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AN ECONOMIC ANALYSIS OF ALCOHOL, DRUGS, AND VIOLENT CRIME IN THE NATIONAL CRIME VICTIMIZATION SURVEY

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ABSTRACT

The purpose of this paper is to examine the direct relationship between the prices of alcohol and drugs and the incidence of criminal violence in a nationally representative sample of individuals in the United States. The positive association between substance use and violence is well documented, as is the negative relationship between the quantity of alcohol or drugs consumed and their prices. These two relationships together form the principal hypothesis examining whether increases in substance prices will directly decrease the incidence of criminal violence. Violence is measured by assault, rape/sexual assault and robbery. Measures of alcohol or drug involved violent crimes are also considered. The data come from the 1992, 1993 and 1994 National Crime Victimization Surveys. A reduced form model is estimated in which the probability of being a victim of a violent crime is determined by the full prices of alcohol and illegal drugs, the arrest rates for violent crimes, and characteristics of the respondent. Individual- level fixed effects are also employed in some models. Results from the preferred specifications indicate that higher beer taxes lead to a lower incidence of assault, but not rape or robbery. Higher beer taxes will also lead to lower probabilities of alcohol- or drug-involved assault. Decriminalizing marijuana will result in a higher incidence of assault and robbery, while higher cocaine prices will decrease these crimes.

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"The reign of tears is over. The slums will soon be a memory. We will turn our prisons into factories and our jails into storehouses and corncribs. Men will walk upright now, women will smile and children will laugh. Hell will be forever for rent." Reverend Billy Sunday speaking at the beginning of Prohibition, 1920.

I. INTRODUCTION

It is commonly believed that alcohol and drug consumption leads to criminal violence. This belief is supported by research from many disciplines showing a positive relationship between substance use and violence (see Miczek et al. 1994, and Forrest and Gordon 1990 for reviews of the literature). If drug and alcohol consumption directly results in violent crime, then one way to lower crime is by reducing consumption. Economist have shown that the consumption of drugs and alcohol is sensitive to price changes. For example, Kenkel (1993), Leung and Phelps (1993), Manning et al. (1995), and Grossman et al. (1998) all show negative price elasticities of demand for alcohol. Grossman and Chaloupka, (1998) find a negative price elasticity of demand for cocaine, Chaloupka et al. (1999) show the same result for cocaine and marijuana use, and Saffer and Chaloupka (1999) find negative price elasticities of demand for marijuana, cocaine, and heroine. The purpose of this paper is to examine the direct relationship between the prices of alcohol and illegal drugs and the incidence of criminal violence. Violence is measured by incidents of assault, rape/sexual assault, robbery, and by alcohol- or drug-involved assault, rape/sexual assault and robbery. This study focuses on prices rather than consumption as potential tools to reduce violence since the easiest way for governments to reduce consumption is through tax increases, in the case of alcohol, and through enforcement of drug laws when cocaine and marijuana are considered.

The data come from special geographically coded versions of the 1992, 1993 and 1994 National Crime Victimization Surveys. A reduced form model is estimated in which the

probability of being a victim of violent crime is determined by the full prices of alcohol and illegal drugs, the arrest rates for violent crimes, the state level unemployment rate, real income per capita, and characteristics of the respondent. The data contain panels of individuals, thus enabling the use of individual-level fixed effects. Results indicate that higher beer taxes will lower the incidences of assault and drug- or alcohol-involved assault, but not rapes or robberies. Decriminalizing marijuana will result in a higher incidence of assault, while higher cocaine prices will decrease assault and robbery.

II. THE RELATIONSHIPS BETWEEN ALCOHOL, DRUGS AND CRIMINAL VIOLENCE

Many studies have shown a strong link between alcohol use by the perpetrator and criminal violence. For example, the Bureau of Justice Statistics (BJS 1988) reports that in the United States, about 60 percent of all persons convicted of assault had been drinking just prior to the crime. By contrast, about 40 percent of burglars and 30 percent of drug offenders used alcohol just prior to committing their crimes. More recent data shows a similar disparity with 41 percent of violent male inmates in local jails reporting drinking at the time of the offense compared to 35 percent of property crime inmates (BJS, 1998). Other studies comparing violent and non-violent criminals find similar results (Roslund and Larson 1979; Myers 1982; Myers 1986).

Additional studies point to a high coincidence rate between violent crimes and alcohol consumption. Rapists are highly likely to have used alcohol prior to their crimes, with rates of use by offenders ranging from 50 percent to 65 percent. (Rada 1975; Rada et al. 1978; Barnard et al. 1979). A high incidence of alcohol use is also observed for people who commit murders and assaults (Wolfgang and Strohm 1956; Tinklenberg and Ochberg 1981). These rates of

consumption associated with crime would not be surprising if similar rates of alcohol use are observed in the general population, however, estimates show that this use is much lower. The BJS reports that about 30 percent of violent offenders are reported to be daily drinkers, while only 6 percent of people age 18 or older in the general population consume two or more drinks per day (BJS, 1998). However, one source of bias in the studies of violent offenders is the possibility that intoxicated offenders are more likely to get caught by the police, to be repeat offenders, and receive longer prison sentences. These three things combined make it more likely that drug and alcohol users are included in the samples of inmates (Pernanen 1991).[1]

Some studies have revealed that it is not only the criminals who consume alcohol prior to committing crimes, but the victim's behaviors may inadvertently put him or her at risk (Pernanen 1991). According to the "lifestyle" theory of victimization, "persons who drink extensively or go 'cruising' for social activity, especially at night, are at higher risk for assault because such behavior often occurs at bars, parties, and other places where victimization risk is heightened." (Sampson and Lauritsen, 1994, p. 32.) Drinking may also alter a person's judgment and relax his/her guard, which can lead to increased victimization risk for assault and other personal crimes such as rape and robbery. A number of studies have shown that alcohol and drugs are frequently used by victims (Wolfgang and Strohm 1956; Johnson et al. 1978; Williams and Singh 1986; Lowry et al. 1988).

It is commonly believed that there is also a link between illegal drug consumption and violence, although the empirical support for this notion is mixed. For example, Chaiken and Chaiken (1982) find that 83 percent of violent inmates used drugs during the same period as the crime, while finding no association between juvenile crime and juvenile use of marijuana or experimentation with hard drugs. By contrast, Beachy et al. (1979) show that adolescent

marijuana users are more aggressive than non-users. The BJS (1988) reports that about 25 percent of violent offenders claim they were under the influence of drugs at the time of the offense. However, the BJS study reports that all jail and prison inmates (not just violent criminals) are much more likely to use drugs than the general population. This is supported by Tinklenberg et al. (1981) who find that male juvenile offenders incarcerated for violent offenses use drugs and alcohol at similar rates as non-violence offenders. Indeed, the general population uses drugs in significantly in lower proportions than prisoners--estimates from the 1998 National Household Survey on Drug Abuse show that only 5.0 percent are current marijuana users (used drugs at least once in the past month) and only 0.8 percent are current cocaine users.

Aside from consumption related violence, considerable amounts of violence have resulted from the illegal drug distribution network. Goldstein et al. (1989) examine 414 murders in New York City, of about half of which were classified by police as drug related. Three quarters of the drug related murders are attributed to the involvement in the illegal drug market. Most of the murders were committed by people who either killed while stealing to pay for drugs, were involved in territorial disputes, or were collecting drug debts. Interestingly, only 10 of the 218 drug related murders were a result of drug consumption (some in combination with alcohol), and 21 were attributed to alcohol consumption alone.

It is important to note that the studies showing a high correlation between substance use and violence do not establish causality. Alcohol (or drugs) and violence may be observed together for a variety of reasons. While this study makes no attempt to explain the causes of the link, some of the major theories which are relevant to this study are mentioned. As discussed below, the competing theories are not problematic for the analytical framework or conclusions of this paper.

