Civilians. They cannot include deterred crimes, whether by police or civilians because those crimes are never attempted. Deterrence, however, is the ideal result because it has the lowest social cost[9]. This paper will attempt to quantify the amounts of civilian deterrence and civilian crime stopping.

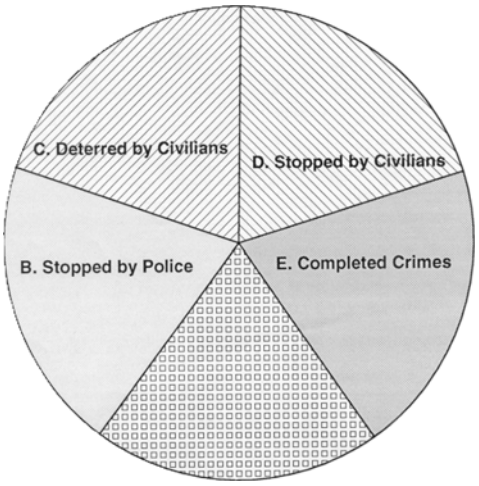
irrelevant. The issue with airbags as well as with guns is whether your risk of being injured by the drunk driver or the criminal is reduced by more or less than your risk of being injured by your airbag or gun. Further, as several researchers have pointed out, the Kellerman statement is incorrect as well because it refers to "friends" rather than acquaintances. Many self-defense homicides are against acquaintances: non-strangers commit about half of all violent crimes. In addition, Kellerman includes suicides.

7. Kleck G., and M. Gertz, "Armed Resistence to Crime: The Prevelance and Nature of Self-Defense With a Gun" in JOURNAL OF CRIMINAL LAW AND CRIMINOLOGY, v. 86(1), p. 164 (1995).

8. Cook. P.J., and J. Ludwig, "Guns in America: National Survey on Private Ownership and Use of Firearms" in NATIONAL INSTITUTE OF JUSTICE RESEARCH IN BRIEF, May 1997.

9. This does not include the cost of protection which should be factored in to any total cost function.

Figure 1
Potential Crimes and Results



A. Deterred by Police/Courts/Corrections

2. Justifiable Homicides and Disincentives For Crime

Over the five year period, 1993-1996, the police committed justifiable homicide an average of 398 times per year.[10] During the same period, the civilian public committed justifiable homicide an average of 299 times per year.[11] This latter figure may be lower than the true number if the FBI is unable to obtain the final outcomes of cases initially incorrectly categorized as unjustified. There were an average of 262.8 million people in the country[12] and 581,496 sworn police[13] during these same years.

The data for justifiable homicide are shown in Table 1.[14] As can be seen from the first row, the police are more than 8 times more likely to kill a felon than is the criminal justice system to execute him after arrest. If we add in the risk from citizens, the result is that executions are only about 7 percent as frequent as are justifiable homicides; executions averaged 49 per year while justifiable homicides averaged 697. Most of these justifiable homicides were

10. FBI STATISTICS, <*http://www.fbi.gov/pressr./pressrel/98archives.1997rel.htm*>.

11. CRIME IN THE UNITED STATES, <*http://www.fbi.gov./ucr/Cius_97/95Crimes6.pdf*>.

12. STATISTICAL ABSTRACT OF THE UNITED STATES, <*http://www.census.gov.statab/.www/.*>.

13. CRIME IN THE UNITED STATES, <*http://www.fbi.gov./ucr/Cius_97/95Crimes6.pdf*>.

14. See for example, <http://*www.fbi.gov/ucr/*> for statistics from various years.

accomplished with guns, particularly handguns. The percentages with guns were 100 for police and 88 for civilians. Handguns were 89 percent for police and 71 percent for civilians.

Table 1
Justifiable Homicides
Averages 1993-1997*

Total	Police	Civilians	Executions
Number	398.2	298.8	48.8
Using Guns	398.2	262.4	
Percent Guns	100%	88%	
Handguns	353.0	213.4	
Percent Handguns	89%	71%	

*Data from *Crime in the United States*, various issues.

The term "justifiable homicide" is defined to mean the killing of a felon by a law enforcement officer in the line of duty or the killing by a civilian of a felon during the commission of a felony.[15] There is a tendency, as indicated in these definitions, to give wider latitude to the police than to civilians to commit homicide. Of course, this depends on each state's laws.

From an initial look at these data it would seem that the risk of death at the hands of either the police or civilians would be of obvious concern to felons. It is evident that executions provide a disincentive to commit murder, as found by Ehrlich (1975)[16] who found that each execution deterred approximately seven to eight murders. Of course, justifiable homicides by police and by civilians are not solely in response to murder but are the result of attempts to commit murder either directly or in the course of committing other crimes. However, if each execution and each justifiable homicide results in 7.5 fewer murders, the total of 697 justifiable homicides each year should have deterred over 5,200 murders each year. Compared with the approximately 21,500

15. See for example, CRIME IN THE UNITED STATES, 1995, p. 22.

16. Ehrlich, I., "The Deterrent Effect of Capital Punishment: A Question of Life and Death," in THE AMERICAN ECONOMIC REVIEW, v. LXV(3), p. 398 (1975). Brumm and Cloninger more recently found support for this hypothesis. See Brumm, H.J., and D.O. Cloninger, "Perceived risk of punishment and the commission of homicides: A covariance structure analysis," in JOURNAL OF ECONOMIC BEHAVIOR AND ORGANIZATION, v. 31 (1996).

murders actually occurring each year as shown in Table 2,[17] this implies that the murder rate would have been about 24 percent higher without these justifiable homicides. The civilian justifiable homicides averaged 299 per year, which should have saved over 2,200 murders per year.

Table 2
Crime
Averages 1993-1997*

Crime	FBI Data	NCVS Data	NCVS/FBI
Murder	21,464	NA	NA
Rape	99,614	138,786	1.393
Robbery	586,263	1,167,722	1.992
Aggravated Assault	1,081,702	2,176,760	2.012
Total Violent	1,789,042	3,483,268	1.947
Burglary	2,620,804	5,261,455	2.008

*Data from *Crime in the United States*, various issues, from *Criminal Victimization 1997*, Changes 1996-97, Dec. 1998, and fr*om Sourcebook of Criminal Justice Statistics*, various issues.

Kleck (1991, pages 112-116 and Table 4.3) argues that civilian legal defensive homicides using guns are actually between four times the FBI count and 7.4 times the FBI count because the FBI does not later change initial incorrect categorizations of unjustifiable to justifiable.[18] He compared the FBI data with local police counts in several cities to find those levels of underestimates.[19] If we use the lower Kleck figure of 4, that would imply, using the Ehrlich 7.5 times incentive effect, that civilian justified homicides result in a reduction of more than 8,900 murders per year. In this case, without those civilian justified homicides, the murder rate would have been more than 41 percent higher.

Of course, the above argument relies on some very strong inferences which may not be valid. The situations which result in murders leading to executions may well differ from those which result in justifiable homicides. The police are likely to encounter felons during an attempt to make an arrest. The police will only be compelled to commit justifiable homicide if they are threatened with life threatening actions by the felon who thy are arresting. Civilians encounter such situations generally during the commission of a felony in

17. FBI STATISTICS, <http://www.fbi.gov/pressr./pressrel/98archives.1997rel.htm>, CRIME IN THE UNITED STATES, <http://www.fbi.gov./ucr/Cius_97/95Crimes6.pdf>, and STATISTICAL ABSTRACT OF THE UNITED STATES, <http://www.census.gov.statab/.www/.>.

