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AN ECONOMIC ANALYSIS OF GUNS, CRIME, AND GUN CONTROL

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ABSTRACT

A model is posited in which guns are demanded for recreation, self-protection, or criminal purposes, and in which crime is supplied. Crime rates influence guns demanded for self-protection, and guns demanded by criminals depend upon guns held by law-abiding citizens. Comparative static analysis was used to investigate the effects of crime and gun control policies, including laws that permit citizens to carry concealed handguns for self-protection.

INTRODUCTION

The news that criminals are becoming increasingly well armed, coupled with the television images of storekeepers defending their property with firearms in hand, has motivated economists and other policy analysts to increase their efforts to understand the market for deadly weapons and the related criminal activity. The purpose of this article is to formulate an economic model of guns, crime, and gun control measure. A great deal of empirical research has been conducted on firearms, violence, and gun control (e.g., Kates, 1984; Kleck, 1984, 1991, 1995; Kleck and Patterson, 1993; Lott and Mustard, 1997; Wright, Rossi, and Daly, 1983), but this is one of the first attempts at formal modeling. The goals of this modeling effort are to set out a simple set of equations that captures the primary features of the policy debate, and then use them to examine the likely effects of changes in crime and gun control policy on crime rates and gun ownership. The model is expressed using the conventional mathematics of economics.

The Centers for Disease Control and Prevention report that there were 35,957 deaths in the United States in 1995 by firearms, which was an increase of 13.8 percent over the total of 31,606 for 1985 as reported by Kleck (1991). Some 51.5 percent of the deaths in 1995 were suicides, and 44 percent were homicides. Accidental deaths were 3.4 percent of the total, and the remaining 1.1 percent were of unknown causes. Of the 19,645 homicides in total, 67.8 percent were committed with firearms. The Bureau of Alcohol, Tobacco, and Firearms (ATF) estimated that there were 228 million guns in civilian hands in the United States in 1995, or 877 per 1,000 population (including children). In other words, it is estimated that there is more than one gun per adult in private hands in the United States. With so many guns in private hands, perhaps it is remarkable that there are not more shootings. As it is, in 1995 there were fifteen deaths per 100,000 guns. The U.S. death rate by firearms was 13.7 per 100,000 persons in 1995, compared to 1.47 in Germany and .07 in Japan.

One motivating factor for this study was the empirical study by Lott and Mustard (1997) of the effects of state laws giving citizens the right to carry concealed handguns. The expansion of the right of citizens to carry concealed guns is notable. Lott and Mustard (1997:4) pointed out that, in 1986, nine states had ". . . laws requiring authorities to issue, without discretion, concealed-weapons permits to qualified applicants." Another fourteen states had laws permitting local discretion with regard to the issuing of such permits. By 1996, the number states with right-to-carry laws had increased by twenty-two (from nine to thirty-one). Only two of these twenty-two states (Louisiana and South Carolina) previously had a law permitting local discretion. It is obvious that many legislators around the nation think that right-to-carry laws will deter crime.

Lott and Mustard (1997) performed the most extensive empirical tests to date of the effects of laws regulating gun ownership on crime rates. Their main findings were that the right of qualified citizens to carry concealed weapons reduced violent crimes (murder, rape, aggravated assault, and robbery), increased nonviolent property crimes (larceny and auto theft), and had no effect on accidental deaths. These findings were based on county-level annual data for the entire nation from 1977 to 1992. In addition, data from counties in Pennsylvania showed that the increase in the number of right-to-carry pistol permits (after the passage of the law in 1988) was associated with lower rates of murder, rape, and aggravated assault. No statistically significant effects on other crime rates were found. Similar tests using permit data for Oregon and Arizona produced inconclusive results. Lott and Mustard (1997) also found that the arrest rate for a particular type of crime was strongly negatively related to that crime rate. The effects hypothesized by Lott and Mustard (1997) were incorporated into the model developed in this study.

The plan of the study was: (1) to discuss the demand for guns for recreational use, self-protection, and criminal intent; and (2) the connections between guns and premeditated and unpremeditated crimes, accidents, and suicides. The model consists of five equations: three gun demand equations and two "crime" equations. Comparative static analysis of the basic model is then used to examine the effects of crime and gun control policies on gun demand and crime.

DEMAND FOR GUNS

The market under consideration is the market for "guns"—implements of deadly force that do not require that the user be in close proximity to the intended victim. Guns are very effective at forcing victim compliance when a crime is being committed, but guns are also used for recreational and self-protection purposes. Balkin and McDonald (1984) and Polsby and Brennen (1995) provide a more extensive and elementary discussion of the demand for guns for these three uses.