The first theory asserts that consumption does cause violence through biological, pharmacological or psychological mechanisms that alter behavior (Pernanen, 1981 and Fagan, 1993). For example, in the case of alcohol, a purely biological violence response may occur as a result of changes in physiological responses, such as certain brain functions (Fagan, 1990). While this type of hypothesis does not suggest a simple dose-response relationship where ingestion automatically leads to violence, this does suggest that alcohol consumption may cause certain individuals to engage in aggressive behavior (Miczek et al. 1994). Also, the pharmacological properties of alcohol consumption may lower the guard of potential victims putting them at higher risk.

Unlike with alcohol, there is some uncertainty surrounding the pharmacological link between drugs and violence. It is known that any biological effects differ by drug type and amount of use. For example, short-term use of marijuana may inhibit aggressive behavior in humans, while long-term use can alter the nervous system in a way that promotes tendencies towards violence (National Research Council 1993). Cocaine in small doses tend to increase aggressive behaviors, but this link may be result of the distortions in the interpretation of social signals by the users (Goldstein 1985, Fagan 1993, and Yudofsky and Silver 1993).

Another source of the link between illegal drugs and violence may arise from what is termed systemic violence. Systemic violence is violence that results from being involved in the illegal drug distribution network (Goldstein 1985). In the most simple case, a dealer may robbed of his or her stash of drugs. Violence may also arise from disputes over territories between rival drug dealers, from disputes within the hierarchy of a seller's organization, or as a user's punishment for failing to pay a debt. Miron and Zwiebel (1995) propose that this type of violence results from low marginal costs of violence. Evading apprehension for violence is

complementary to evading apprehension for selling illegal drugs, and the additional penalties for violence may be small.

An observed correlation between violence and consumption may arise if people who plan on being violent may drink or get high in order to give themselves courage or an excuse for the behavior (Fagan, 1990 and Cordilia, 1985). From an economics standpoint, this theory translates into using substances as a way of lowering the cost of violence by lowering the probability of facing penalties. Becker (1968) shows that the criminal's choice level of crime is determined by weighting the probable costs and benefits of crime. Alcohol use, for example, may decrease the probability of facing penalties if the victim or the courts are less willing to impose costs on criminals who drink. This may occur if the criminal's behavior is deemed to be out of his or her control and is a result of being under the influence of alcohol.[2,3]

In the case of robbery, causality may stem from an economic compulsion. That is, robberies may occur if drug or alcohol addicts commit robberies to pay for their expensive habits (Goldstein 1985). As discussed below, the economic compulsion argument has different implications for the effect of price increases on violence.

Finally, alcohol and violence may actually be unrelated, but are observed together because both behaviors are outcomes of an unobserved third factor, for example, a risk-taking personality or an environment that encourages both behaviors (Fagan, 1990). The "lifestyle" theory of victimization can be included as one type of third factor theory where the victim's behavior puts himself or herself at risk.

III. RELEVANT LITERATURE

It is clear that there is an association between alcohol, illegal drugs and crime, but

knowledge of this association alone may not be helpful in guiding public policy designed to reduce crime. Studies from economics add a new dimension to the literature on substance use and crime by providing estimates of the effectiveness of policy tools (i.e. tax increases on alcohol) in reducing violent crime.

Cook and Moore (1993) examine the effects of alcohol prices on aggregate state crime rates in the United States. Using data from the Uniform Crime Reports, the authors look at rates of murder, rape, assault, and robbery for the 48 contiguous states from 1979-1988. Criminal offenses are modeled as a function of alcohol consumption and the socioeconomic and demographic characteristics of a state's population. Alcohol consumption is determined by its price and state-specific factors (which can be similar to the determinants of crime). Combining these two equation yields a reduced form model where a specific crime rate is a function of the state excise tax on beer and a series of time and state dummy variables. Results show that alcohol consumption is positively related to rape, robbery and assault, but not homicide. In addition, increasing the tax on beer reduces the rates of rape and robbery, but has no effect on assault or homicide rates.

Chaloupka and Saffer (1992) also look at the effect of beer taxes on state level crime rates, but in addition to the variables mentioned above, their model includes drug consumption and law enforcement. An indicator for the decriminalization of marijuana is included to represent the full price of marijuana consumption, and real expenditures on police are included as a proxy for law enforcement. Other variables that may affect the availability of alcohol such as the minimum legal drinking age and the percentage of a state's population living in dry counties are also included. Key results of this study show that increasing the tax on beer reduces rates of robbery, rape and homicide, but not assault. Decriminalizing marijuana will increase

rapes, robberies and assaults.

In another study using the Uniform Crime Reports, DeSimone (forthcoming) examines the impact of cocaine prices on both property and violent crime rates. Data come from 29 large cities during the 1981-1995 period, and a two-stage least square model is used to account for the endogeneity of cocaine prices. Results show that higher prices of cocaine will decrease the rates of murder, rape, robbery, and assault although the result for assault is sensitive to the inclusion of other variables.

Other studies on the effects of drug and alcohol prices on violence use micro-level data. For example, Saffer (forthcoming) examines the effects of beer taxes on crime using data from the 1991 cross section of the National Household Survey on Drug Abuse. The crimes examined include violent as well as non-violent crime, and are measured by indicators for whether the respondent has been arrested, has stolen anything of value, has caused property damage, or has used force to commit a crime in the past year. Reduced form models of crime are estimated where crime is a function of the beer tax, drug control spending, and characteristics of the individual. Results show that higher beer taxes will reduce the probability of all types of crime.

Studies of the effects of higher alcohol prices on other types of violence include studies on child abuse (Markowitz and Grossman, 1998a and 2000), spousal abuse (Markowitz, forthcoming October 2000) and violence on college campuses (Grossman and Markowitz, forthcoming). These studies all show that increasing the price of alcohol is an effective way to reduce the incidence of physical violence.

Markowitz (forthcoming) has also looked at the relationship between alcoholic beverage prices and taxes, and robbery, assault, and sexual assault in an international framework. Using individual-level data in the 1989 and 1992 International Victimization Surveys, this paper shows

that increases in the price of alcoholic beverages decreases the probability of all three types of violence in 16 different countries around the world. The same results hold for the tax on alcohol. However, these results are sensitive to the inclusion of country fixed effects. Some models include dummy variables in order to capture the unobserved effects of culture on crime and drinking in each country. These dummies are problematic in that they are highly collinear with the price and tax variables, which leads to unstable estimates. The conclusions of this paper are based on models which do not control for the unobserved effects of culture on crime and drinking.

In addition to the effectiveness of tax increases in reducing violence, there is some evidence that the availability of alcohol may have an impact on violence as well. A study by Lenke (1975) shows that there is a high statistical correlation between rates of violent crime and per capita alcohol consumption in several Scandinavian countries during the period 1960-1973. In addition, Lenke (1975) and Takala (1973) look at changes in alcohol prices, incidence of strikes by employees of liquor stores, and introduction of new sales points (i.e. selling beer in grocery stores) to explain changes in violent crime rates. Both studies show that violent crimes decrease when alcohol is less available. In a study of alcohol availability in Los Angeles County, Scribner et al. (1995) find that the rate of assaultive violence (homicide, rape, robbery, and aggravated assault) increases with higher numbers of outlets licensed to sell alcohol. Similarly, Scribner et al. (1999) show that a higher outlet density is associated with a higher homicide rate in New Orleans.

This paper is the first to analyze the impact of alcohol and drug regulatory variables on rape, robbery, and assault in a nationally representative, individual-level data set for the United States. Previous crime studies (such as that by Cook and Moore 1993, Chaloupka and Saffer

1992, and DeSimone forthcoming) have had to rely on aggregate crime rates. Aggregate-level data presents a problem in that such data only includes crimes that have been reported to the police. In the United States, for example, the 1994 National Crime Victimization Survey estimates that less than half (41.6 percent) of violent crimes were reported to police. The use of aggregate data may cause the price coefficients in the reduced form equation to be biased because of measurement error. If this measurement error is random, the only effect would be to raise the standard errors of the coefficients on all the independent variables. However, if crime is systematically underreported and correlated with the prices of drugs or alcohol then the coefficient on the prices would be biased down. Such a situation might occur if people in areas with low alcoholic beverage prices visit bars frequently, consume more alcohol, engage in bar-room brawls but do not report such assaults to the police. Goldstein (1985) reports that many intoxicated victims do not report their victimizations because they do not wish to talk to the police while drunk. Also, these victims may be confused about the details of the crime and may believe that reporting the crime would be futile. The use of victimization data avoids potential bias as a result of non-reporting.