18. Kleck, G., POINT BLANK, GUNS AND VIOLENCE IN AMERICA p. 112-116 and Table 4.3 (1991).

19. See Kleck (1991, p. 112-116 and Table 4.3).

circumstances in which a reasonable person would feel threatened with serious harm. In order to infer that many murders are deterred, it would need to be reasoned that the felon would understand the risk of such consequences and would modify his behavior accordingly so as to reduce the risk of being killed. That is, the felon would not attack the police who are trying to arrest him, or would moderate any attack on civilians to reduce the probability they would be able to justify killing him. Of course, one way to reduce both risks is to avoid crimes which lead to such outcomes. That is, the criminal could choose less risky crimes or choose to commit fewer crimes.

Continuing with this potential incentive, the ratio of other violent crimes to murders is about 82 to 1, based on FBI data. These are shown in Table 2. However, based on the (*NCVS*) survey data also shown in Table 2, the ratio is more like 162 to 1. If we assume that violent crimes other than murder are reduced by the risk of justifiable homicide in the same proportion they bear to murders, again due to this incentive effect, this implies that the risk of justifiable homicide from police and civilians for the criminal results in somewhere between 430,000 and 840,000 fewer violent crimes than would otherwise be perpetrated. However, using Kleck's lower bound numbers for justifiable homicides would imply a reduction of from 1,700,000 to 3,300,000 violent crimes.

Out of the average of 697 reported justifiable homicides each year, there were guns used in 660 cases.[20] This is over 94 percent of all justifiable homicides and indicates that many of these justifiable homicides would not have been possible without the guns being available to the police or to the victims. The police used guns all of the times while civilians used guns 88 percent of the times. Assuming that absent the civilian guns, the civilian justifiable homicides committed with guns would not have occurred, this can be used to infer that there would have been from 2,000 to 7,900 more murders per year and from 160,000 to 320,000 (or 640,000 to 1,300,000, using Kleck's lower bound estimates of justifiable homicides) more other violent crimes per year due to the lack of the negative incentive for the criminals.

The above is based on the single estimate of 7.5 murders deterred per execution by Ehrlich. It is worth considering the fact that executions averaged 75 per year during the period studied by Ehrlich. With only about two-thirds as many each year in a more recent period, it would seem reasonable that the marginal product would be higher. That is, each execution should be more effective now than during the time studied by Ehrlich. The risk to a murderer of being executed was then about 0.008 (1 in 125) and has now dropped to about 0.002 (1 in 500). Therefore, the above estimates of the incentive effects of justifiable homicides may be biased downward; the true effect could well be

20. See Table 1.

much larger. The average effect should also be larger, assuming a declining marginal product.[21]

Cloninger (1991) found that lethal responses by police were associated with a reduced crime rate.[22] It would seem likely that lethal civilian responses would have the same effect. His elasticity was (negative) one-sixth[23] which, given the data here, implies that each incremental lethal response would reduce the number of violent crimes by 1,350. This is a somewhat larger effect than computed above; if there is a constant marginal effect, violent crimes are reduced by about 400,000 annually by civilians killing felons, including about a 350,000 reduction in violent crimes due to civilian killings with guns owned by felons, or, if we use Kleck's numbers, there is a 1,400,000 reduction.

Using Ehrlich's figure and Cloninger's figure these results are quite close to each other in terms of the incentive not to commit crimes. It is also consistent with estimates of crime reduced through self-defense with guns as given by various surveys. There are two ways for crimes to be deterred. First, if the risk is too great, the criminal does not undertake to commit the crime in the first place. Second, the potential victim, through being armed and showing this fact to the attacker, causes the attacker to desist. Thus, the overlap of crimes deterred with the use of guns in self-defense does exist, but the two categories are not the same. The latter is more properly considered as stopping the crime.

3. Inferences About Civilian Arms

As mentioned above, if is often recommended to civilians that they leave their defense to the police and not attempt to engage in self-defense against criminals.[24] However, the fact that civilians kill an average of 299 felons per year, 88 percent with guns, while police kill 398 felons per year with guns, implies that civilians are having a substantial portion of the effect police have. If Kleck's estimates are correct, civilians have a much greater effect than do the police. There are fewer police than there are civilians but a greater portion of the police carry firearms. It would appear that these two factors are offset with respect to the number of felons killed, a measure of the risk to a felon.

This section takes a look at the relative risks faced by the felon who attacks police compared with attacking civilians. The circumstances may well differ in the interactions, but the issue of risk remains the same in both cases.

21. The rate of police justified homicides is about the same as the rate of deaths through "police intervention", an earlier series. Thus, the overall official rate of killing felons has fallen.

22. Cloninger, D.O., "Lethal Police Response as a Crime Deterrent", in AMERICAN JOURNAL OF ECONOMICS AND SOCIOLOGY, v. 50(1) p. 59-69 (1991).

23. See Cloninger (1991).

24. Lott, J.R. Jr., MORE GUNS, LESS CRIME: UNDERSTANDING CRIME AND GUN CONTROL LAWS, p. 13 (1998a). As Lott notes, the police are normally unable to protect civilians and usually react after a crime is committed.

It is usually the case that a person who attacks police officers knows that they are armed because uniformed police generally carry their arms in an unconcealed fashion. That is not the case with civilians who, if they are armed, are usually carrying their weapons concealed rather than openly. The attacker knows the risk of attacking police involves the use by the police of their guns, while the attacker of a civilian has an unknown probability of encountering an armed victim, since the probability of a civilian being armed is much lower than the probability of the police officer being armed.

The police will usually encounter felons as the result of a police attempt to arrest the felons. The original crimes for which they are to be arrested have already been committed and the police attempt to arrest the perpetrators after the fact. The civilian is most likely to encounter a felon during the commission of the felonious act. The civilian is generally surprised by the felon as opposed to the police officer who expects to be dealing with a felon. The result is that the civilian is less likely to be prepared to deal with the felon than is the police officer.

The number of individuals who are killed by the police or by civilians in such justifiable homicides can be computed as the result of a probabilistic process. Take the number of encounters some group has with felons. We will use the groups of police and civilians. Multiply the number in each group by the probability that the person who has the encounter with a felon is armed. Then multiply the result by the probability that the person having the encounter needs to and is able to use his/her firearm. Multiply that result by the probability that the person who is able to use the gun actually fires the gun. Multiply that result by the probability that the person who fires actually hits the felon. Finally, multiply that result by the probability that the felon who is hit actually dies. The result will be the number of felons killed by either group, police or civilians.

Using algebraic symbols, let the number in the group be N_i where i is either police or civilians. The probability of an encounter where deadly force is appropriately used is E_i; thus the number of encounters is $N_i\ E_i$. The probability of a person being armed, given an encounter, is A_i. The probability of the armed person being able to use the firearm is U_i. The probability of firing the gun, given the capability of use, is F_i. The probability of hitting the felon upon firing is H_i. The probability of death for the felon who is hit is D_i. The number of felons who die as the result of being shot by the police or civilians is M_i. The identity is thus: (1)

$$M_i = N_i\ E_i\ A_i\ U_i\ F_i\ H_i\ D_i$$

for each of the two groups, police and civilians.

