A Note on Drinking, Driving, and Enforcement Costs

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The drunk driving problem is back. After all the justifiable hand wringing over cocaine abuse, attention is returning to the much larger problem of driving while intoxicated. There is a simple reason: drunks are suddenly killing more people on the highways.

—Newsweek, December 21, 1987

I. Introduction

Drunk driving has become a major law enforcement issue in the U.S. In recent years, organized groups, reinforced with general opinion, have demanded that government do more to protect the public against the significant threat drunk drivers pose to public safety. For the most part, the political response has been focused on increased enforcement of tougher penalties. There has been little attention paid to reducing the legally allowable Blood Alcohol Content (BAC) as a means of deterring drunk driving. In part, this lack of attention may be explained by the fact that there has been little research on the effect of reducing allowable BAC in the literature on drinking and driving [4].

The experience in the Scandinavian countries suggests that allowable BAC is an important variable in the effort to reduce the prevalence of drunk driving. The Scandinavian Model (low BAC limits, strict enforcement, and stiff sanctions) has provided evidence that there is a deterrent effect stemming from the tougher Scandinavian Laws. Random breath alcohol test surveys have found that only 1 to 2 percent of Norwegian and Swedish drivers were above the .05 BAC level late at night or on weekends [2]. Similar surveys [6] have found that 13.5 percent of U.S. drivers had BACs above the .05 level. This proportion ranged from 5.9 percent in Salt Lake City to 23.9 percent in San Antonio. There is obviously a striking difference between the Scandinavian and U.S. experiences, and this difference points to the potential importance of BAC as a policy variable.

The purpose of this note is to develop a model of drunk driving enforcement in which BAC plays a crucial role. The model suggests that reducing BAC levels below those currently prevailing in the U.S. is necessary if drunk driving is to be reduced at the least social cost.

II. Lowering BAC—A Cost Effective Solution

Becker [1] observed that increasing fines generates greater deterrence without increasing enforcement costs. Increased fines are then clearly appropriate for consideration as a social solution to the problem of drinking externalities. However, an alternative supplementary policy also appears reasonable. Instead of (or in addition to) increased fines as a deterrent, we would recommend more stringent definitions of drunkenness—stiffer legally mandated BAC limits. Both approaches offer trade-offs with social enforcement costs, and substituting lower BAC limits might be more

1 Currently, most states have illegal per se BAC levels of 10%. For convenience, the percentage sign is eliminated, but understood, on the BAC measures in the text.
politically attractive than Draconian fine structures in bringing down average BAC levels on our highways.

There are two reasons why we would expect lower average observed BACs to stem from a lower BAC statute, say .05. First, there is the "fine effect" emphasized by Becker. Since the fine would start at .05 and be graduated upward, you could expect a stronger deterrent effect, as any given BAC level above .05 would have a higher fine. Less .10 or .15 BAC driving seems likely with BAC statutes that are set at .05 rather than .10. A .10 BAC would become twice the legal limit and a serious offense. Second, the threshold effect suggests that even without a graduated fine effect (say the punishment were the same for .05 BAC as it were with current .10 levels), we would still expect the average highway BAC levels to fall. Even if the detection rate declines, as it probably would, many law-abiding drivers formerly driving in the .05 and above range might now drive below the .05 BAC level. Additionally, the use of "designated drivers" having zero BAC might rise with more stringent, allowable BAC levels. Hence, the new threshold could bring the average BAC level down.

III. Enforcing the BAC Limits

In the absence of any restriction on drinking and driving, more drivers probably would drive at BAC levels that are socially excessive in light of obvious externalities. The BAC limit the individual will choose, that equating marginal private benefits and marginal private costs, will be in excess of BAC limits that equate marginal social benefits and costs.