A second advantage of using individual-level data over aggregate-level data is that the characteristics of the victim can be included in the models, whereas aggregate data relies on the demographic composition of each state. This point is best made by Trumbull who says, "Economic models of crime describe individual behavior. The use of aggregate data to estimate empirical models implies an unlikely homogeneity of the population" (Trumbull, 1989 pp.426).[4] The individual's characteristics are likely to be much better predictors of victimization than a state population's average characteristics.

In addition to including socio-economic and demographic characteristics of victims, this

paper goes one step further and accounts for unobserved heterogeneity among individuals. This is accomplished by exploiting the panel nature of the data and including individual-level fixed effects. Fixed effects account for any unobserved time-invariant characteristics that may predict victimization and which may be correlated with some of the included independent variables.

IV. ANALYTICAL FRAMEWORK

The analytical framework is derived from the economic models of crime developed by Becker (1968), Chaloupka and Saffer (1992) and Cook and Moore (1993). Criminal violence is determined by both the actions of the perpetrator and the victim. Taking into account the drinking habits and personal characteristics of both the potential criminal and victim gives the following equation for violence:

1) $V_i=v(A_i, A_j, E, Y_i, Y_j, U_i, U_j)$.

Equation 1, termed the structural violence equation, shows that the probability of being a victim of a violent crime (V_i) is a function of the alcohol (or drug) consumption of the individual (A_i) who is the potential victim, the alcohol (or drug) consumption of other individuals (A_j) who can be strangers or acquaintances and are potential perpetrators, law enforcement variables (E), and other observed factors of individuals (Y_i, Y_j) which affect the propensity towards crime or victimization such as age, gender, income, and employment status. Unobserved individual-level factors (U_i, U_j) which influence the probability of violent crime are also included.

Alcohol or drug consumption by either party can be expressed as a demand function:

2) $A=a(P_A, Y, U)$,

where P_A is the full price of alcohol or drugs, and Y and U are individual characteristics that may determine consumption. These sets of characteristics may be the same ones that determine

violence. The full prices of alcohol or drugs reflect both the monetary price and other costs of obtaining the substance, such as time and travel costs, and any potential sanctions for use of illegal substances.

Substituting equation 2 into equation 1 gives a reduced form estimate for violence:

3) $V_i = v(P_A, E, Y_i, Y_j, U_i, U_j)$.

Given that the crimes examined in this study are crimes of personal contact, the victim and the criminal will be located in close proximity and thus face the same full price of drugs and alcohol.[5] Equation 3 can be fully estimated empirically only when the characteristics of both the potential victim and criminal are observed, and this will be possible only when a crime has been committed. In light of this, a modified version of equation 3 serves as the basis for estimation when only the characteristics of potential victims are observed:

4) $V_i = v(P_A, E, Y_i, e)$,

where e is an error term that contains Y_j, U_j, and U_i. Including individual-level fixed effects will account for the time-invariant, unmeasured victim characteristics in the error term (U_i). However, omitting characteristics of either the perpetrator or the victim should not be problematic so long as these variables are uncorrelated with the prices of drugs or alcohol, the variables of interest in this paper.

This paper focuses on the empirical estimation of the reduced form equation. Equation 4 is relevant to policy because the coefficients on prices will show the propensity of price increases to reduce violence. A negative coefficient on the beer price, for example, indicates that increasing the price of beer can be used as an effective policy tools in reducing violence; a zero or positive coefficient shows that increasing the price will not reduce violence.

The conclusions of this paper hold without regard to the direction of causality between

substance use and violence, although the sign on the price coefficients may give clues as to which (if any) causality theories may hold. Causality is not at issue because consumption is substituted out of the equation. If violence is directly caused by the pharmacological properties of drugs and alcohol, then the price coefficients will be negative. That is, increases in prices will decrease consumption which directly decreases violence, although the reverse may hold in the case of short-term marijuana use where consumption inhibits aggression. Here, the relationship between price and violence may be positive. A negative price coefficient may also emerge when consumption is used as a way lower the probability of facing penalties for violent behaviors. Decreasing the prices of drugs or alcohol will increase consumption and lower the probability of facing penalties, thereby lowering the cost of engaging in violence. Decreased costs of committing violence is expected to raise violence, thus creating a negative relationship between the price of substances and violence.[6] Next, if violence and consumption are linked only by some unmeasured third factor then price increases will have no effect on violence, and the price coefficients in the reduced form will be zero, so long as the price is uncorrelated with the third factor.

When considering the economic compulsion theory, the predicted effects of changes in the prices of drugs and alcohol on violence depends on the price elasticity of demand. An increase in price will increase (decrease) expenditures on alcohol if the price elasticity of demand is inelastic (elastic), leading to more (less) income-generating violence. Previous research has shown the price elasticities of demand for alcohol, marijuana, cocaine, and heroin are inelastic (Leung and Phelps 1993; Pacula et al. 2000; and Saffer and Chaloupka 1999), implying that an increase in price will increase violence, and the price coefficient will be positive.

In the case of illegal drugs, predicting the effects of price changes on violence becomes

more complicated if violence is caused by the institutional characteristics of the illegal drug market. Consider a movement along a fixed demand curve caused by the entry of dealers into the illegal drug market, perhaps due to decreased penalties or lax law enforcement. With increased number of sellers, prices fall and the quantity of drugs demanded increases. Systemic violence is expected to rise as the market size increases because more dealers will be using violence to enforce codes of conduct within their organizations or to punish debtors. In this case, a negative effect of price on violence will be observed. Entry will also lead to declining profits for each seller which may result in violent "drug wars" as dealers battle for territory, again creating a negative relationship between price and violence.

It is difficult to tell from the sign of the price coefficient which of the theories on the relationship between drugs, alcohol and violence applies, indeed, these theories are not necessarily mutually exclusive. It is quite likely that different theories apply for different persons simultaneously. Consider the joint effects of pharmacological violence and violence stemming from economic compulsion (assuming an inelastic demand). A negative price coefficient will emerge if the negative effects of price on pharmacological violence outweigh the positive effects of price on income producing violence. Conversely, a positive price coefficient will emerge if the opposite holds, while a zero coefficient may emerge if the two effects cancel out each other. Estimating the reduced form equation will give clues to the direction of causality, but will not provide definitive evidence. Rather, the reduced form equation shows the propensity of price changes to reduce violence, without regard to the causality between consumption and violence.

V. DATA

The data come from special releases of the 1992, 1993 and 1994 National Crime Victimization Surveys (NCVS) which contain area identifiers for each respondent. The NCVS is a nationally representative survey of households focusing on individuals' experiences with criminal victimization. The survey consists of a rotating panel of individuals and is administered every six months for a three-year period. A new rotation group enters the sample every six months, replacing a group which has been in the sample for three years. The NCVS has been ongoing since 1972 and was redesigned in 1992. In 1992 and the first six months of 1993, half of the respondents were administered the new survey design, and half were given the old survey. Only the individual who received the new survey are included in this data. Beginning in the second half of 1993, all respondents were given the new survey. Because of the rotating panel and the change in the survey instrument, a person can have anywhere from one to six interviews recorded in this data. There are approximately 200,000 individuals surveyed over the sample period providing a sample of almost 450,000 observations.

Dependent Variables

A number of dependent variables are used. The first three represent the probability of being a victim of a violent crime: assault, rape or sexual assault, or robbery. Respondents who reported having been victimized in the last six months were assigned a value of one for the appropriate crime, otherwise they were assigned a value of zero. Any incident which occurred outside the United States or in a state other than the respondent's current residence is omitted from the analyses.