Next, consider the ratio of the equations for the two groups. It doesn't matter which group is in the numerator, but let us place the police there. The result is:(2)

$$\frac{M_p}{M_c} = \frac{N_p E_p A_p U_p F_p H_p D_p}{N_c E_c A_c U_c F_c H_c D_c}$$

Now, consider the ratios of these numbers and probabilities, one at a time.

The number of felons who are in contact with the police in an adversarial relationship, $N_p E_p$, is related to the number of arrests made by the police on felony charges. Some of those arrested will be found not guilty of the crime with which they are charged and others will have some or all of the charges dropped due to lack of evidence. In 1994, there were 808,647 arrests for murder, rape, robbery, and aggravated assault.[25]

That same year, there were only 145,961 convictions for those four violent crimes.[26] That is only about an 18.1 percent conviction rate and it might seem that police making most of the arrests are not risking violent confrontations. (Of course, the convictions are later than the arrests and may even be in a later year, but the numbers do not vary enough from year to year to suggest a greater conviction rate.) It is nevertheless probable that a substantial majority of the arrests are of people who have a violent background. That is often the reason the individual is a suspect in a case; in the past, there has been evidence of a tendency to commit such crimes. Consequently, it may be expected that the police are encountering violent persons each time they make an arrest for a violent crime. Of course, there are other encounters where an arrest is not made; the suspect escapes after the encounter. That would increase the confrontation numbers by an unknown amount.

Over the 5 years 1993-1997, as shown in Table 3,[27] there were an average of 783,202 arrests made for the four violent crimes indicated. In each case, police encountered a person who was believed to be violent and, in most cases, had an actual violent past. These represent the chances for violent confrontation between police and felons, which could result in justifiable homicides.

25. Table 4.1 in SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS (1995).

26. Table 5.45 in Sourcebook of Criminal Justice Statistics (1997).

27. See SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS (1997), CRIME IN THE UNITED STATES, <http://www.fbi.gov./ucr/Cius_97/95Crimes6.pdf>, and STATISTICAL ABSTRACT OF THE UNITED STATES, <http://www.census.gov.statab/.www/.>.

Table 3

Arrests for Violent Crime

Year	Murder Arrest Rates*	Rape Arrest Rates*	Robbery Arrest Rates*	Agg. Ass. Arrest Rates*	Violent Arrest Rates	Pop.^	Violent Crime Arrests
1993	9.5	15.2	71.7	206.5	302.9	257,800	780,876
1994	8.9	14.3	70.8	216.6	310.6	260,350	808,647
1995	8.5	13.5	70.2	223.0	315.2	262,755	828,204
1996	7.6	12.8	64.1	204.1	288.6	265,179	765,307
1997	7.0	12.1	51.3	203.2	273.6	267,901	732,977
Average	8.3	13.58	65.62	210.68	298.18	262,797	783,202

* Sources: *Sourcebook of Criminal Justice Statistics 1997* and C*rime in the U.S. 1997*.

^ Sources: *Statistical Abstract of the U.S. 1998* and Census Bureau Web.

Citizens encounter felons when they are attacked. The typical attack is a rape, robbery, or aggravated assault. Murders are in lesser numbers but are included here even though the victim did not successfully fight off the attacker because some intended murder victims may have successfully done so; certainly there was an attack. As shown in Table 2, these have averaged 1,789,042 over the 5 years from 1993-1997. However, if we use the values from the National Crime Victimization Surveys (NCVS), also shown in Table 2, the average is 3,483,268 violent crimes annually over the same 5 years.[28] Whichever is chosen, this is the value $N_c E_c$.

It could be argued that burglaries should be counted along with violent crimes, inasmuch as burglars are sometimes surprised by the property owner. The normal intent of a burglar is to enter unoccupied premises and to make off with valuable property without encountering the owner of the property. Wright and Rossi (1986, p. 145) found that 74 percent of criminals agreed with the statement, "One reason burglars avoid houses when people are at home is that they fear being shot during the crime."[29] The result is that most burglaries do not result in personal encounters between the burglar and the victim. Some

28. The NCVS was revised in 1992 so that the data from earlier periods are not strictly comparable. The later numbers are larger due to better responses. This, of course, indicates that the latest NCVS data are probably still too low.

29. Wright, J.D., and P.H. Rossi, ARMED AND DANGEROUS: A SURVEY OF FELONS AND THEIR FIREARMS, p. 145 (1986).

burglaries do result in such encounters, however, and probably should be counted. Because the number is unknown and because there was no intent on the part of the burglar to have an encounter, these are not counted here. It is noteworthy that England has essentially outlawed most private possession of guns and has a philosophy that self-defense is not a valid reason for shooting an assailant.[30] Possibly because of those factors, there is a much higher rate of burglary of occupied homes in England than there is in the United States.[31]

The ratio of the average number of felony arrests to the average number of violent crimes is 0.4378. Thus, it is inferred that the ratio of the number of encounters with violent felons by police to encounters with violent felons by civilians, $N_p E_p/N_c E_c$, is 0.4378. If we use the *NCVS* data, adding in murders, the ratio is 0.2235.

The next ratio in equation (2) is that of the relative probabilities of being armed, A_p/A_c. It is normal for the police to carry guns. This would be especially true when they are attempting to make arrests. Consequently, the probability for police approaches 1.0. For the private citizen, the probability is certainly much lower. It is not, however, equal to the fraction of citizens who carry guns. For that to be the case, all civilians would have to be subject to the same probability of being attacked. That is not the case. Some people are at much greater risk of attack such as people who live in poorer sections of cities, minorities, and people who themselves are operating outside the law. At this point, let us leave this ratio to be determined later.

The next ratio is of the ability to use the gun, U_p/U_c. For at least three major reasons, the police should be more readily able to use their guns. First, they are generally better trained in the use of the gun and probably have practiced more in shooting it. Second, their guns are usually more readily available since they have no need to conceal their firearms which are therefore probably carried in a more convenient position. Third, the initiative is with the police because they have probably confronted the person to be arrested, as opposed to the civilian, who when confronted with a felon is usually surprised. Despite all of these factors, let us presume that the probabilities are equal; the ratio is one. This assumption is for simplicity only and will be later relaxed.

The next ratio is of the probabilities of firing the gun. It seems at first more likely that the police will fire their guns than that the civilian will. First, there is the issue of "buck fever" which is the psychological inability to pull the trigger when it is called for. This phenomenon also afflicts soldiers, many of whom do not fire even in the heat of a battle. It could well affect police, but their training would be expected to reduce this. Another reason for civilians

30. Cf. Kopel (1994, p. 154).

31. See Kleck (1991, p. 139-40), and Lott (1998a, p. 5). Also, this is reported in Bureau of Justice Statistics, Crime and Justice in the United States and England and Wales, 1981-1996, on the BJS website (visited Dec. 17, 1998).

not firing their guns could be that the felon who is attacking them will often retreat when he sees that the intended victim is armed. When the police are making an arrest, the felon is less likely to be able to retreat.

