Group Profiling for Alcohol Impaired Motorists with Driving Skills Disparities: Should we Care for Fairness?∗

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(Preliminary Version - Nov 2011)

A game theory model with incomplete and imperfect information is proposed here to understand the decision faced by motorists, from two identifiable groups, to drive under the influence of alcohol. In order to assess the best implementable policy, the rational decision from a traffic police force to engage in a group profiling policy strategy is described. We also suggest a perfect bayesian equilibrium solution, provinding conditions of existence and uniqueness. The predictions from this model suggest that, if there exist disparities in the driving skills for both groups when motorists are impaired by alcohol, traffic police officers should stop and administrate a breath alcohol test to a higher proportion of motorists from the group with the largest violation rate. Therefore, we suggest that group profiling through a statistical discrimination procedure is feasible. However, if there is no statistical evidence to support such disparity, only a fair policy -that is, to stop and test motorists from both groups with the same intensity- is implementable. In this latter case, we suggest that a biased behavior in policing is explained by prejudice or taste-based discrimination.

Keywords: group profiling, discrimination, economics of crime, law enforcement, alcohol.

JEL classification: J700; K420

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Reseña de Grupo para Conductores Bajo Influencia del Alcohol con Diferencias en las Habilidades de Conducción: Nos Debemos Preocupar por la Imparcialidad?¹

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Se propone un modelo de teoría de juegos con información imperfecta e incompleta para entender la decisión que enfrentan los conductores, pertenecientes a dos grupos poblacionales específicos, de conducir bajo los efectos del alcohol. Buscando encontrar la mejor regla implementable de política, se describe también la decisión racional de la fuerza de policía de tránsito para utilizar la estrategia de reseñar por grupo. También se sugiere una solución de Equilibrio Bayesiano Perfecto, proporcionando condiciones de existencia y unicidad. Las predicciones del modelo sugieren que, si existen diferencias en las habilidades para conducir bajo estado de embriaguez para los dos grupos, la policía de tránsito debe perseguir y administrar pruebas de alcoholemia a una mayor proporción de conductores cuyo grupo poblacional presente la mayor tasa de conducción bajo efectos del alcohol. En este caso, la reseña de grupo motivada por discriminación estadística es factible. Sin embargo, si no hay evidencia de alguna disparidad en las habilidades de conducción, solo una política imparcial -esto es, perseguir y administrar la prueba de alcoholemia a todos los conductores con la misma intensidad- es implementable. En este último caso, se sugiere que cualquier diferencia en el trato a conductores por parte de la fuerza pública es explicado por prejuicio, o discriminación basada en preferencias.

**Palabras Claves:** Reseña de Grupo, Discriminación, Economía del Crimen, Refuerzo de la Ley, Alcohol.

**Clasificación JEL:** J700; K420

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1 Introduction

Alcohol impaired driving is one of the major concerns on public health in the United States. According to the NHTSA report for 2008, a motorist is killed every 30 minutes because of driving under the influence of alcohol or other substances. Indeed, accounting for all racial and ethnic groups, alcohol impaired driving is the major cause of dead for people below thirty years old. Moreover, drunk motorists are 7 times more probable to cause a fatal accident, and their risk is thirteen times greater, relative to sober drivers (Levitt and Porter (2001)). Furthermore, experimental evidence supports the idea that driving under the influence of alcohol is a harmful practice, in a sense that decreases driving precision, especially for those motorists with driving skills below the average (Harrison and Fillmore (2005)).

Although an alcohol impaired driving behavior is commonly associated with risk factors, such as history of substance abuse, age, and some socioeconomic indicators like household income, a few contributions suggest that a drinking and driving conduct could be explained by group membership. In fact, assessing the likelihood of driving under the influence of alcohol across ethnic groups, recent studies point out that US-born Hispanics are more likely to drive under the influence of alcohol than immigrant Hispanics (Maldonado-Molina, Reingle, Jennings, and Prado (2011)). Nonetheless, some studies recognize a significant bias in the self-reported rates of alcohol impaired driving relative to the rates in which ethnic groups in the US are stopped and tested (Caetano and McGrath (2005)). Indeed, even if there are substantial differences across impaired driving rates and fatal crash rates across groups, there is no consensus about which ethnic, gender, or racial groups is more prone to a drinking and driving conduct (Asbridge, Payne, Cartwright, and Mann (2010)). Hence, there is still a debate about whether traffic law enforcement administration should engage in group profiling, as a deterrent strategy to diminish the number of illegal drunk motorists on the roads, as long as to reduce the number of fatal crashes related with alcohol consumption.