The definition of robbery includes the acts of completed robbery with injury from serious assault; completed robbery with injury from minor assault; complete robbery without injury from

minor assault; attempted robbery with injury from serious assault, or attempted robbery without injury. Assault is a combination of simple and aggravated, and is categorized by completed aggravated assault with injury; attempted aggravated assault with weapon; threatened assault with weapon; completed simple assault with injury; and assault without weapon and without injury. Rape/sexual assault is defined as completed or attempted rape; sexual attack with serious assault; sexual attack with minor assault; or sexual assault without injury. In the NCVS data, the most serious crime is recorded. For example, robbery with injury from serious assault is recorded as a robbery, not as an assault. In this sense, crime is underreported in these data.

Table 1 shows the means and standard deviations of all variables. The means are weighted to produce population estimates. According to the simple statistics, there is a 1.3 percent chance of being a victim of assault, a 0.09 percent chance of being a victim of rape or sexual assault and a 0.3 percent chance of being a victim of robbery.

Not all violence is alcohol- or drug-related, so a more appropriate dependent variable for this study would include only those incidents where substances use was a factor. Unfortunately, the NCVS does not question the victims on their substance use, but an approximation of the perpetrators' substance use is available. Each respondent who was victimized was asked, "was the offender drinking or on drugs or don't you know?" Using the response to this question, three additional dependent variables are created which show the probability of being a victim of a drug- or alcohol-involved crime. That is, any violent incident in which the offender was believed to be under the influence of drugs or alcohol was coded as a one. Respondents who report victimizations that were not drug or alcohol related are coded as zero. Similarly, respondents who reported no victimization are coded as zero. Missing values are placed where drug and alcohol use by the perpetrator is unknown. As with the first three measures of violent

victimization, any incident which occurred outside the United States or in a state other than the respondent's current residence is omitted from the analyses.

In this sample, known incidents of alcohol or drug involved crime comprise 33 percent of assaults, 46 percent of rapes, and 25 percent of robberies. Thus, the probability of being a victim of an alcohol- or drug-involved crime is much lower than for all violent crimes. Table 1 shows that the probability of being a victim of drug or alcohol involved assault is 0.5 percent. The probability is 0.04 percent for drug or alcohol involved rape/sexual assault, and is 0.07 percent for drug or alcohol involved robbery. The majority of criminals were observed to be under the influence of alcohol (64 percent), with approximately 16 percent reported to be on drugs only, 15 percent on both drugs and alcohol, and the remainder on either drugs or alcohol (which one was unknown).

Estimating the impact of drug and alcohol prices on crimes involving these substances will provide the most appropriate measure of the relationship between these policy variables and violent crime. These dependent variables are not the sole focus of this paper, however, because of the potential for severe underreporting of substance use in these data. Forty-two percent of assault victims, 24 percent of rape or sexual assault victims and 61 percent of robbery victims report that the offender's substance use status at the time of the crime was unknown. Underreporting in the dependent variable will increase the standard errors, but will not bias the coefficients as long as the error is uncorrelated with the independent variables. If victims who are under the influence of these substances systematically cannot tell if the perpetrators are under the influence then the price coefficients will be biased down. Given the possibility of measurement error, the estimates are interpreted with caution.

Independent Variables

Alcohol and drug regulatory variables

Three variables are used to capture the monetary prices of drugs and alcohol. First, the real (1982-1984=1) state-level excise tax on beer is used as a measure of the price of alcohol. The focus on beer rather than other types of alcohol is valid because beer is the most popular alcoholic beverage, and tends to be the most prevalent beverage used in crimes. In surveys of local prison inmates and adults on probation, beer is reported to had been consumed alone or in conjunction with other types of liquor in approximately 80 percent of criminal cases in which any type of alcohol was consumed (BJS, 1998). Beer taxes come from the Beer Association's *Brewer's Almanac*. Second, an indicator is included for whether a state has decriminalized the possession of small amounts of marijuana for personal use. Prices of marijuana are generally not available, so the decriminalization indicator is used instead. For this variable, a value of 1 means the state has decriminalized, thus users in these states face a lower expected penalty and a lower price of possessing marijuana. By 1992, 11 states had decriminalized marijuana and in 1994, Alaska recriminalized marijuana. Information on decriminalization of marijuana comes from the BJS (1995). Next, the real state-level price of cocaine is included. Cocaine prices come from the Drug Enforcement Administration's System to Retrieve Information from Drug Evidence (STRIDE). The methodology for creating the cocaine price series is described in detail in Grossman and Chaloupka (1998).

In order to capture the full price of obtaining alcohol, the per capita number of outlets licensed to sell liquor in a state and the percentage of each state's population living in counties where it is illegal to sell beer ("dry" counties) are included. With larger percentages of populations living in dry counties or fewer liquor outlets, travel time to obtain alcohol increases,

adding to the full price of alcohol. Data on the number of outlets come from *Jobson's Liquor Handbook* (various years), and data on the population of dry counties come from the *Brewers' Almanac* (1996). Models are presented with and without these two variables since they may be endogenous in the crime equation. As Scribner et al. (1995) point out, outlets and violence may be positively related not due to increased alcohol consumption, but because the outlets are located in places where the risk of criminal violence is elevated, for example, in dimly lit areas or areas with a lack of security. More generally, outlets and dry counties would be endogenous in a crime equation if there are some unobserved neighborhood characteristics that determine both the level of crime and the location of outlets. Within a city, for example, residential neighborhoods may be successful in keeping out bars and liquor stores and at the same time may lower crime through a neighborhood watch program. The potential endogeneity is purged in the fixed effects models since unobserved time-invariant area characteristics (area fixed effects) drop out when individual fixed effects are included.

Individual and state level characteristics

A number of other independent variables are included to help predict the probability of violent victimizations. Table 1 includes the means and standard deviations for these variables. The respondent's age, gender, race, marital status, number of years of completed schooling, and employment status are included. Employment status is represented by a dichotomous indicator for not working (including being unemployed, being in the military and not in the labor force). Real (1982-1984) household income is also included in all models. Next, variables that might account for the individual's behavior which may put him or her at risk for violent attacks are included. The first is the number of days on average during the past six months on which the

respondent went shopping. The second is the number of days in the last six months the respondent spent the evening out away from home, for reasons of work, school, or entertainment. Finally, the number of days in the last six months on which the respondent rode public transportation is also included. Observations with missing values on certain socio-demographic variables are replaced with the sample mean. The variables that are affected are income (12 percent missing), education (1 percent missing), marital status (0.3 percent missing) employment status (14 percent missing) shopping (8 percent missing), evenings out (8 percent) and public transportation (8 percent missing).

The arrest rate for the type of violent crime in question is included in all models to proxy for law enforcement and for the probability of facing arrest. When assault is the dependent variable, the arrest rate for assault is included in the model. When rape is considered, the arrest rate for rape is included, and similarly for robbery. Information on arrests come from the FBI's Uniform Crime Reports. The arrest rate is defined as the number of arrests divided by the number of known offenses. If a crime is underreported than the arrest rate is overstated. Including the arrest rate in crime studies is often problematic because of potential reverse causality where more arrests may be indicative of more police protection, which in turn may be attributable to higher crime rates. This problem alleviated by using a partially lagged arrest rate.[7] The endogeneity of the arrest rate is not problematic for the main conclusions of this paper so long as the arrest rate is uncorrelated with the prices of drugs and alcohol. Models were tested that exclude the arrest rate and results remain unchanged.