The law typically permits the use of deadly physical force only where a person has reason to believe that he or she or another person is in imminent physical danger from the attacker.[32] If the felon retreats from the show of force represented by the drawn gun, it would be illegal to fire the weapon. The police, while theoretically held to the same standard, would know the law more precisely than the average citizen and might be willing to fire in more borderline circumstances than would the civilian. All of these factors would seem to increase the ratio of the police firing probability to the civilian firing probability.

On the other hand, the police are possibly more familiar with confrontations with felons than are civilians. After all, that is a substantial part of their job. The civilian would seem to be much less likely to have experience in doing so. As a result, the civilian might well fire when the professional police officer would know that it is not necessary.

The effect of either factor is reduced when it is realized that some civilian victims of felons are themselves criminals; there is a good deal of predation by criminals on other criminals. For example, drug dealers have both cash and valuable drugs; they are a potential target for other criminals and could well be expected to arm themselves in response. Because they cannot look to the civil authorities either for protection or for contract enforcement, they need the means for both in order to ensure their own safety and business success. They have every incentive to learn how to shoot. Further, they are more likely to be less reluctant than the police to actually fire their weapons.

Though the overall effects of these factors is unknown; the assumption will be made at this point that the police and the civilians will have the same probability of actually firing their guns given that they have gained access to them under combat conditions.

The next issue is the relative probability of police and civilians hitting their targets. Police are generally better trained and should be better marksmen than the average civilian. However, there is no reason to expect that persons who are capable of drawing their guns and firing them would be less trained; they are a select subset of the population who have chosen to be armed. It would seem reasonable that they would have practiced just as the police would have. Kleck (1991) reports that attackers (the criminals) hit their victims in only 19 percent of cases while New York City police hit their intended targets in 39 percent of intended shootings.[33] This represents only one study for the police

32. This represents a movement away from prior laws which allowed the shooting of a thief to a position where only a "reasonable" threat can justify shooting.

33. See Kleck (1991, p. 163).

and the rate of hits for attackers may well differ from the hit rate for defenders. Further, we don't know whether the shooting by attackers was for the purpose of injuring the victim or as part of an intimidation process where the aim was deliberately away from the victim and the firing was simply effectively a threat done to gain compliance with the attacker's demands. Keep in mind that this probability of hitting the target is only for those who fire their guns. As a working assumption on this question, assume that the rate of hitting the intended target is the same for police as for civilians.

The next ratio is of the probabilities of those felons who are hit and then die from their injuries. There is no reason to expect a difference between the police and the civilians on this issue. Both are shooting with the intention of stopping the felon and are probably aiming at the trunk area of the body because that is both the largest target and usually the most effective place to hit. If body armor is worn by the felon, a head shot generally would be more effective, but that is a smaller target and more difficult to hit. It is only in fiction or accidents that the police shoot the hand or the leg of the felon. To the extent that civilians have poorer marksmanship, their shots are likely to spread out more and therefore may be less likely to be fatal. On the other side, the police have better communications facilities and can call for medical assistance more quickly after shooting a felon than can a civilian on the average. The result would be that more rapid medical care may save more of the felons shot by police than of those who are shot by civilians. However, it will be assumed that the probabilities of fatal injury are equal.

Finally, look at the ratio of the felons killed by police using guns and by civilians using guns. Over the 5 years from 1993 through 1997, that ratio averaged 1.5175. If the Kleck reasoning is used, however, the ratio drops to about 0.38.

We can now use the above assumptions and computed figures to find that the proportion of civilians who are armed when they are attacked by felons has averaged 28.9 percent if the FBI data are used. From equation (2), the arithmetic is:

$$1.5175 = (0.4378)\ (1/X)\ (1)\ (1)\ (1)$$

where X is the percentage of civilians armed when they are attacked. If the *NCVS* data are used, the proportion of armed civilians is 14.7 percent. From equation (2),

$$1.5175 = (0.2235)\ (1/X)\ (1)\ (1)\ (1).$$

This does not imply that either 14.7 percent or 28.9 percent of civilians are armed at any point in time. (The Kleck reasoning would imply even higher numbers of 40 percent and up). The choice to be armed is likely to depend on the perceived risk of being attacked by a felon. Using the National Crime Victimization Study data for 1979-1987, I have elsewhere found (Southwick, 1995) that there is a strong positive correlation between the likelihood that an

attacker is armed and the likelihood that the victim is armed.[34] People are more likely to arm themselves if they believe there is a high likelihood they will be attacked or if they have valuables to protect.[35] There are costs to being armed and the benefits are higher in either of those cases so it makes more sense on a benefit/cost basis. Kleck and Gertz (1998) reported that about 1.5 percent of all adults are carrying at an average time on their persons and twice that percent carry in their vehicles. That is consistent with the higher percent armed when attacked since the choices are interrelated.

It should also be noted that some victims are not quite the innocents it might be thought. Criminals reported that they fired their guns upwards of 25 percent more often in self-defense than they did in the course of a crime.[36] Of course, their perception of self-defense may differ from the legal definition. They may well be engaged in an illegal activity and self-defense may mean protection against anybody who would interfere with that activity. The *National Crime Victimization Study* does not ask whether the victim was or was not a criminal, only whether he or she was attacked by someone else. The initiative is the decision point for the categorization.[37]

Let us suppose that one or another of the probability ratios is not of the magnitude assumed. Then, the result will differ from the 15 or 28 percent armed victims derived above. First, consider the ratio of the ability to use a firearm, given that the police officer or victim is armed. It was assumed that these were equal. However, suppose that the police have a probability 20 percent higher than the civilians. Next is the ratio of the probabilities of actually firing the gun at the felon. It was assumed that the police and the civilians had the same ratio. This, however, was argued as conservative. Suppose the police have a 20 percent greater probability of firing. Finally, there is the ratio of the probabilities of hitting the felon. It was argued that the police should be expected to be better shots and would therefore be more likely to hit their targets. Despite this, it was assumed that the probabilities are equal. Suppose that the police actually have a 20 percent greater chance of hitting their target. Compounding all of these changes which all act in the same direction means that it would then be inferred that somewhere between 20 and 50 percent of civilians attacked by felons are themselves armed.

Let us suppose that even the *NCVS* figures are low. The reasons for which crime victims may not want to report crimes to the police may still apply when reporting the same information to another government employee. The leading reasons for not reporting violent crimes to police were: it was a private matter,

34. Southwick, L. Jr., SELF-DEFENSE WITH GUNS: THE CONSEQUENCES, Presented at the Western Economic Association National Conference, San Diego, CA (June 1995).

35. See Kleck and Gertz (1995, p. 164).

36. See Wright and Rossi (1986, p. 86).

37. See Kleck (1991, p. 108-9).

the offender was unsuccessful, it was reported to some other official, it wasn't important enough, police don't want to be bothered, police are ineffective, fear of reprisal, lack of evidence, and inconvenience.[38] Of course, it would not be likely to be reported to the questioner if the victim had been acting illegally as well.