People who demand guns for recreational purposes can be assumed to maximize a utility function which includes the pertinent form of recreation as one of the goods. Recreation is "produced" by combining guns and other purchased inputs with recreational time. Maximization of the utility function subject to income and time constraints produces a demand function (Equation 1):

$$G_r = G_r(Y, P, L_r, T), \qquad (1)$$

where G_r is guns for recreational purposes, Y is income, P is the price of guns, L_r is a variable that measures the restrictiveness of the laws regarding possession of guns for recreational purposes, and T is the time budget for nonwork activities. Assume that P and L_r have negative effects on G_r.

Guns are also an input into the production of self-protection. The empirical research reviewed by Kleck (1991:ch. 4) and Lott and Mustard (1997) indicates strongly that many individuals purchase guns for self-protection, and that criminals have reported being thwarted on occasion by guns owned by potential victims. Self-protection can be produced by guns and other purchased inputs such as locks and other weapons, and by the use of time for avoiding risky situations or investing in self-defense courses. The formal analysis is essentially the same as in the case of recreational demand, except that the demand for self-protection is a function of crime. The demand for guns for self-protection can be expressed as in Equation 2:

$$G_s = G_s(Y, P, L_s, C, T), \tag{2}$$

where G_s is guns for self-protection, L_s is a measure of the restrictiveness of the law governing the possession of guns for self-protection, and C is a crime rate (or vector of crime rates). In particular, passage of a right-to-carry law as discussed above is a reduction in the restrictiveness of the gun laws. Assume that P and L_s have negative effects and C has a positive effect on G_s.

A critical issue in the modeling of guns and crime is whether the demand for guns for self-protection is also a function of guns possessed by criminals. Empirical evidence supports the hypothesis that crime rates influence the demand for guns (especially handguns) for self-protection (Kleck, 1991:ch. 4; Wright, Rossi, and Daly, 1983:ch. 5). It is not known if there is a study that has determined whether, at given crime rates, the greater use of guns by criminals is an independent factor in the demand for guns for self-protection. Casual arguments can be made on both sides of the issue. It may be that potential victims have no desire to engage in gunplay with criminals, and so the use of guns by criminals (at given crime rates) has little or no effect on guns demanded for self-protection. On the other hand, potential victims may feel that, if more criminals are using guns, crime deterrence depends more heavily on owning a gun. The implications of such a domestic "arms race" will be examined, using a standard notion of an arms race—where nations engaged in an arms race are stimulated by the weapons possessed by the other side, even if those weapons are never used.

The criminal segment of demand consists of those persons who would use guns in the commission of crimes such as robbery, burglary, and premeditated murder. Such persons earn some or all of their livelihoods through crime. Assume that the criminal produces income by combining time spent in the planning and perpetration of crimes with purchased inputs such as guns and other tools of the trade, and for simplicity, also assume that criminals are neutral to risk. The offender has the utility function (Equation 3):

$$U = U[E(Y), L], \tag{3}$$

where $E(Y)$ is the expected value of income and L is leisure time. The offender maximizes utility subject to a time constraint. The expected value of income per time period is represented in Equation 4:

$$E(Y) = (1 - J - S)Y_c + J(Y_c - F), \tag{4}$$

where J is the probability of apprehension and punishment, S is the probability of encountering an intended victim with a gun, F is the value of punishment suffered for commission of a crime, and Y_c is criminal "net" income (gross income from crime minus expenses, which include money spent on guns). The term $(1 - J - S)$ is the probability that the criminal will be successful in the commission of the crime and will escape apprehension. Equation 4 includes the assumption that the criminal gains no income when meeting a potential victim who is armed with a gun. This simple theory of criminal behavior leads to the demand function for guns (Equation 5):

$$G_c = G_c(P, F_g, S, J, F, T), \tag{5}$$

where G_c is guns for criminal purposes, and F_g is the penalty for using a gun in the commission of a crime. Assume that P, F_g, J, and F all have negative effects and that S has a positive effect on G_c.