Other independent variables include a series of dummy variables for the half year in which the respondent was interviewed. For example, respondents who were interviewed in the first or second quarter of 1992 are assigned to a dummy variable representing the first half of

year 1992. These respondents are surveyed again in the third and fourth quarter of 1992, respectively, and are both given a value of one for the second half of 1992. Including this series of half-year dummies will help capture some of the national trends in violent crimes. The state-level unemployment rate and per capita real income are also included in all models. These variables help account for the phase of the business cycle which may have an influence on crime, as well being a proxy for the opportunities available to perpetrators. Higher unemployment rates may be positively related to the crime rate in that if fewer opportunities exist for legal activities, then more time may be allocated to illegitimate activities. Similarly, higher per capita income may represent the availability of more legitimate opportunities, and thus less violent crime. If income producing crimes are considered, the effects of income would be ambiguous in that the returns to income producing crimes are greater when the per capita income is greater. Data on real income come from the Bureau of Economic Analysis and unemployment figures come from the Bureau of Labor Statistics.

Lastly, the percentage of each state that are Mormon, Protestants, Southern Baptist and Catholic, are include in all models. These variables may help proxy for the perpetrators' unmeasured personality traits. Data on religious affiliation come from Bradley et al. (1992). Since these data are reported only in 1980 and 1990, values for 1992, 1993 and 1994 are interpolated based on a rate of growth from 1980 to 1990.

Merging

All state-level variables are merged with the NCVS data based on the state in which the individual resided during the survey period. If a family moves, the survey does not follow it, rather the new family which moves into the household is surveyed instead. The regulatory

variables are added according to the time period of the possible crime (six months prior to the survey date). Beer taxes are reported quarterly, therefore, taxes are taken as an average of the tax that existed in the state in the survey quarter and in the previous quarter. Arrest rates are reported at the county level and are reported annually. Also reported annually are the number of outlets licensed to sell alcohol, the percent of counties that are dry, the marijuana decriminalization indicator, the cocaine price, the unemployment rate, per capita income, and religion variables (all of which are reported at the state level). These annually reported variables are merged according to the year in which the crime question is most likely to refer. For example, surveys administered in the first and second quarters of 1992 were assigned values from 1991. Surveys administered in the third and fourth quarters of 1992 were assigned values for 1992. A similar algorithm is used for 1993 and 1994 surveys. Beer taxes are missing for Hawaii (1,088 observations or 0.2 percent of the sample), and arrest rates are missing from certain states in certain years. In the case of the taxes, observations with missing data are deleted from the sample. In the case of arrest rates, the missing values were replaced with the mean arrest rate for the U.S. as a whole for that year.

VI. ESTIMATION AND RESULTS

Models are estimated using linear probability models (LPM). Probit models were tested and results remain unchanged. Models were also tested correcting the standard errors according to White (1980) but the results also remain unchanged. Tables 2-4 show the effects of the prices of drugs and alcohol on the probabilities of being a victim of assault, rape/sexual assault, and robbery, respectively. Three models are presented in each table. The first columns show the results of the linear probability models, with the second column excluding the potentially

endogenous alcohol availability variables. The model in the third column of each table includes individual-level fixed effects. This model includes the two alcohol availability variables since there is no endogeneity problem when fixed effects are present. Fixed effect models were tested which exclude the availability variables, and the results remain unchanged.

In order to estimate the fixed effects models, all time-invariant variables have to be omitted and individuals with only one observation are deleted from the sample. The resulting sample size is 364,266. The fixed effects are estimated using deviations from the means. This approach is equivalent to adding a dummy for every individual. The standard errors in these models have been adjusted to account for the correct degrees of freedom (Johnston and Dinardo, 1996).

One possible problem with the fixed effects estimation is that any bias in the coefficients as a result of measurement error in the independent variables is exacerbated. The severity of the bias depends on the correlation of the independent variable across time. The more highly correlated a mismeasured variable is across time, the larger the bias will be (Johnston and Dinardo, 1996). The beer tax, marijuana decriminalization indicator, number of outlets and percent dry are not likely to suffer from measurement error, although the cocaine price may. Grossman and Chaloupka (1998) discuss some reasons why the cocaine price is measured with error. First, the price is taken from a specific city but is assigned to everyone in the state. Second, the cocaine price is adjusted for purity, but users may have imperfect information about the quality of the cocaine. This will create a discrepancy between the market price and the price that determines consumption. In light of this, the results for the cocaine price in the fixed effects models are likely to be biased so the results will emphasize the LPM estimations.

Alcohol and Drug Prices

Assault

Table 2 shows the results for the probability of being a victim of assault. The most striking result is that increases in the tax on beer will lower the probability of victimization. This result holds across all models, including the fixed effects model. In the LPM models, a one percent increase in the beer tax will decrease the probability of being a victim of assault by a range of 0.04 to 0.05 percent. The coefficient on the beer tax increases in the fixed effects model, yielding an elasticity of -0.45. The increase in the magnitude of the beer tax coefficient in the fixed effects model implies that there is an omitted, time invariant variable in the LPM models that is positively correlated with both the beer tax and violence.

Drug prices may also affect the probability of being a victim of assault. The marijuana decriminalization indicator is positive and statistically significant in all models (although at slightly over the 10 percent level in the fixed effects model), indicating that the less stringent the penalty for possession of marijuana, the more likely assaults are to occur. Decriminalizing marijuana (going from a 0 to a 1 for this variable) will increase the probability of assault by 0.2 and 0.6 percentage points, in the LPM and fixed effects models, respectively. Cocaine prices are negative and statistically significant only on the LPM models. Once the individual-level fixed effects are included, the coefficient becomes positive and insignificant. As mentioned earlier, the bias on the coefficient on the cocaine prices in the fixed effects models is exacerbated, so less emphasis is placed on the last result.

The coefficient on the number of outlets and the percentage of the state living in dry counties are likely to be biased in the LPM models so the discussion of these coefficients will focus solely on the fixed effects models where unobserved area-level effects are accounted for.

Contrary to the findings of previous studies, increasing the number of outlets licensed to sell liquors does not have any effect on assaults. A zero coefficient may be an indication that outlets do not directly cause crime, but that crime and outlets occur together in the same locations. In addition, higher proportions of a state living in dry counties will not lead to a higher probability of assault.

Rape/Sexual Assault

Table 3 shows the determinants of rape and sexual assaults (from here on, the term rape refers to both rape and sexual assault). Even though the majority of rape victims (94 percent) are women, the results are presented for both genders combined. Limiting the sample to females yields results that are practically identical to those shown in Table 3. These results show that drug and alcohol prices have no effect on the probability of rape in any specification. This provides evidence against a causal relationship between rape and substance use and suggests that the behaviors are linked by a common third factor.

The fixed effects model in column 3 reveals that more outlets licensed to sell alcohol will increase the probability of rapes, and this result is statistically significant at the one percent level. Unlike with assaults, this result indicates that higher alcohol availability leads to more rapes. A one percent increase in the number of outlets will increase the probability of rape by 1.75 percent. Higher percentages of each state living in dry counties will have no effect on rapes. Excluding sexual assaults from the dependent variable yields very similar results, with more outlets leading to more rapes and beer and drug prices having no effects (results not shown).

Robbery

As with rapes, increasing the tax on beer will have no effect on the probability of being a victim of robbery (Table 4). Recall that for robbery a zero price coefficient may indicate offsetting effects of prices on violence from pharmacological reasons and economic compulsion reasons. When individual fixed effects are not included, higher prices of marijuana and cocaine will decrease the probability of robbery victimization. These effects are not statistically different from zero once the fixed effects are included. More outlets licensed to sell alcohol and higher percentages of the population living in dry counties also have no effect on robberies.

Unemployment, Income, and Arrest Rates

The state level unemployment rate is included to capture the availability of time for legitimate activities and thereby proxy for the activities of potential perpetrators. The respondent's employment status is included to represent the activities of victims. For assault and rape (Tables 2 and 3), the state unemployment rate has no effect on the probability of these crimes occurring. For robbery, higher unemployment rates predict more robberies only when the fixed effects are excluded.

By contrast, those who are not employed have a higher probability of being victims assault and robbery, as show in the first two columns of Tables 2 and 4. Adding fixed effects causes these signs to reverse. The negative coefficient on employment status is statistically significant for assaults and insignificant in the robbery equation. Employment status has no effect on the probability of rape.