A group profiling behavior in policing occurs when police departments decide to target disproportionately individuals who belong to identifiable groups. Whether or not this practice should be avoided depends on which factors motivate this observed discrimination. Primarily, police departments engage in group profiling when exist some observable attributes directly correlated with group membership, that would also explain the proclivity to commit illegal activities. This case is what the literature has named as statistical discrimination (Phelps (1972); Arrow (1973)). On the other hand, police officers would employ group profiling practices because of their preferences. These preferences could also modify the expected costs to
stop and test motorists from some specific groups. This latter behavior is known as prejudice or taste-based discrimination (Becker (1957)). Ethical considerations support the idea that group profiling motivated by preferences is not desirable, and only discrimination in policing is “acceptable” if there is evidence about the existence of some variables, positively correlated with group membership, that might also explain the illegal behavior observed in the data.

There is a plenty of studies that have tried to assess whether a group profiling policing strategy is efficient, as long as which elements motivate this practice. Knowles, Persico, and Todd (2001) develop a theoretical model of highway drug searching to explain whether police officers engage in racial profiling explained by prejudice, and why, even with the same initial conditions for both racial groups, African American people become more targeted and searched than non-Hispanic whites. They conclude that there is no evidence of prejudice between both populations groups, but if the main goal of the police is to increase the amounts of confiscated drugs, there is a substantial bias against non-Hispanic white motorists. Moreover, Donohue and Levitt (2001), regarding the racial composition of both, potential offenders and law enforcement officers, find empirical evidence suggesting that an increase in the number of police officers from the minority (majority) group explains no variation in the arrests of individuals from their same group, but an increase in the number of arrests of potential offenders from the (minority) majority group. However, they recognize that this behavior might be explained by a growth in the effectiveness of the police force when is dealing with violators from their same racial group, as long as the existence of a psychological bias that might foster an asymmetric administration of justice. This type of analysis is extended by Antonovics and Knight (2009), suggesting that if statistical discrimination alone explains the difference observed in crime rates between racial groups, the stopping and searching decisions should not depend on the race of the police officer. However, by a theoretical and empirical study using data from the Boston police department, they conclude that the difference in the search rates between whites and African-Americans might be motivated by taste-based discrimination.

Although some studies have pointed out the negative effects of group profiling in policing (Durlauf (2006); Glaser (2006)), there are no conclusive arguments to support or dismiss this strategy. For instance, Bjerk (2007) proposed a theoretical model with statistical discrimination to show in which cases, depending on the specific characteristics of the illegal event, imposing a color blind policy on police officers can increase, decrease, or no have significant impact on the aggregate crime rate. Moreover, Blumkin and Margaliot (2008) suggest that racial profiling to find drug carriers is more efficient if police departments focus only on
marginal offenders. Furthermore, they affirm that a group profiling strategy should depend on the difference of the violation rates between racial groups, specially if acts of terrorism were performed by these groups.

Focusing only in impaired driving, there exist some contributions from the classical deterrence theory to assess under which conditions a drinking and driving behavior is preventable (Kenkel (1993)). Moreover, recent studies, from an econometric perspective, have addressed the problem of how identify causal effects of deterrence instruments, such as fines, blood alcohol level limits, and pigouvian taxes (Benson, Mast, and Rasmussen (2000)). Nonetheless, to our knowledge, little work has been done to assess whether group profiling, as a main policy to fight against alcohol impaired driving, is motivated by preferences or by statistical discrimination. This paper suggests a game theory approach to studying the economic incentives that motorists face to drink and drive illegally under a group profiling strategy from authorities. The economic model that we propose here accounts for all the expected benefits and costs that prospective violators will consider, and the incentives that motivate a discriminatory treatment by traffic police officers. In addition, this theoretical framework propose a set of conditions easily verifiable in the data, to assessing if disparities in the alcohol impaired driving rates across population are explained by prejudice or statistical discrimination in policing. Furthermore, our approach suggest some specific, normative implications.