The probability of encountering an armed intended victim, S, (Equation 6) is a function of guns held by the citizenry and of the restrictiveness of the laws governing the possession of guns for self-protection, or:

$$S = S(G_r, G_s, L_s). \quad (6)$$

This equation implies that—holding the number of guns possessed by citizens constant—reducing the restrictiveness of the gun laws (reducing L_s) will increase directly the probability that a criminal will encounter an armed intended victim. This specification is consistent with the passage of a right-to-carry law which will increase the likelihood that a citizen who owns a gun will be carrying it. As indicated prior, it is also assumed that a reduction in L_s will increase G_s because guns owned for self-protection are now more "productive" in providing self-protection. For future reference, the partial derivatives of Equation 6 with respect to G_r, G_s, and L_s are S_r, S_s, and S_L, respectively.

A reading of Kleck (1991) and Wright, Rossi, and Daly (1983) reveals that evidently there are no studies, of the demand for guns by criminals, that would shed light on the question of whether S influences G_c. Guns are very effective at forcing compliance by an unarmed victim, but encountering an armed potential victim is another matter. The proposition embodied in the model in Equation 4 is that the criminal cannot force the compliance of an armed victim. The proposition that S has a positive effect on G_c is based on the notion that an unarmed criminal does not wish to encounter an armed potential victim. An armed criminal confronting an armed potential victim creates a standoff in which the crime is not completed.

GUNS AND CRIME

It is assumed that there are two crimes of interest: intentional premeditated crimes committed by offenders (C_1); and unpremeditated crimes of violence, accidents, and suicides, which can be committed by anyone with a gun (C_2). Crimes of type C_1 are supplied according to the conventional Becker (1968) supply-of-crime function (Equation 7):

$$C_1 = C_1[P, F_g, F, J, S(G_r, G_s, L_s)]. \quad (7)$$

where C_1 is a negative function of F and J as in Becker's model, and C_1 is also a negative function of P (price of guns) and F_g (expected penalty for illegal possession of a gun) because they increase the cost, G_c, an input into the production of crime. Note also that C_1 is influenced negatively by G_r and G_s and positively by L_s because of their effects on S, the probability of encountering an armed intended victim.

The empirical studies of gun availability and crime reviewed by Kleck (1991) and Wright, Rossi, and Daly (1983) generally show that variations in gun availability are not related to variations in crime rates. These studies did not make a distinction between guns available to criminals and guns owned by potential victims. Equation 7 suggests that guns available to criminals and guns owned by potential victims may indeed have offsetting effects on crime rates. Lott and Mustard (1997:55) presented evidence on this point by showing that, in the case of counties in Pennsylvania, increases in guns owned for self-protection were associated with lower violent crime rates.

Crimes and accidents of type C_2 are determined simply by Equation 8:

$$C_2 = C_2(G_r, G_s, G_c). \quad (8)$$

All guns potentially could be used in unpremeditated crimes, cause accidents, or be used for suicide, though the magnitude of the effects represented in Equation 8 are much in dispute. For example, Kleck (1991) argued that suicide victims are serious about their intentions and would use other means in the absence of an available gun. Others doubt this assertion. Kleck (1991:ch. 7) reported that there were 1,959 fatal gun accidents in the United States in 1980, including 316 children under the age of fifteen. Kleck (1991) has also estimated the total stock of guns in civilian hands in 1980 to be 167.7 million (51.7 percent handguns), so the accidental death rate for 1980 is estimated at

1.17 per 100,000 guns per year. The figures for 1985 (1995) are 1,649 (1,225) accidental deaths and 190.5 (228) million guns, or a rate of .87 (.54) deaths per 100,000 guns, indicating that accidental deaths have declined. Lott and Mustard (1997:63) found that the adoption of a right-to-carry law was not associated with a higher rate of accidental deaths from handguns during 1982–91.

COMPARATIVE STATIC ANALYSIS OF THE BASIC MODEL

The basic model presented consists of five equations: the three demand functions (Equations 1, 2, and 5) and the two supply-of-crime functions (Equations 7 and 8). In the basic version of the model, the demand for guns for self-protection is assumed to be a function of crime rates but not a function of guns held by criminals. The endogenous variables are G_r, G_s, G_c, C_1, and C_2. Exogenous variables of interest are P, L_s, F_g, F, and J. P, the price of guns, is taken to be exogenous—guns are elastically supplied at P. Given values of the exogenous variables, equilibrium values for gun ownership and the crime rates are assumed to exist.

The effects of various crime and gun control policies can be investigated by performing comparative static analysis of the model. Each of the five equations is totally differentiated. For example, the total differential of Equation 2 is (Equation 9):

$$dG_s = G_{sp}dP + G_{sL}dL_s + G_{s1}dC_1 , \qquad (9)$$

where G_{sp} is the partial derivative of G_s with respect to P (the price of guns), G_{sL} is the partial derivative of G_s with respect to L_s (the restrictiveness of laws related to gun ownership for self-protection), and G_{s1} is the partial derivative of G_s with respect to the crime rate C_1.