The models in columns 1 and 2 of Tables 2 through 4 show that higher state-level real income per capita results in fewer assaults and rapes, but more robberies. These findings are consistent with the predictions that higher incomes provide more legitimate opportunities,

leading to less violent crime, but more income producing crimes. In the same models, higher levels of household income results in less of all three types of crimes, indicating that higher income families have the availability of resources to guard against crimes. Turning to the fixed effects models, the same conclusions can be made for income per capita and household income only when rapes are considered (Table 3). For assaults and robberies, the coefficients on these two variables become statistically insignificant.

Arrest rates are hypothesized to have a deterrent effect on crime, but the empirical results do not always uphold this prediction. Higher arrest rates decrease the probability of assault and robbery in the LPM specifications (Tables 2 and 4, columns 1 and 2), but have a positive effect on the probability of rape, and no effect on any crime when fixed effects are added.

Individual Characteristics

The results for the individual characteristics tend to be similar across the crimes. The regression results show that older people are less likely to be victims of crime. Women are less likely to be victims of assault and robbery but are more likely to be victims of rape. Blacks and Hispanics are less likely to be victims of assault and rape, but are more likely to be victims of robberies than whites. Divorced and single people are more likely than married people to be victims of all types of crimes.

Education plays a role in determining victimizations, although the direction of the effect is not clear. For assaults, higher education lowers the probability of victimization. For rapes, more education will raise the probability when the individual fixed effects are not included, and no relationship emerges when fixed effects are included. More education has a negative effect on robbery, but this result is only statistically significant (at the 10 percent level) in fixed effects

model.

Interestingly, the lifestyle behaviors of the respondents play a major role in determining the probabilities of violent victimizations. More frequent shopping trips, more evenings spent out and frequent rides on public transportation all increased likelihood of being a victim of assault and robbery. These results hold for models with and without fixed effects. A similar conclusion can be made for rape, with the exception of the fixed effects models in column 3 of Table 3.

Alcohol/Drug Involved Crime

Table 5 shows the impact of drug and alcohol regulatory variables on the probability of crimes that were committed while the perpetrator was observed to be under the influence of drugs or alcohol. Recall that these dependent variables are subject to severe measurement error so these results will be interpreted with caution. The results for the household and individual-level characteristics are very similar to those show in Tables 2-4, so these results are not shown.

The determinants of the probability of being a victim of a drug- or alcohol-involved assault are shown in panel A of Table 5. The results in all models show that higher beer taxes will lead to a lower probability of this type of assault, with a tax elasticity similar to that of all assaults. The tax elasticity for both LPM models is -0.06, and is -0.76 in the fixed effects model. Decriminalizing marijuana or lowering cocaine prices will lead to more drug- and alcohol-involved assaults, however, this statement can only be made when the individual-level fixed effects are excluded. Including the fixed effects yields coefficients that are not statistically different from zero, and the sign of the cocaine price coefficient becomes positive. The number of outlets and the percentage of counties that are dry have little effect on drug or alcohol

involved assaults.

Panel B of Table 5 shows the results for alcohol- or drug-involved rape and sexual assault. Here, increases in the beer tax will not affect the probability of these crimes, nor will changes in the number of alcohol outlets or the percentage living in dry counties. The coefficients on the marijuana decriminalization indicator and the cocaine price vary in sign and statistical significance depending on the model under consideration. In the LMP models, the coefficients are negative and of similar magnitude, are statistically insignificant in column 1 and are significant in column 2 at the 10 percent level. The signs flip in the fixed effects model and both variables become statistically significant at the 10 percent level. These contradictory results, together with the measurement error present in the dependent variable, lead to no definitive conclusions about the ability of higher drug prices to lower the incident of rape or sexual assault.

Lastly, panel C of Table 5 examines the probability of alcohol or drug involved robbery. These results show that the drug prices and alcohol availability measures have no propensity to affect robbery, although higher beer tax may reduce the probability. The coefficient on the beer tax is negative and statistically significant in the LPM models but becomes insignificant when the fixed effects are included. Interestingly, the magnitude of the beer tax coefficient does not change much across the models and yields a tax elasticity of -0.18, -0.21 and -0.22 in columns 1, 2 and 3, respectively. These results are in direct contrast to those for robbery in Table 4, where the coefficients on robbery in all three models were statistically insignificant. One explanation for the contradictory results stems from the possible causes of violence. I argue that the results in Table 4 may present a combination of the pharmacological and economic compulsion effects (where robbery is committed to finance a drug or alcohol habit). It is possible that in robberies

where the perpetrator is under the influences of these substances the pharmacological effects will outweigh the economic compulsion effects, and thus produce a negative coefficient on the beer tax.

VII. DISCUSSION

Alcohol and drug consumption have often been linked with incidents of violent crime. Given this positive relationship, the main question this paper addresses is whether increasing the prices and availability of drugs and alcohol can reduce consumption, and thereby reduce violent crime. The empirical framework in this paper allows the question to be answered without regard to the possible direction of causality between consumption and violence. Linear probability models provides baseline estimates, and mitigate potential biases from measurement error. Individual-level fixed effects models account for unobserved time-invariant heterogeneity across individuals and the areas they live in.

The results show that increasing the beer tax will decrease the probability of assault but will have no effect on robbery and rapes/sexual assaults. Using the coefficient from the fixed effects model, a one percent increase in the beer tax will decrease assaults by 0.45 percent. Decriminalizing marijuana will increase the probability of being a victim of assault, but will have no effects on rapes. The effect on robbery depends on the estimation method, however, in the fixed effects model (the preferred specification), decriminalization has no effect. As for cocaine, the preferred specification is the LPM models due to the possibility of severe bias as a result of measurement error in the fixed effects model. Indeed, for assault and robbery, a negative and significant coefficient on the cocaine prices emerges in the linear probability models, but becomes statistically indistinguishable from zero once the individual fixed effects

are included.

Similar results emerge when alcohol and/or drugs are involved in the crime. In cases where the perpetrator was observed to be under the influence of a substance by the victim, higher beer taxes will decrease the probability of assaults and have no effect on rapes and sexual assaults. The results for robberies depend on the model specification. In the LPM models, higher beer taxes will lower the incident of robberies. The coefficient in the fixed effects model is similar in magnitude to those in the LPM models, but it is not statistically different from zero. The effects of the marijuana decriminalization indicator and cocaine prices are ambiguous and depend on the model specification. In general, all of the results for drug and alcohol involved crime are questionable because of the potentially severe underreporting of the drug and alcohol consumption of the perpetrator.

The results of this paper can be used to inform the public policy debate on ways to reduce violent crime although caution must be taken in doing so. While increases in the beer tax will decrease the probability of assault victimizations, raising the tax will also impose costs on the millions of people who drink and are not violent. Cocaine price increases may be achieved by allocating more resources to the war on drugs, yet by doing so, scarce resources will be diverted from other types of crime or other publicly funded programs.

FOOTNOTES

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[1] Using data on victimizations alleviates this source of bias.

[2] See Markowitz and Grossman (1998b) for a complete derivation of a model in which alcohol affects the probability of facing penalties.

[3] Note that this last argument may only hold for violent criminals. Criminals who commit property crimes may be more likely to be caught and face penalties when drinking if the drinking causes them to be more careless while committing the crime (Cordilia, 1985).

[4] Although Trumbull's comment is written in the context of describing behavior by potential perpetrators, the same comment can apply to victims' behaviors (see model below). Also, there is evidence that the characteristics of the perpetrators and victims tend to have similar characteristics (Sampson and Lauritsen 1994).

[5] Goldstein (1985) finds that the most common victims of income generating drug related violence are people residing in the same neighborhood as the offender.

[6] See Markowitz and Grossman (1998b).

[7] A twelve month arrest rate is matched with crimes occurring in a six month period. The method for matching annual data to the NCVS is describe below in the section on merging.