Make the presumption that there are one-third of the crimes which are not even reported to the surveyor in the *NCVS*, for whatever reasons may apply; several of the reasons listed above would lead the victim not to give the information to the *NCVS* any more than to the police. The result would be that we would infer a probability of a victim's being armed with a firearm from 10 percent to 13 percent.

These figures are consistent with a Roper survey discussed by Kleck (1991) which had about 5 percent of adults in the U.S. regularly carrying guns for self-defense.[39] Wright (1984) reports on another survey which found that 7 percent carry guns at least some of the time.[40] A *Los Angeles Times* poll found that 11 percent carry guns at least some of the time for self-defense.[41] Those people with the highest probabilities of being attacked are the most likely to carry guns for self-defense since they have the most to gain. A person with a low probability of being attacked will have little value to carrying a gun for defense since he will have a very low probability of using it. The person with a great probability of being attacked will have a higher value for a gun and will be more likely to choose to carry one. Thus, a probability of 10 to 17 percent for a crime victim having a gun for defense appears realistic.[42]

4. Risks To Criminals of Armed Civilians

As a next step, let us see if we can fill in some of the values in equation (1) for both the police and civilians. Of course, we already have good approximations for the numbers on each end of the equation, M_i and N_iE_i. The former is the number of felons killed and the latter is the number of encounters with felons which could lead to conflict.

Now, consider the value for D_i. This is the probability that the felon who is wounded by a bullet will die from that wound. As discussed earlier, it is likely to be about the same for police as for civilians. Cook (1985) summarizes several earlier studies to arrive at a figure of about 15 percent.[43] One of the comparisons he uses is the rate at which police who are injured by

38. Cf. Table 3, 34 in Sourcebook of Criminal Justice Statistics, 1996.

39. See Kleck (1991, p. 118).

40. Wright, J.D., "The Ownership of Firearms for Reasons of Self-Defense," in FIREARMS AND VIOLENCE, ISSUES OF PUBLIC POLICY, p. 321 (1984).

41. Table 2.67 in SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS (1994).

42. See Table 4.1 in Kleck (1991), for additional surveys.

43. Cook, P.J., "The Case of the Missing Victims: Gunshot Woundings in the National Crime Survey," JOURNAL OF QUANTITATIVE CRIMINOLOGY, v. 1, p. 1 (1985).

gun using attackers die. These data are from the years 1978-1982. If we use more recent data on police injuries from firearms, as shown in Table 4, from 1993-1997, the average death rate from wounds is 10.6 percent.[44] As Cook notes, some of the injuries are from the use of the gun as a club rather than from firing the gun, so this will understate the true probability of death.[45] It seems reasonable that more rapid responses to injuries in recent years as well as better medical care generally should operate to reduce the rate of death from firearm injuries.[46]

Table 4

Police Attacked*

Year	Firearm Assaults	Injury	Death	Death/Injury
1993	4,002	27.4%	67	6.1%
1994	3,168	26.3%	78	9.4%
1995	2,238	15.2%	62	18.2%
1996	1,887	24.9%	51	10.9%
1997	1,844	15.1%	62	22.3%
Total	13,139	23.0%	320	10.6%

**Law Enforcement Officers Killed & Assaulted*, (FBI) various years.

Suppose that the recent death rate from firearm woundings has fallen to 12 percent from Cook's 15 percent. This would seem plausible, given the above results. From that and the fact that civilians used guns to kill some 262 felons in the average year from 1993-1997, we would infer that civilians wounded some 2,183 felons in the average year. Keep in mind that Kleck estimates

44. FBI, "Law Enforcement Officers Killed and Assaulted 1996" (visted Nov. 2, 1999) <http://www.fbi.gov/ucr/ucreports.htm>; FBI NATIONAL PRESS OFFICE, "Law Enforcement Officers Killed and Assaulted 1997" (visited Nov. 2, 1999) <http://www.fbi.gov.pressrm/pressrel /98archives/1997rel.htm>.; Note that the police deaths from firearms comprise about 92 percent of all felonious police killings.

45. See Cook (1985, p. 95).

46. Southwick, L. Jr., "An Economic Analysis of Murder and Accident Risks for Police in the United States," in APPLIED ECONOMICS, v. 30, p. 593-605 (1998); It is interesting that the risk of being murdered is actually lower for police than for civilians of the same age and sex in the U.S.

figures that are from 4 to 7.4 times as high which would increase these numbers by that factor or 8,700 to 16,100 wounded felons.

Next, we need to consider the marksmanship of the civilians. When shooting with intention to hit the felon, what is the probability that the shot will hit the target? One would expect that police would be better marksmen. However, civilians who carry firearms may well have a higher expectation of being attacked than do other people. As a result, they would desire to be prepared for such an attack. Preparation may well involve practice shooting and, therefore, when these people are attacked, they may shoot fairly well.

Kleck (1991) states that "*NCS* [National Crime Victimization Survey] data covering the United States from 1979 to 1987 indicates that only 19% of incidents where an attacker shot at a victim resulted in the victim being hit."[47] However, this almost certainly overstates the proportion of gunshots which hit the victim. According to the *NCVS*, over half of all violent crimes are not reported to the police.[48] One of the reasons often given was that the attacker was unsuccessful or did not harm the victim.[49] There are undoubtedly numerous cases where the crime is not reported either to the police or to the *NCVS* even though the respondent knows that a crime was committed. For example, the victim may have been engaged in an illegal activity as well. The likelihood of reporting a crime is a function of whether the victim is harmed; this will also hold true for the *NCVS* responses. Therefore the probability of an attacker who shoots at a victim, and actually hits the victim, is much lower than 19 percent. On the other hand, the report is made by the victim who may believe that the shot was intended to hit him when the actual intention was to frighten or distract him.

Returning to Table 4, the assaults on police using a firearm resulted in injury 23 percent of the time. Of course, some of these involve using the firearm as a blunt instrument rather than firing it; most probably do not[50]. Many of these assaults are deliberate and are planned, so the hit rate should be higher than for the civilian who is fighting off an attacker.

If we assume that the victim's probability of hitting the target is equal to the attacker's probability of hitting the victim, that implies that a gunshot aimed at the attacker will hit that attacker only about 10 to 20 percent of the time. If it does not hit the attacker, it is very likely to frighten him away which is usually the desire of the victim. Assuming a 15 percent hit rate implies that victims shot at attackers 14,550 times each year. It would be closer to 59,000 times if Kleck's estimate of four times the number of civilian justifiable homicides is correct.

47. See Kleck (1991, p. 163).

48. See Tables 3.34 and 3.35 in SOURCEBOOK OF CRIMINAL JUSTICE Statistics (1997).

49. Cf. Table 3.40 in Sourcebook of Criminal Justice Statistics (1995).

50. Cook (1985) estimates that 85 percent of police injuries from guns are bullet wounds.

Next, let us posit the percentage of those who are able to shoot who do, in fact, shoot at their assailants. In most cases, the simple display of the firearm by the defender will be sufficient to ward off the attack. In Table 5, the proportion of violent crimes which are committed by persons with guns is computed at an average of about 28 percent. That implies that 72 percent of attackers are not using guns. Almost all of that 72 percent will be deterred by the sight of a gun, even without its being fired. Further, a good fraction of the other 28 percent will be deterred by the sight of a gun since they cannot be sure of winning a gun battle and the costs of losing vastly exceed the benefits of winning. Let us conservatively suppose that 95 percent of attackers who do not have guns and 65 percent of those who do will be deterred by the victim's possession and display of a gun. Then, there would be a need to actually shoot at the assailant in only 13.4 percent of the times the victim is able to use the gun. If the victim actually fires the gun half of these times, that implies a firing rate of 6.7 percent. This in turn implies that the defender actually uses the gun in 217,000 violent crime defenses or 850,000 defenses, using the Kleck estimate of justifiable homicides.