Considered in this way, it becomes clear that the appropriate BAC limit is not merely a medical impairment issue: What is the optimal BAC limit? In a world where regulatory compliance is achieved costlessly, it is a simple matter to determine theoretically the optimal BAC limit. In this model, reductions in accident externalities come entirely from reductions in allowable blood alcohol limit. The crucial feature of our model comes from the recognition that average BAC, \( A \), is a function of both the blood alcohol limit, \( L \), and the level of policing, \( P \). This function is given by \( A(L, P) \). Over relevant ranges of \( L \) and \( P \), it is reasonable to assume that \( A \) increases at a decreasing rate with respect to \( L \) and decreases at a decreasing rate with respect to \( P \). Letting subscripts represent partial derivations with respect to the indicated variable, we have

\[
A_1 > 0, \quad A_{11} < 0, \quad A_2 < 0, \quad A_{22} > 0.5
\]

2. According to the medical profession, most drivers are "impaired" at the .05 BAC level.

3. Visual detection is more difficult at .05 than at .10, but new technology may make detection easier in the future as new forms of breath testing devices enter the market [5]. However, this begs the real issue, since our model suggests that even with poorer detection, drinking drivers will be deterred by the fine or threshold effects.

4. MacRae and Wilde [3] point out the importance of policing in determining proper policy with respect to accident externalities, although they do not explicitly model the implications of these considerations.

5. The subscript represents a partial with respect to the indicated variable. The signs on these partials are easily derived from a model of maximizing motorist behavior, but they reflect such plausible behavior that this background modeling is left implicit. The equality \( A_1(L, P) = 0 \) will hold only if \( L \) is increased beyond the Blood Alcohol Level that anyone would choose in the absence of the BAC limit. Therefore, the strict inequality can be expected to hold at all policy relevant BAC limits. Also the equality \( A_2(L, P) = 0 \) will hold only if policing has been increased to the point where complete compliance to the BAC limit is realized. This will obviously not be the case in an optimal policy as long as there are positive marginal policing costs.
The private net benefit realized from the average blood alcohol levels is given by the function $B(A)$. Since the purpose of a blood alcohol limit is to keep motorists from drinking and driving as they otherwise would, it is assumed that $B'(A) > 0$ over the relevant range of blood alcohol levels, with $B''(A) < 0$. The cost of accident externalities, $C(A)$, is given as a function of average blood alcohol levels only, with $C'(A) > 0$ and $C''(A) > 0$. It is assumed that the marginal and average cost of policing is given by the positive constant $K$. Finally it is assumed that there is some BAC level, $\bar{L}$, below which it is politically impossible to lower the blood alcohol limit.\footnote{6}

It is now possible to express the policy problem as that of choosing the $L$ and $P$ that maximizes

$$B[A(L, P)] - C[A(L, P)] - KP$$

subject to the constraint

$$L \geq \bar{L}.$$ 

(2)

The policy variables that solve this problem necessarily satisfy the conditions

$$[B'(A) - C'(A)]A_1 \leq 0$$

(3)

$$[B'(A) - C'(A)]A_2 - K = 0$$

(4)

were the strict inequality holds in (3) only if constraint (2) is binding; i.e., $L = \bar{L}$.\footnote{7}

The intuition contained in conditions (3) and (4) is straightforward. Condition (4) requires that policing be increased until its marginal value equals its marginal cost. Since $K > 0$, the marginal value of policing, $[B'(A) - C'(A)]A_2$, remains positive, which, with $A_2 < 0$, implies that $B'(A) - C'(A) < 0$. Therefore, given that $A_1 > 0$, it follows that (3) holds as a strict inequality and the optimal $L$ equals $\bar{L}$. The efficient policy calls for substituting, to the maximum extent possible, reductions in the legally allowable BAC for policing activity. The intuition here comes from recognizing that of the two ways to reduce average BACs, lowering the BAC limit or raising the level of policing, the former is less costly than the latter. This is similar to the policy of substituting harsh but socially inexpensive penalties for costly detection efforts in the control of crime, as discussed by Becker\footnote{1}.\footnote{7}

IV. Conclusions

The drinking and driving literature has, for the most part, ignored the importance of enforcement costs to the problem they address. Once the cost of enforcing the BAC limit is recognized, the blood alcohol content limit should be set as low as is politically feasible. Sweden recently tried to lower the legally allowable BAC to .03, coupled with a reduction in the penalty. It did not receive the support of the public because of the reduction in the penalty. What is "politically
feasible” will, of course, depend on what the typical voter thinks is “fair,” a problem no different from that facing more typical discussions of the optimal fine. But surely the current climate of public opinion toward drunk driving allows for a significant reduction in legal BAC levels below the prevailing level of .10. And given the current techniques of monitoring the alcohol content of drivers, the cost of lowering the prevalence of drunk driving to some specified level can be reduced by substituting low BAC limits, at least over some range, for enforcement effort.

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