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Table 1
Definitions, Means and Standard Deviations
N=443,271

Variable	Definition	Mean	Standard Deviation
Assault	Dichotomous indicator for aggravated and simple assault	0.0132	(0.11)
Rape/sexual assault	Dichotomous indicator for rape or sexual assault	0.0009	(0.03)
Robbery	Dichotomous indicator for attempted and completed robbery	0.0028	(0.05)
Alcohol/drug involved assault	Dichotomous indicator for alcohol or drug involved aggravated and simple assault	0.0046	(0.06)
Alcohol/drug involved rape/sexual assault	Dichotomous indicator for alcohol or drug involved rape or sexual assault	0.0004	(0.02)
Alcohol/drug involved robbery	Dichotomous indicator alcohol or drug involved for attempted and completed robbery	0.0007	(0.02)
Beer tax	Real state excise tax on beer	0.394	(0.35)
Marijuana decriminalization	Dichotomous indicator for the decriminalization of marijuana for personal use	0.344	(0.48)
Cocaine price	Real cocaine price	94.925	(18.98)
Number of outlets	Number of outlets licensed to sell liquor per 1000	2.353	(0.94)
Percent dry	Percentage of the state in dry counties	4.697	(8.86)
State unemployment rate	State unemployment rate	6.891	(1.41)
State per capita real income	State level real income per capita in hundreds	143.699	(19.85)
Mormon	Percent of state that is Mormon	1.558	(6.37)
Southern Baptist	Percent of state that is Southern Baptist	7.110	(8.72)
Catholic	Percent of state that is Catholic	20.171	(12.97)
Protestant	Percent of state Protestant	21.548	(9.18)
Assault arrest rate	County level arrest rate for assault	0.529	(0.54)
Rape arrest rate	County level arrest rate for rape	0.390	(0.41)
Robbery arrest rate	County level arrest rate for robbery	0.350	(0.41)
Age	Respondent's age	40.889	(19.13)
Female	Respondent's gender	0.516	(0.50)
Black	Respondent's race is African American	0.117	(0.31)
Hispanic	Respondent's race is Hispanic	0.081	(0.27)
Other race	Respondent's race is other	0.032	(0.18)
Divorced	Respondent is divorced	0.166	(0.37)
Single	Respondent is single	0.303	(0.45)
Household income	Real household income, in 1000s	23.530	(14.31)
Education	Years of completed schooling	12.189	(3.27)
Not employed	Respondent is unemployed, not employed or in the military	0.325	(0.44)
Number of shopping trips	The number of days on which the respondent went shopping	53.520	(61.20)
Number of evenings out	The number of days on which the respondent spent the evening out for reasons of work, school or entertainment	51.304	(63.06)
Public transportation	The number of days on which the respondent rode public transportation	8.995	(34.28)
1992, quarters 1 and 2	Survey year and quarter indicator	0.165	(0.32)
1992, quarters 3 and 4	Survey year and quarter indicator	0.166	(0.31)

1993, quarters 1 and 2	Survey year and quarter indicator	0.167	(0.31)
1993, quarters 3 and 4	Survey year and quarter indicator	0.167	(0.42)
1994 quarters 1 and 2	Survey year and quarter indicator	0.168	(0.42)
1994, quarters 3 and 4	Survey year and quarter indicator	0.169	(0.41)

Note: Means are weighted to produce population estimates.

Table 2
Assault

	LPM (1)	LPM (2)	Fixed Effects (3)
Beer tax	-0.0012	-0.0017	-0.0151
	(-1.88)	(-2.91)	(-1.86)
Marijuana decriminalization	0.0022	0.0021	0.0061
	(5.82)	(5.66)	(1.61)
Cocaine price	-0.00005	-0.00004	3.97E-06
	(-3.96)	(-3.85)	(0.10)
Number of outlets	-0.0004		0.0001
	(-2.13)		(0.09)
Percent dry	0.0000		0.0001
	(0.13)		(1.30)
State unemployment rate	-0.0002	-0.0002	0.0001
	(-1.17)	(-1.00)	(0.09)
State per capita real income	-0.00003	-0.00002	-0.00002
	(-2.22)	(-1.79)	(-0.23)
Mormon	-0.00004	-0.00002	0.0023
	(-1.18)	(-0.70)	(0.69)
Southern Baptist	-0.0003	-0.0003	0.0019
	(-7.66)	(-8.35)	(1.13)
Catholic	-0.0002	-0.0002	0.0013
	(-9.00)	(-9.08)	(0.92)
Protestant	-0.0001	-0.0001	0.0008
	(-3.89)	(-4.04)	(1.06)
Assault arrest rate	-0.0007	-0.0008	-0.0003
	(-2.44)	(-2.48)	(-0.57)
Age	-0.0004	-0.0004	
	(-32.56)	(-32.57)	
Female	-0.0052	-0.0052	
	(-15.61)	(-15.61)	
Black	-0.0031	-0.0032	
	(-5.62)	(-5.69)	
Hispanic	-0.0047	-0.0047	
	(-7.40)	(-7.36)	
Other race	-0.0045	-0.0044	
	(-4.77)	(-4.71)	
Divorced	0.0093	0.0093	0.0069
	(19.42)	(19.44)	(4.87)
Single	0.0064	0.0064	0.0157
	(13.71)	(13.72)	(15.99)
Household income	-0.0002	-0.0002	0.00004
	(-11.87)	(-11.87)	(1.00)
Education	-0.0004	-0.0004	-0.0005
	(-7.03)	(-7.02)	(-3.35)
Not employed	0.0008	0.0009	-0.0020
	(1.94)	(1.96)	(-2.67)

Table 2 (continued)

Number of shopping trips	0.00003	0.00003	0.00001
	(10.91)	(10.92)	(1.76)
Number of evenings out	0.00004	0.00004	0.00003
	(16.13)	(16.13)	(8.77)
Public transportation	0.00005	0.00005	0.00004
	(9.60)	(9.57)	(4.53)
1992, quarters 3 and 4	-0.0025	-0.0025	-0.0027
	(-3.62)	(-3.58)	(-2.44)
1993, quarters 1 and 2	-0.0019	-0.0019	-0.0025
	(-2.71)	(-2.66)	(-2.14)
1993, quarters 3 and 4	-0.0005	-0.0005	-0.0018
	(-0.83)	(-0.76)	(-1.61)
1994 quarters 1 and 2	-0.0015	-0.0015	-0.0038
	(-2.47)	(-2.41)	(-3.29)
1994, quarters 3 and 4	-0.0019	-0.0019	-0.0053
	(-2.89)	(-2.79)	(-3.65)
R-squared	0.011	0.011	0.002
N	443,385	443,385	364,266

Note: T-statistic in parenthesis, intercept note shown.