Indeed, one of the novel features of this contribution is that the implementation of a fair policy, conceived as a situation where traffic police officers target and search irrespective from group membership, is achievable if and only if there is no stochastic dominance across groups at the driving skill level. Thus, if different groups face the same economic disincentives to engage in an alcohol impaired driving behavior, and nothing else explains the proclivity to drinking and drive, all groups should be treated in the same way. Namely, the rates at which traffic police officers should stop and test motorists must be the same across groups. Hence, any difference in the rates in which police search and test motorists will be explained only by prejudice and not by statistical discrimination procedures. On the other hand, if there is stochastic dominance between groups at the driving skill level, in a sense that one group is more skilled in driving under the influence of alcohol, a fair policy is not feasible because traffic police officers, at the equilibrium, will test more motorists from groups with higher observed violation rates. Therefore, advocating a fair policy depends exclusively on the non-existence of stochastic dominance among groups.

The paper is organized in four sections, including this introduction. The section two
presents the theoretical model, as long as the economic incentives that explain the observed disparities in the rates in which motorists drink and drive. In section three we characterize the equilibrium and we find the normative implications from a fair policy with stochastic dominance in the driving skills. Additionally, we show under which circumstances a discriminatory policy might be acceptable. Finally, the last section concludes.

2 The Model

In this section we propose an adaptation of the Coate-Loury model (Coate and Loury (1993)) to study how discrimination in policing affects the violation rates across population, and how incentives determine the alcohol impaired driving decisions by motorists.

The original model proposed by these authors has the intention to explain why there exists discrimination in labor markets when only group membership is observable. Employers, who are only able to detect a worker’s group membership, but not his/her true labor productivity, would infer whether if that worker is skilled or not, and because of that, workers at the same time will infer if they are more likely to be hired, as long as if they should invest in the acquisition of human capital. The main interesting feature of this framework is that, in equilibrium, the beliefs of the employers are self-confirmed. Thus, these beliefs modify the incentives and decisions of human capital investment made by workers in a self-fulfilling mechanism. Assessing the effects of an affirmative action policy to reduce discrimination in hiring workers from minority groups, they find that the implementation of such policy might be counterproductive. Indeed, if the minority group realizes that, even in the case of no investment in human capital, there exists a positive probability of being assigned to the high paid job -i.e. the job which requires high skilled workers-, their human capital investment decisions would be even lower, confirming the stereotypes of low qualification regarded by employers.

Although the main objective of this paper is not an evaluation of an affirmative action policy, the Coate-Loury framework has been chosen because we consider that their contribution is an useful benchmark to analyze the interaction between motorists and traffic police officers under asymmetries of information. Particularly, when a motorist decides to drinking and drive, traffic police officers should infer, using available information, if the motorist is drunk or not. This occurs because the prior decision made by the motorists is hidden action. In order to making a rational inference process, traffic police officers should regard some observable variables, or signals, as a key elements that might be correlated with the prior,
unobserved decision to engage in an alcohol impaired driving behavior. Traffic police officers could develop this inference process in two ways. In one hand, they might hold biased beliefs against motorists from certain groups and adjust the intensities in which those motorists must be stopped and tested. On the other hand, traffic police officers could treat every motorists with the same intensity. In other words, when a motorist is approaching to a sobriety checkpoint administrated by the police, he/she faces the same probability of being stopped and tested, irrespective of his/her group membership. Hence, the policing decision, or more properly, the optimum level of those signals that might suggest a stopping and testing decision, will be conditioned to those prior beliefs. The implications of these inference processes will be explained in the following sections.

2.1 Preliminaries

Consider a road with two types of risk neutral motorists, labeled \( A \) and \( B \), with measures \( \sigma \) and \( 1 - \sigma \), respectively, and a sobriety checkpoint operated by the traffic police department. The labels \( A \) and \( B \) are used to denote group membership. Namely, we are assuming that the observed disparities in the alcohol impaired driving rates across population, as long as the differences in the searching rates by the police, might be explained by markers such as race, gender, type of vehicle, ethnicity, to name a few. To simplify the analysis, we are assuming that traffic police officers are a single identifiable group with no explicit membership to groups \( A \) or \( B \).