Total differentiation of the five-equation model produces the following system of equations written in matrix form (Equation 10):

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -G_{s1} & 0 \\ -G_{cs}S_r & -G_{cs}S_s & 1 & 0 & 0 \\ -C_{1s}S_r & -C_{1s}S_s & 0 & 1 & 0 \\ -C_{2r} & -C_{2s} & -C_{2c} & 0 & 1 \end{bmatrix} \begin{bmatrix} dG_r \\ dG_s \\ dG_c \\ dC_1 \\ dC_2 \end{bmatrix} = \begin{bmatrix} G_{rp}dP \\ G_{sp}dP + G_{sL}dL_s \\ G_{cp}dP + G_{cf}dF_g + G_{cs}S_LdL_s + G_{cJ}dJ + G_{cF}dF \\ C_{1p}dP + C_{1f}dF_g + C_{1J}dJ + C_{1F}dF + C_{1s}S_LdL_s \\ 0 \end{bmatrix} . \qquad (10)$$

The second subscript denotes partial derivatives with respect to the variables as follows: r for G_r, s for G_s, c for G_c, 1 for C_1, p for P, L for L_s, f for F_g, J for J, and F for F.

Cramer's rule can be used to solve for the effects of the exogenous variables on the five endogenous variables. In each case, the denominator of the comparative statics result is equal to the determinant D of the matrix on the left-hand side of the system of equations (Equation 11), or:

$$D = 1 - C_{1s}S_sG_{s1} > 0 . \qquad (11)$$

The sign of G_{s1} is positive because the partial derivative is the effect of an increase in crime on guns for self-protection. S_s is positive, and C_{1s} is negative because this partial derivative is the effect of an increase in the probability of meeting an armed intended victim on the crime rate, so $D > 0$. It is highly unlikely that an increase in crime C_1 ultimately results in a decrease in C_1 through the effect on guns held for self-protection, so $C_{1s}S_sG_{s1}$ is less than one in absolute magnitude and D is greater than one and less than two. Additional empirical tests are needed here.

Because D is greater than one, the direct effects of policies are reduced. For example (Equation 12),

$$(dG_c/dJ = (1/D)G_{cJ}[1 - G_{s1}C_{1s}S_s + G_{cs}S_sG_{s1}C_{1J}] < 0). \qquad (12)$$

Increasing J, the probability of apprehension and punishment, reduces the demand for guns by criminals directly (G_{cJ}) and indirectly through the effect of J on guns owned for self-protection. These effects are somewhat muted because $D > 1$.

The proposition tested by Lott and Mustard (1997) is that the effect of reducing L_s (the restrictiveness of laws governing ownership of guns for self-protection) is to reduce crime, C_1. The equilibrium solution (Equation 13) is that:

$$dC_1/dL_s = (1/D)[C_{1s}(S_L + S_sG_{sL})] > 0\,; \qquad (13)$$

so that reducing L_s unambiguously reduces the crime rate C_1. The numerator of the right-hand side of Equation 13 shows that a change in L_s has two effects: one operates directly through the change in S (the probability of encountering an intended victim who is armed) brought about by the change in the law; and the other operates through a change in the number of guns owned for self-protection. Note once again that the effect of reducing L_s is somewhat muted by the fact that $D > 1$. The reduction in crime itself will somewhat reduce the demand for guns owned for self-protection.

Table 1 is a summary of the comparative statics results. Crime control policies are represented by J, the probability of apprehension and punishment, and F, the value of punishment. Increases in J and F have no effect on G_r, unambiguously reduce G_c and G_s and, hence, reduce C_2. Their effects on C_1 are also negative. For example, see Equation 14.

$$dC_1/dJ = (1/D)C_{1J} < 0\,. \qquad (14)$$

Note once again that the direct effect of increasing the probability of apprehension and punishment on crime, C_{1J}, is muted by the $1/D$ term because a reduction in crime leads to a reduction in guns owned for self-protection. Crime control policies still work to reduce crime, but this effect is scaled down in a world in which private citizens own guns for protection against crime.