Table 5[51]
Violent Crime With Guns

		Murders			Robberies	Aggravated	Agg. Ass.
Year	Murders	% Guns^	Rapes*	Robberies*	% Guns^	Assaults*	% Guns^
1993	24,530	69.61	106,014	659,870	42.44	1,135,607	25.29
1994	23,330	70.02	102,220	618,950	41.60	1,113,180	24.00
1995	21,606	68.22	97,460	618,950	41.00	1,099,180	22.90
1996	19,645	67.79	96,252	535,594	40.70	1,037,049	22.00
1997	18,209	67.80	96,122	497,950	39.70	1,023,492	20.00
Average	21,464	68.78	99,614	586,263	41.18	1,081,702	22.91
Overall Percent Guns, assuming rape at 5 percent						28.45%	

* Data from *Sourcebook of Criminal Justice Statistics*, various years.
^ Based on FBI data from *Crime in the United States*, various years.

51. Federal Bureau of Investigations, *Law Enforcement Officers Killed and Assaulted 1996* (visited Nov. 2, 1999) <http://www.fbi.gov/ucr/ucreports.htm>; FBI National Press Office, *Law Enforcement Officers Killed and Assaulted 1997* (visited Nov. 2, 1999) <http://www.fbi.gov.pressrm/pressrel/98archives/1997rel.htm>.

Using the armed victim percentage of about 15 percent as derived above, the number of attacks from the *NCVS* data of 3,483,000 implies that about 520,000 of the victims were armed at the time of the attack. From the inference of 217,000 defenses, this implies a probability of being able to use a self-defense gun in case of being attacked of about 40 percent. With more defenses, a larger number of attacks is implied.

The total self-defense results are approximately 217,000 directly and from the earlier inferences on deterrence, about 350,000 other crimes reduced by deterrence. This adds up to about 570,000 fewer violent crimes as the result of gun carrying civilians. Of course, there may be some overlap in this count, so to be conservative, set it at 500,000 fewer successful violent crimes. If Kleck is right, the number is closer to 2 million.

If we were to accept the *NCVS* data on self-defense, some 60,000 to 80,000 victims either attacked the offender with a gun or threatened the offender with a gun.[52] That would imply that only 12 to 16 percent of armed victims are able to use their guns in self-defense. This seems low, based on the above inferences which themselves seem conservative. On the other hand, the estimate of 217,000 self-defenses per year with guns is below the estimates made by Kleck (2.0-2.5 million) and by Cook and Ludwig (1.5 million) while the estimate using Kleck's measure of justifiable homicides is close to them. A *Los Angeles Times* poll found that 8 percent of the civilian population had ever used or displayed a gun for self-defense purposes.[53] In 1994, there were about 195 million adults.[54] With 5 percent saying "once" and 3 percent saying "more than once", at least 20.4 million usages are implied.[55] Prorating over 20 years, it implies at least 1 million defensive gun uses per year. Of course, the conservative assumptions made here have probably resulted in a lower estimate than is actually the case.

One unknown but important factor is the extent to which the numbers of justifiable homicides as presented by the FBI are accurate. Kleck, as noted earlier, argues that civilian legal defensive homicides using guns may be as few as four times the FBI count or as much as 7.4 times the FBI count. If he is correct, many of these must also be in crimes not reported in the *NCVS*. It would raise the estimate, as noted, to a figure comparable to other estimates. It would also raise the deterrence effect to at least 1.4 million. A 20 percent overlap of deterrence and self-defense would give an effective reduction in completed violent crimes of at least 2.0 million due to gun possessing and using civilians.

52. National Crime Victimization Survey Data Disk (1979-1987).
53. Table 2.67 in SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS (1994).
54. SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS (1994).
55. Table 2.76 in SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS (1994).

5. The Crime Effect of Guns

It would defy economic logic if people bought guns in order to improve their safety from crime if that improved safety were more than offset by greater risk from accident and theft. In order to assert such an hypothesis, it is necessary to believe either that people are irrational or that they are unaware of the risks of owning firearms. Accidental deaths have fallen steadily, from some 13 per million population to under 5 per million population in the period 1960 to 1995.[56] During this same period, gun ownership has dramatically increased, from 330,000 per million population to almost 900,000 per million population.[57] This would seem either to imply that people are aware of the greater safety and are responding by buying more guns or they believe (correctly) that they can reduce the risks by proper training and appropriate behavior.

It would appear that people are buying guns in response to crime in order to deter it or ward off attackers. In fact, I have elsewhere (Southwick, 1997) reported on just that finding.[58] As seen above, guns are useful in doing exactly that. The crimes warded off amount to a minimum of 1,900 per million population and could be as many as 13,700 per million population. A gun therefore appears to ward off from 0.002 to 0.015 violent crimes per year on the average. Consequently, it is, reasonable for the purchaser to believe that a gun can be used for self-defense.

It is also possible to look at the question directly. If people are buying guns to deter crime, it should be possible to find out statistically whether guns are useful in doing so or whether crime is reduced when guns are increased. Lott and Mustard (1997)[59] found this to be the case in regard to easing the laws on firearms ownership and carrying with consequent crime reductions, but they were unable to look at the effects of the number of firearms directly because the data needed were not collected by the responsible agencies; the agencies are generally forbidden by law to collect the data. The result is that data on gun purchases are available only on an annual basis for the whole United States rather than by state.

In order to analyze such a time series, it is appropriate to normalize the data in order to reduce the colinearity of the various time series. In this

56. See Table 116 in 1984 U.S. Statistical Abstract and Table 148 in 1998 U.S. Statistical Abstract.

57. ATF Facts (Nov. 1994), Bureau of Alcohol, Tobacco & Firearms and Communication from Bureau of Alcohol, Tobacco, and Firearms.

58. Lawrence Southwick, Jr., "Do Guns Cause Crime? Does Crime Cause Guns? A Granger Test," ATLANTIC ECONOMIC JOURNAL, v. 23(3), 256-273 (Sept. 1997).

59. See particularly their conclusions, Lott, J.R. Jr. & D.B. Mustard, "Crime, Deterrence, and Right-To-Carry Concealed handguns," JOURNAL OF LEGAL STUDIES, v. XXVI, 1-68 (Jan. 1997). Lott also found the same result using others' coefficient estimates, Lott, J.R. Jr., "The Concealed Handgun Debate," JOURNAL OF LEGAL STUDIES, v. XXVII, 221-243 (Jan. 1998) (b).

section, the purchases of handguns will be considered and the effects on changes in crime will be tested statistically. Of course, variables will be normalized by population.