Table 3
Rape/Sexual Assault

	LPM (1)	LPM (2)	Fixed Effects (3)
Beer tax	-0.0001	0.00005	-0.0004
	(-0.68)	(0.30)	(-0.20)
Marijuana decriminalization	-0.0001	-0.0001	0.0006
	(-1.05)	(-1.14)	(0.63)
Cocaine price	-9.90E-07	-2.08E-06	0.00001
	(-0.33)	(-0.71)	(1.54)
Number of outlets	0.0001		0.0007
	(1.02)		(3.22)
Percent dry	-0.00002		0.00002
	(-2.37)		(0.71)
State unemployment rate	-0.00002	-0.00004	-0.00004
	(-0.37)	(-0.95)	(-0.29)
State per capita real income	-0.00001	-0.00001	-0.00003
	(-2.04)	(-2.01)	(-1.75)
Mormon	0.00000	-0.00001	-0.0003
	(-0.12)	(-0.72)	(-0.40)
Southern Baptist	-0.00001	-0.00002	0.0001
	(-1.01)	(-2.65)	(0.23)
Catholic	-2.29E-06	-0.00001	0.0001
	(-0.42)	(-0.99)	(0.32)
Protestant	9.77E-07	-3.33E-06	-0.0001
	(0.14)	(-0.49)	(-0.44)
Rape arrest rate	0.0002	0.0002	-0.00004
	(2.02)	(1.98)	(-0.27)
Age	-0.00003	-0.00003	
	(-10.71)	(-10.71)	
Female	0.0012	0.0012	
	(14.35)	(14.34)	
Black	-0.0004	-0.0003	
	(-2.51)	(-2.38)	
Hispanic	-0.0004	-0.0004	
	(-2.27)	(-2.19)	
Other race	0.0001	0.0001	
	(0.23)	(0.30)	
Divorced	0.0011	0.0011	0.0002
	(8.43)	(8.44)	(0.59)
Single	0.0005	0.0005	0.0007
	(4.39)	(4.40)	(2.73)
Household income	-0.00003	-0.00003	-0.00002
	(-8.38)	(-8.40)	(-2.05)
Education	0.00004	0.00004	-0.00002
	(2.72)	(2.76)	(-0.67)
Not employed	0.00002	0.00002	-0.00002
	(0.19)	(0.20)	(-0.13)

Table 3 (continued)

Number of shopping trips	1.76E-06	1.75E-06	1.07E-07
	(2.52)	(2.51)	(0.12)
Number of evenings out	2.60E-06	2.61E-06	2.02E-07
	(3.69)	(3.69)	(0.22)
Public transportation	4.42E-06	4.45E-06	6.27E-07
	(3.49)	(3.51)	(0.31)
1992, quarters 3 and 4	-0.0002	-0.0002	0.0001
	(-0.91)	(-0.95)	(0.30)
1993, quarters 1 and 2	-0.0002	-0.0002	-0.00002
	(-0.96)	(-1.01)	(-0.07)
1993, quarters 3 and 4	-0.0002	-0.0002	0.0001
	(-1.45)	(-1.58)	(0.30)
1994 quarters 1 and 2	-0.0003	-0.0004	-0.00004
	(-2.21)	(-2.34)	(-0.13)
1994, quarters 3 and 4	-0.0004	-0.0004	0.0001
	(-2.08)	(-2.33)	(0.19)
R-squared	0.001	0.002	0.0002
N	443,605	443,605	364,266

Note: T-statistic in parenthesis, intercept note shown.

Table 4
Robbery

	LPM (1)	LPM (2)	Fixed Effects (3)
Beer tax	-0.0004	-0.0004	0.0021
	(-1.21)	(-1.36)	(0.56)
Marijuana decriminalization	0.0004	0.0004	0.0009
	(2.40)	(2.30)	(0.54)
Cocaine price	-0.00001	-0.00001	-1.44E-06
	(-2.65)	(-2.74)	(-0.08)
Number of outlets	-0.0001		0.0002
	(-0.59)		(0.51)
Percent dry	-0.00001		-0.00001
	(-0.71)		(-0.23)
State unemployment rate	0.0002	0.0002	-0.0001
	(2.76)	(2.74)	(-0.26)
State per capita real income	0.00001	0.00001	-1.28E-06
	(1.42)	(1.70)	(-0.03)
Mormon	0.00001	0.00001	0.0042
	(0.81)	(0.89)	(2.80)
Southern Baptist	-0.00002	-0.00002	-0.0005
	(-1.26)	(-1.66)	(-0.71)
Catholic	-0.00002	-0.00002	0.0003
	(-2.24)	(-2.41)	(0.48)
Protestant	0.00001	4.19E-06	0.0007
	(0.54)	(0.35)	(1.84)
Robbery arrest rate	-0.0006	-0.0006	-0.0002
	(-3.26)	(-3.30)	(-0.58)
Age	-0.0001	-0.0001	
	(-9.45)	(-9.45)	
Female	-0.0017	-0.0017	
	(-10.89)	(-10.89)	
Black	0.0017	0.0018	
	(6.80)	(6.82)	
Hispanic	0.0011	0.0011	
	(3.63)	(3.67)	
Other race	0.0007	0.0007	
	(1.63)	(1.69)	
Divorced	0.0021	0.0021	0.0011
	(9.37)	(9.38)	(1.63)
Single	0.0015	0.0015	0.0025
	(7.06)	(7.06)	(5.47)
Household income	-0.00004	-0.00004	8.35E-07
	(-6.88)	(-6.88)	(0.04)
Education	-0.00001	-0.00001	-0.0001
	(-0.51)	(-0.49)	(-1.70)
Not employed	0.0004	0.0004	-0.0001
	(1.99)	(2.00)	(-0.35)

Table 4 (continued)

Number of shopping trips	0.00001	0.00001	3.16E-06
	(5.34)	(5.34)	(1.80)
Number of evenings out	0.00001	0.00001	0.00001
	(8.85)	(8.85)	(6.92)
Public transportation	0.00004	0.00004	0.00002
	(17.31)	(17.30)	(5.90)
1992, quarters 3 and 4	-0.0003	-0.0003	-0.0005
	(-0.84)	(-0.84)	(-0.89)
1993, quarters 1 and 2	-0.0005	-0.0005	-0.0008
	(-1.57)	(-1.56)	(-1.54)
1993, quarters 3 and 4	0.0001	0.0001	-0.0011
	(0.42)	(0.42)	(-2.03)
1994 quarters 1 and 2	-0.0002	-0.0002	-0.0017
	(-0.61)	(-0.62)	(-3.20)
1994, quarters 3 and 4	-0.0001	-0.0001	-0.0020
	(-0.38)	(-0.41)	(-2.98)
R-squared	0.003	0.003	0.001
N	443,551	443,551	364,266

Note: T-statistic in parenthesis, intercept note shown.

Table 5
Alcohol/Drug Involved Crimes

	LPM (1)	LPM (2)	Fixed Effects (3)
Panel A: Assault			
Beer tax	-0.0007	-0.0007	-0.0090
	(-1.78)	(-1.96)	(-1.98)
Marijuana decriminalization	0.0008	0.0008	0.0004
	(3.45)	(3.49)	(0.21)
Cocaine price	-0.00002	-0.00002	0.00001
	(-2.73)	(-2.77)	(0.37)
Number of outlets	0.00002		0.00001
	(0.17)		(0.02)
Percent dry	6.62E-07		0.0001
	(0.05)		(1.90)
R-squared	0.004	0.004	0.001
N	441,302	441,302	361,528
Panel B: Rape/Sexual Assault			
Beer tax	-0.0001	-0.00002	-0.0005
	(-0.49)	(-0.23)	(-0.41)
Marijuana decriminalization	-0.0001	-0.0001	0.0010
	(-1.29)	(-1.61)	(1.71)
Cocaine price	-2.81E-06	-3.30E-06	1.10E-05
	(-1.39)	(-1.65)	(1.80)
Number of outlets	-0.00004		0.0002
	(-1.16)		(1.18)
Percent dry	-0.00001		0.00001
	(-2.42)		(0.89)
R-squared	0.001	0.001	0.0001
N	443,523	443,523	361,528
Panel C: Robbery			
Beer tax	-0.0003	-0.0004	-0.0004
	(-2.17)	(-2.72)	(-0.22)
Marijuana decriminalization	0.0001	0.0001	-0.0003
	(1.45)	(1.30)	(-0.41)
Cocaine price	-1.94E-06	-1.89E-06	0.00001
	(-0.73)	(-0.73)	(0.68)
Number of outlets	-0.0001		0.0001
	(-1.19)		(0.60)
Percent dry	-2.71E-06		0.00001
	(-0.48)		(0.58)
R-squared	0.001	0.001	0.0002
N	442,883	442,883	361,528

Note: T-statistic in parenthesis, intercept note shown. For the rape/sexual assault models, the category of other race is combined with the omitted race category for data discloser reasons. All models also include the state unemployment rate and per capita income, religion variables, the arrest rate, the respondents age, gender, race, marital status, household income, education, employment status, lifestyle variables and time dummies.