Every motorist, which could be classified between the two existing markers, should decide whether to drink and drive without any restriction, or driving sober. By assumption, the sobriety checkpoint cannot be evaded by any type of vehicle, which implies that the probability of eluding the sobriety checkpoint is zero. Thus, motorists will assess all the benefits and costs from engage in an alcohol impaired driving behavior because there exist a positive probability of being stopped and tested. On the other hand, traffic police officers at the sobriety checkpoint, in a case by case basis, will use their resources to detect the maximum possible number of drunk motorists who are traveling on the road by an administration of a breath alcohol test. However, it is useful to recognize the existing informational asymmetries between both parties.Primarily, all motorists face uncertainty about the true probability of being stopped and tested. Conversely, traffic police officers face an information problem

\footnote{We are assuming that there is only two identifiable groups in whole population. However, this study could be extended to include more than two groups}

\footnote{By simplicity, we are assuming in this setting that choose to drive sober, or to drink below the legal limit, are the same decision}
because the drinking and driving decision made by motorists is not fully observable at all.

Despite the information problem described before, there are certain risky attitudes from motorists that traffic police officers will observe to decide whether to stop motorists or not. In this setting, we are assuming that when a motorist is approaching at the sobriety checkpoint, traffic police officers only observe the motorist’s group membership and a noisy signal \( \theta \in [0, 1] \). This variable \( \theta \) can be regarded as a factor that traffic police officers observe to decide whether the motorist should be tested. This signal might be the speed level, the number of occupants on the vehicle, and other observable variables that are assumed to be positively correlated with an alcohol impaired driving behavior. Let \( P(\theta) \) and \( Q(\theta) \) be the probabilities that this signal is equal or less than \( \theta \), for sober and drunk motorists, respectively. By assumption, \( P(\theta) \geq Q(\theta) \), which implies that \( \frac{P(\theta)}{Q(\theta)} \) is a non increasing function of \( \theta \). Therefore, it is more probable that drunk motorists exceed the signal level \( \theta \). We are assuming that these distributions do not depend on group membership. However, when a comparison between sober and drunk motorists is made, drunk motorists have a larger probability to surpass the signal level, relative to sober motorists. Finally, these cumulative density functions are assumed to be commonly known by everyone.

The sobriety checkpoint policy is then, to set a signal level \( \theta \), and stop and administrate the breathe alcohol test to all motorists who exceed this chosen level. However, the traffic police officers are worried about trying to avoid the two types of error in the classical statistical sense. Actually, it is costly to stop sober drivers, or failing to stop drunk motorists. Hence, let \( z(\theta) \) and \( 1 - z(\theta) \) be the costs for stop a sober motorist, or failing to stop a drunk driver, respectively. By assumption \( z(\theta) \) is a continuous decreasing function of \( \theta \), bounded in the \([0, 1]\) interval. This means that the more evidence against an individual is available the less will be the cost of a testing decision. This allows us to regard the true opportunity cost faced by the traffic police force in the administration of the breathe alcohol test. Indeed, observe that \( z(1) = 0 \) and \( z(0) = 1 \). Hence, as long as the signal increases, the cost from testing sober drivers decreases, and the cost from failing to test drunk motorists increases.

It is necessary to describe the sanctions that motorists would face if they are caught under the influence of alcohol. By assumption, the decision to drink and drive depends not only of all the expected benefits and costs from that illegal behavior, but also on the true driving abilities that motorists own while they are impaired. In that sense, regardless of group membership, the heterogeneity of motorists is explained by differences in their driving ability. Let \( e \in [0, \bar{e}] \) be the cost of driving successfully, with \( \bar{e} < \infty \). Thus, more skillful motorists will
have lower costs. Let \( G_i(e) \), with \( i = \{A, B\} \), be the proportion of motorists from group \( i \) with driving costs no higher than \( e \). This cumulative density function for both groups is commonly known. Additionally, if a motorist is caught under the influence of alcohol, a fine \( F > 0 \) is imposed. In the case of no testing, every drunk motorist face a probability \( \lambda \) of suffering a fatal crash, with cost \( H > 0 \). However, drivers also will experiment an utility \( V > 0 \) for being drunk and drive in such condition. Thus, assuming that \( H > V \) and \( \lambda \frac{V}{H} \), the expected benefit from driving under the influence of alcohol \( V - \lambda H \) is strictly positive. This means that the probability of having a fatal accident is lower enough. This assumption can be supported by previous research suggesting no existence between the level of proactive driving under influence (DUI) arrest activity and DUI related crashes, explained by the lower probabilities of having a fatal crash, and the perceived low rates of detection and conviction across population (Dula, Dwyer, and LeVerne (2007)). Finally, because we want only to focus on the expected benefits from impaired motorists, we are normalizing all the benefits and costs that face sober drivers to zero\(^5\).