The causal relation to be tested is whether the purchasing of handguns effects a change in the rates of the violent crimes as defined by the FBI, using the data collected by the FBI. (The *NCVS* data are for a much shorter period). The data on the crimes are available from 1957 through 1996. The Bureau of Alcohol, Tobacco, and Firearms (BATF) collects data on the numbers of guns sold each year of various types.[60] These data are available from 1946 through 1995. In addition, data on population and poverty are available from various *U.S. Statistical Abstracts*.

If handguns or other guns in civilian hands affect crime rates, it would be expected that the *stock* of guns in civilian hands has the effect rather than the *current purchases* of guns. The former are all available for use by defenders and can be used to ward off criminals. However, the actual numbers of guns available at any given time, the stocks, are unknown because the rates at which guns are destroyed are unknown and the rates at which hand-made guns are manufactured or guns are smuggled into the country are unknown. The numbers legally purchased, however, are known with a fair degree of accuracy. We can, however, infer that, if the stock of guns affects the crime rate, the purchases of guns, which is very close to the *change* in the stock of guns, should affect the *change* in the crime rate. Because the depreciation rate in the stock of guns is likely to be relatively constant over time, it can be ignored. Accordingly, the dependent variables will be the changes in the rates of the violent crimes. Burglary will be added inasmuch as Lott and Mustard find that criminals turn to burglary when robbery becomes more difficult with the addition of more civilians carrying concealed firearms.[61] The rates will be computed in terms of crimes per million population.

The major independent variable of interest will be the rate of purchase of handguns. These are the most concealable and, in the event of an attack by a criminal, the most readily used in self-defense. While people do buy rifles and shotguns for self-defense, they are used less frequently. From Table 1, it can be shown that about 81 percent of the justifiable homicides by civilians using guns are done with handguns. Therefore the use of handguns is the most relevant if self-defense uses are proportional to the numbers of justifiable homicides. The purchases of guns are in terms of handguns per thousand population.

60. ATF Facts, (Nov. 1994), Bureau of Alcohol, Tobacco, and Firearms and Communications from BATF.

61. See Lott and Mustard (1997).

Other independent variables to be used include the change in the poverty rate[62] and the change in the real per capita income level. These are respectively measured as the change in the percentage poor and the change in terms of 1995 dollars of income per capita. Other variables were tested but did not pass the test of significance to be entered in a stepwise procedure.

Each regression is to be run using two procedures. First, an ordinary least squares procedure is used. Note that simultaneous equations is not a problem here because the purchase of a gun in one year is assumed to affect the change in crime from that year to the next. The crime in any year may affect gun purchases in that year or a later year, but this is not a simultaneous effect. The second regression is the same as the first but with a correction for first order autoregession, a frequent problem in time series regressions.

First, look, at Table 6. The correlations among the variables are presented, along with the means and standard deviations for each variable. The violent crime variable is the sum of murder, rape, robbery, and aggravated assault. Each of the crime rates is computed on a per million population basis. The changes from one year to the next are also on a per million population basis as a result. The quantity of handguns purchased each year is per 1000 population. The change in income, measured in 1995 dollars, is in dollars per capita. The rate of poverty is the fraction of the population which is in poverty; the change is therefore also a fraction. It will be noted that the only correlation above 0.9 is between robbery and violent crime, both dependent variables. Thus, there is expected to be no colinearity problem. Because of missing years on certain variables, the data are only available for 1962 through 1995, giving 34 observations.

62. This was cited by Handgun Control, Inc. on their web-site as an important missing variable in the Lott and Mustard study. <http://www.handguncontrol.org>.

Table 6

Regression Variable Correlations & Descriptions

Years 1962-1995

	△*Violent*	△*Murder*	△*Rape*	△*Robbery*	△*Agg. Assault*	△*Burglary*	*Qh/1000Pop*	△*Income*	△*Poverty*
△Violent	1.0000								
△Murder	0.8662	1.0000							
△Rape	0.6931	0.6753	1.0000						
△Robbery	0.9184	0.8204	0.5335	1.0000					
△Agg. Assault	0.8647	0.6962	0.6679	0.5988	1.0000				
△Burglary	0.7235	0.7048	0.4879	0.8234	0.4137	1.0000			
Qh/1000Pop	-0.1046	-0.0703	-0.1414	-0.0860	-0.0960	-0.2409	1.0000		
△Income	-0.2094	-0.0907	-0.0757	-0.3632	-0.0136	-0.2908	-0.1573	1.0000	
△Poverty	-0.0679	0.0178	-0.1380	-0.0476	-0.0705	-0.0462	-0.2354	-0.1327	1.0000
Mean	167.94	1.1490	8.437	56.84	101.51	165.65	8.3793	336.70	-0.00186
Std. Dev.	253.76	4.8535	14.286	153.99	113.90	856.48	2.7433	367.77	0.00820

The results are presented in Table 7 for the ordinary least squares. Table 8 shows the results corrected for first order autoregressivity. The coefficients are presented along with their standard errors. The coefficient on handgun purchases is significantly negative in all of the equations (only at the 10 percent level, however, in the corrected regression for robbery) except for rape, where it is not significant. A positive change in income has a significant negative effect on the change in robbery and burglary, but nowhere else. A reduction in poverty appears to increase burglary, possibly by making targets more attractive, although this is not a very strong result. Except for aggravated assault, there is a significant autoregressive effect. The relative proportions of

the variance explained is about what would be expected, although generally higher than anticipated; it is usually more difficult to obtain high r^2 values for equations explaining changes in rates than for equations explaining the rates themselves. For example, the purchases of handguns and change in income explain almost a quarter of the change in the rate of robbery.

Table 7
OLS Regression Results
Handgun Effects on Crime
(Standard Errors in Parentheses)

Dependent Variable-Change	Constant	Purchase of Handguns	Change in Income	Change in Poverty	r^2 (adj.)
Violent Crime	569.63*	-38.326*	-0.2479	-1,575	0.154
	(145.10)	(15.750)	(0.1683)	(7,846)	
Murder	8.8870*	-0.74830*	-0.00518	-148.62	0.178
	(2.7370)	(0.2970)	(0.00317)	(148.00)	
Robbery	294.64*	-18.499*	-0.27465*	-5,205.9	0.249
	(82.99)	(9.006)	(0.09624)	(4,486.0)	
Rape	19.554*	-1.3821	0.00143	10.160	-0.018
	(8.964)	(0.9728)	(0.01040)	(484.600)	
Aggravated Assault	246.54*	-17.697*	0.03050	3,769.8	0.081
	(67.89)	(7.367)	(0.07873)	(3,670.0)	
Burglary	1,648.7*	-118.88*	-1.7397*	-53,212*	0.347
	(430.5)	(46.72)	(0.4993)	(23,270)	

* Significant at 5 percent level, two-tail test.