Gun control policies are represented by P, L_s, and F_g, the price of guns, the restrictiveness of gun laws regarding ownership for self-protection, and the expected penalty for use of a gun in the commission of a crime. An increase in P may be brought about by levying a tax on guns or by making the production or sale of guns illegal. In the latter case, guns would still be available, but the market price would increase to compensate the producers and sellers for their risk of being caught violating the law. Increases in P unambiguously reduce G_r, most likely reduce G_c and G_s and, hence, most likely reduce C_2. An element of ambiguity arises. The direct negative effects of P on G_c, G_s, and G_r, increase C_1 and hence increase G_s and G_c. It appears unlikely that this last indirect effect outweighs all of the more direct effects of P on G_c. A similar ambiguity arises in the result for dG_s/dP. The effect of P on C_1, however, is ambiguous, and depends upon the relative sizes of the effects on G_r, G_s, and G_c. An increase in P could primarily affect the demand for guns for self-protection, and therefore lead to an increase in crime.

TABLE 1

COMPARATIVE STATICS RESULTS: MODEL OF GUNS AND CRIME

	Dependent Variables				
Independent Variables	G_r	G_s	G_c	C_1	C_2
F (penalty for crime)	0	–	–	–	–
J (probability of conviction)	0	–	–	–	–
P (price of guns)	–	–*	–*	?	–*
L_s (restrictiveness of gun law for self-protection)	0	?	?	+	?
F_g (penalty for use of gun in crime)	0	–	–	–	–

*Sign of effect is most likely negative.

While the effect of reducing L_s is to reduce crime rate C_1 unambiguously, the effects on gun ownership are ambiguous. Guns owned for self-protection tend to fall because the crime rate is lower, but permitting the carrying of a concealed gun tends to increase gun ownership. Guns owned by criminals may increase or decrease because the effect on guns owned for self-protection is ambiguous. It is possible, therefore, that the effect of right-to-carry gun laws will increase overall gun ownership as they reduce crime.

Finally, the increase in F_g unambiguously reduces C_1. This last result suggests that gun control penalties applied only to gun use in the commission of a crime would be more effective at reducing premeditated crime, C_1, than a general gun-control policy of increasing P. Increasing F_g reduces G_s and G_c and, hence, reduces C_2.

COMPARATIVE STATIC ANALYSIS OF THE "ARMS RACE" MODEL

It has been suggested that the demand for guns for self-protection might also be a function of guns held by criminals. In this case the demand for guns for self-protection becomes (Equation 15):

$$G_s = G_s(Y, P, L_s, C, G_c, T). \quad (15)$$

This version of the model produces an arms race effect that does not exist in the basic version of the model described earlier.

As in the prior model, the effects of crime and gun control policies can be investigated by performing comparative static analysis of the model, which now consists of Equations 1, 5, 7, 8, and 15. Total differentiation of the five-equation model produces the following set of equations (Equation 16) in matrix form:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & -G_{sc} & -G_{s1} & 0 \\ -G_{cr}S_r & -G_{cs}S_s & 1 & 0 & 0 \\ -C_{1r}S_r & -C_{1s}S_s & 0 & 1 & 0 \\ -C_{2r} & -C_{2r} & -C_{2c} & 0 & 1 \end{bmatrix} \begin{bmatrix} dG_r \\ dG_s \\ dG_c \\ dC_1 \\ dC_2 \end{bmatrix} = \begin{bmatrix} G_{rp}dPg \\ G_{sp}dP + G_{sL}dL_s \\ G_{cp}dP + G_{cf}dF_g + G_{cs}S_L dL_s + G_{cJ}dJ + G_{cF}dF \\ C_{1p}dP + C_{1f}dF_g + C_{1J}dJ + C_{1F}dF + C_{1s}S_L dL_s \\ 0 \end{bmatrix}. \quad (16)$$

The notation is the same as before. The only difference between this system of equations and the corresponding system for the basic model is the presence of the $-G_{sc}$ term in the matrix on the left-hand side.

Cramer's rule can again be used to solve for the effects of the exogenous variables on the five endogenous variables. In each case the denominator of the comparative statics result is equal to the determinant D of the matrix on the left-hand side of the system of equations (Equation 17), or:

$$D = 1 - (G_{sc}G_{cs}S_s + C_{1s}S_sG_{s1}). \quad (17)$$

Both G_{sc} and G_{cs} are presumed to be positive, but most likely the term $G_{sc}G_{cs}S_s$ is less than one. More guns in the hands of the public leads to more guns held by criminals (and vice versa), but this arms race is probably not explosive. As discussed before, the $C_{1s}S_sG_{s1}$ term is negative and likely to be less than one in absolute value. The determinant D, therefore, has a smaller positive value in the arms race model than in the aforementioned model.