Table 8
AR(1) Corrected Regression Results
Handgun Effects on Crime
(Standard Errors in Parentheses)

Dependent Variable-Change	Constant	Purchase of Handguns	Change in Income	Change in Poverty	Rho
Violent Crime	540.24*	-36.980*	-0.1853	-832.2	0.3263*
	(165.80)	(17.810)	(0.1560)	(7,685.0)	(0.1645)
Murder	8.5750*	-0.74520*	-0.00443	-76.756	0.4433*
	(3.2280)	(0.3436)	(0.00273)	(138.300)	(0.1560)
Robbery	279.30*	-18.849^	-0.19624*	-1,535.8	0.4073*
	(97.42)	(10.400)	(0.08530)	(4,282.0)	(0.1590)
Rape	13.786	-0.7632	-0.00026	-207.97	0.4728*
	(10.770)	(1.1420)	(0.00884)	(451.30)	(0.1534)
Aggravated Assault	238.89*	-16.903*	0.02912	3,486.5	0.1896
	(74.28)	(8.020)	(0.07741)	(3,711.0)	(0.1709)
Burglary	1,577.2*	-117.15*	-1.4165*	-30,669	0.5234*
	(514.3)	(54.12)	(0.4005)	(20,700)	(0.1483)

* Significant at 5 percent level, two-tail test.

^ Significant at 10 percent level, two-tail test.

It is also possible to infer aggregate effects of the stock of handguns from these equations as well. This is done in Table 9. First, the effect of the stock of handguns is calculated in 1995 using the BATF method which is to assume no depreciation of the gun stock, so the stock in 1945 is added to subsequent sales of handguns to obtain the total stock.[63] If a depreciation rate of 2 percent is assumed, equivalent to a half-life of 35 years for guns, the stock would only be about 69 percent as large. If a depreciation rate of 4 percent is assumed, equivalent to a half-life of 18 years for guns, the stock would only be about 51 percent as large. This would reduce the aggregate effect by 31 to 49 percent,

63. Bureau of Alcohol, Tobacco, and Firearms <http://www.atf.treas.gov>.

depending on the depreciation rate chosen. Because that rate is unknown, the BATF figures assuming no depreciation rates for the stock of guns are used.

Table 9

Aggregate Effects

	OLS			AR(1)		
	Per Million	Total*	Total#	Per Million	Total*	Total#
△Violent	-1,435	-377,093	-738,725	-1,385	-363,849	-712,781
△Murder	-28	-7,363	-7,363	-28	-7,332	-7,332
△Rape	-52	-13,599	-18,946	-29	-7,509	-10,462
△Robbery	-693	-182,013	-362,535	-706	-185,457	-369,394
△Agg. Assault	-663	-174,122	-350,395	-633	-166,310	-334,674
△Burglary	-4,452	-1,169,671	-2,348,199	-4,387	-1,152,649	-2,314,027

* Using FBI Data.

\# Using NCVS Data, except for murder.

The next step is to compute the ratio of the stock in 1995 to the average level of purchases over the time period used in the regressions. This was about 37.4; there are about 37.4 times as many handguns in stock in civilian hands as are purchased each year. Because the effect of the stock should be proportional to the effect of an increment to the stock, the aggregate effect on crime should be in the same proportion. Since this is calculated on a per million population basis, it is necessary to multiply by the number of millions of population to arrive at the total effects of the handguns on crime.

These effects are presented in Table 9 for the both the OLS equations and the AR(1) equations; the results differ little between the two. As best estimates, violent crimes are reduced by about 370,000 per year due to the presence of handguns in the hands of civilians. The main crime reductions are in robbery, at about 183,000, and aggravated assault, at about 170,000. There are also about 7,300 fewer murders due to these handguns. While the rape result is too variable to have much confidence in it, it does appear to be around 10,000 fewer rapes each year. Of particular interest is the 1,160,000 fewer burglaries each year which result from these handguns. This is the opposite of the result found by Lott and Mustard who found an increase in burglary (and other property crimes) resulting from easing gun-carrying restrictions.[64] That

64. *See* Lott and Mustard (1997).

substitution effect, however, differs from the one found here; more carrying of guns raises the risk to a robber but does not change the risk in the home while an increased number of guns raises the risk to the robber *and* to the burglar.

The first results reported here are based on the FBI crime data. The *NCVS* data, however, give estimates of crimes (other than murder) which are almost twice as great (see Table 2). Using those numbers, and assuming proportionality, would imply that the reduction in violent crimes in the United States due to the ownership of handguns by civilians is about 740,000 per year; there are almost three-quarters of a million fewer crimes per year than there would be if the criminals did not have to fear the armed civilian. (See Table 9).

The ownership of other guns, rifles and shotguns, has not been included because the effect was not statistically significant. However, for protection of the home, as opposed to self-protection on the street, these can be effective. There should be some deterrence effect here as well, although it is not found in this study because the regressions were not run.

6. Conclusions

Different tests of the hypothesis that guns in the hands of civilians reduce crime have been tested herein. In addition, it was attempted to quantify the effects. First was a look at the rate of justifiable homicide by civilians in Section 2. Using deterrence effects of executions found by others, this was extended to justifiable homicides. The result was an estimate of an incentive effect (deterrence) of from 0.4 to 1.4 million fewer violent crimes due to civilian self-defense use of guns. That included from 2,200 to 7,900 fewer murders per year, implying that the murder rate would have been some 10 to 37 percent higher than it actually was had civilians not had guns for self-defense.

The next step, in Section 3, was a look at the probability that a victim is armed. This was done by comparing the probabilities of being armed, of being confronted with a felon, of being able to use a gun, of shooting, of hitting the felon, and of killing the felon between police and civilians. The result was that an expected 10 to 17 percent of civilian victims of violent crime are armed at the time of victimization.

The fourth section further developed the risks to criminals from armed civilians. From that, it was estimated that at least 500,000 fewer crimes occurred due to armed civilians. If Kleck's lower estimates of justified homicides are accepted, the numbers are much larger at more than 2,000,000. This is a deterrent effect; the crimes never occur.

Finally, in the fifth section, a direct estimate of the crime reduction due to civilian handguns was made. The regression run was on changes in crime rates as a function of handgun purchases. The result was significant in every case except for rape and the estimated coefficient was negative there as well. It was reasonable to infer that over 740,000 fewer violent crimes occur each year,

including 7,300 fewer murders, because of handgun ownership and use by civilians. Again, this is a deterrent effect. Long guns probably add to this effect.

Putting together all of these results, we find that there is a good correspondence among them. They are derived from different approaches, so that correspondence adds credibility to each method. Somewhere around 0.8 to 2.0 million violent crimes are deterred each year because of gun ownership and use by civilians. In addition, another 1.5 to 2.5 million crimes are stopped by armed civilians. There may be some overlap in these two categories because of the ways in which the data are collected, but there are almost certainly some two to four million fewer completed crimes each year as the result of civilian gun ownership. Returning to Figure 1, the numbers of crimes "A. Deterred by Police/Courts/Corrections" are unknown. The numbers in "B. Stopped by Police" are certainly quite low because police usually respond after the crime is completed. The numbers in "C. Deterred by Civilians" would seem to be around 0.8 to 2.0 million. The numbers in "D. Stopped by Civilians" are around 1.5 to 2.5 million. Finally, the numbers in "E. Completed Crimes" are about 3.5 million, based on *NCVS* data. Without the civilian guns being used to deter and stop crimes, the numbers of completed crimes could well double. It would undoubtedly be the case that increased gun ownership would further reduce crime.

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