For the model to exhibit conventional results, it is necessary that D be positive. This shall be assumed—the arms race is not explosive. Furthermore, if D is positive and less than one, there obtains what might be called a crime and gun control "multiplier effect." For example (Equation 18):

$$dG_c/dJ = (1/D)[G_{cJ}(1 - G_{s1}C_{1s}S_s) + G_{cs}S_sG_{s1}C_{1J}] < 0. \quad (18)$$

Increasing J, the probability of apprehension and punishment, reduces the demand for guns by criminals directly (G_{cJ}) and indirectly through the effect of J on guns owned for self-protection. Further, if $0 < D < 1$, these effects generate a multiplier effect. The arms race operates in reverse because both criminals and citizens who own guns for self-protection are reducing their ownership of guns, and these effects feed back on each other.

In this model the effect of reducing the restrictiveness of laws governing the carrying of concealed handguns on crime, turns out to be larger than in the model mentioned before. The equilibrium solution (Equation 19) looks the same:

$$dC_1/dL_s = 1/D[C_{1s}(S_L + S_sG_{sL})], \quad (19)$$

but recall that D is now a smaller number than before because of the arms race feature. The strong empirical results obtained by Lott and Mustard (1997) for the effects of L_s on C_1 suggest that the arms race feature might exist. Further empirical tests are needed here as well.

Crime control policies are represented by J, the probability of apprehension and punishment, and by F, the value of punishment. Increases in J and F have no effect on G_r, unambiguously reduce G_c and G_s and, hence, reduce C_2. Their effects on C_1 are ambiguous. For example (Equation 20):

$$dC_1/dJ = (1/D)[C_{1J}(1 - G_{cs}S_sG_{sc}) + C_{1s}S_sG_{sc}G_{cJ}]. \quad (20)$$

An increase in J has a direct negative effect on C_1 (the first term inside the brackets), but it also reduces G_c, which leads to a reduction in G_s and an increase in C_1. This last result is in contrast to the results in the basic model, where the effects of crime control policies on crime are unambiguously negative.

The effects of gun control policies in this arms race model are qualitatively identical to those of the basic model. Increases in P unambiguously reduce G_r; most likely reduce G_c and G_s; and hence, most likely reduce C_2. The element of ambiguity in the effects on G_c and G_s once again arise because of the reduction in G_r, which can increase C_1—and therefore increase G_s and G_c. Increases in P have ambiguous effects on C_1 for the same reasons as in the basic model. Gun control measures make crimes more costly to commit, but the reductions in guns held by the law-abiding citizens tend to increase crime.

In summary, the arms race model has the same qualitative results as the basic model except in two cases. The effects of crime control policies on crime (C_1) are ambiguous. The arms race model, however, also includes the possibility that there is a gun control multiplier effect.

CONCLUSION

Two economic models of guns and crime have been formulated that include interactions between criminals and law-abiding citizens. In the first model, law-abiding citizens demand guns partly in response to crime, and criminals demand guns partly in response to guns owned by potential victims. The second model adds the assumption that law-abiding citizens demand guns partly in response to guns owned by criminals. The models have some unusual implications. In the first model, increases in the usual crime control measures may reduce crime less than one would expect because of the indirect negative effect on guns owned by the law-abiding public. Gun control policies most likely reduce the demand for guns, but the effect on premeditated crime is ambiguous because of the negative effect on guns owned for self-protection and recreation. The model also implies that a reduction in the restrictiveness of laws governing the ownership of concealed guns for self-protection will reduce crime. In the second model, the effect on crime of increases in the usual crime control measures might be muted even more or reversed by the reduction in guns owned by the law-abiding public. The second model, however, also includes the possibility that gun control measures will multiply—reductions in guns held by the criminals lead to further reductions in guns held by law-abiding citizens (and vice versa).

Additional research of the sort presented in this article may be undertaken. The model can be expanded by considering various types of guns and additional types of weapons, and by disaggregating crime into its various components (e.g., robbery, murder, burglary, etc.). Lott and Mustard (1997) found that the adoption of right-to-carry laws led criminals to substitute nonviolent crimes such as larceny and auto theft for violent crimes. Most importantly, more empirical research is needed to test for the existence and to estimate the magnitudes of the various parameters of the model. Much of the debate about statistical tests in the existing empirical literature centers around the endogeneity or exogeneity of various variables. The model presented in this study clarifies these matters.

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