The problem suggested before, between a drunk driver from group \( i \), and a group of traffic police officers assigned to the sobriety checkpoint, can be described as a game of incomplete and imperfect information with four stages. In the first stage, nature chooses group membership and driving cost while impaired. In the second stage, motorist from group \( i \) should decide whether to be impaired by alcohol or not. In the third stage of the game the motorist meets the traffic police force assigned to the sobriety checkpoint, while police officers decide whether to test the motorist or not, considering their prior beliefs and the observed signal \( \theta \). In the last stage of the game, payoffs are realized in accordance with the motorist’s type, and the decision taken by both, motorist and the traffic police officers. It is useful to recall that this problem can be conceived as a problem of imperfect information because actions are not fully observable by all agents. Indeed, the motorist’s prior decision to drink is not observable by traffic police officers. In addition, a incomplete information problem arises because final payoffs depends on the probability of getting a fatal accident, an event that is uncertain in this approach.

### 2.2 The Sobriety Checkpoint’s Policy

We begin by describing how traffic police officers, assigned to the sobriety checkpoint, made their decision process. Let \( \pi_i \) be the probability that a motorist from group \( i \) is driving under the influence of alcohol. This probability is the prior belief developed by traffic police officers.

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\(^5\)This last assumption implies that sober motorists are indifferent between driving without restrictions or being stopped and tested by the police.
officers, and is commonly known by all parties. Hence, considering this prior belief, traffic police officers will update the likelihood that a motorist from group \( i \) is impaired by alcohol, given the realization of the signal \( \theta \). Let \( \gamma_i \) be this posterior probability given by the Baye’s Rule:

\[
\gamma_i = \frac{\pi_i q(\theta)}{\pi_i q(\theta) + (1 - \pi_i) p(\theta)}.
\] (1)

Assessing the existing expected costs, a motorist from group \( i \) will be always tested if the expected cost from testing a sober motorist is no higher than the cost from failing to test a drunk one.

\[
(1 - \gamma_i) z(\theta) < (1 - z(\theta)) \lambda \gamma_i
\]

We are assuming that the expected cost from failing to test a motorist is internalized by the traffic police department only if a fatal crash occurs. This is a plausible assumption since there is no way to know the true state of the motorist if no test has been made. Besides, because in this setting it is not possible to elude the sobriety checkpoint, only a fatal accident will reveal a failure in the policing decision process.

Using condition (1), we find the minimum probability level, where for lower values a motorist from group \( i \) will not be tested.

\[
\bar{\pi}_i(\theta) = \frac{z(\theta) p(\theta)}{z(\theta) p(\theta) + (1 - z(\theta)) \lambda q(\theta)}.
\] (2)

In contrast, if \( \pi_i \geq \bar{\pi}_i(\theta) \) a test will be administrated with probability one. Condition (2) can be modified to find the optimal signal level \( \tilde{\theta} \), as a function of the prior belief \( \pi_i \):

\[
\tilde{\theta}(\pi_i) = \bar{\pi}_i^{-1}(\theta).
\] (3)

Therefore, all the motorists from group \( i \) whose signal exceed \( \tilde{\theta}(\pi_i) \) will be stopped and
tested. It is useful to point out the properties of this threshold. In fact, because \( z(\theta) \) is a monotone decreasing function of \( \theta \), the threshold is decreasing in \( \pi_i \). Thus, if \( \pi_i = 0 \), then \( \tilde{\theta}(0) = 1 \), so no motorist will be tested. On the other hand, if \( \pi_i = 1 \), then \( \tilde{\theta}(1) = 0 \), which implies that almost every motorist from group \( i \) will be tested at the sobriety checkpoint. Hence, a more optimistic belief imply a higher threshold and a lower probability to be tested.

### 2.3 The Motorist’s Decision

Now we have to describe the motorist decision to engage in an alcohol impaired driving behavior. Given that the prior belief \( \pi_i \) is known by both, traffic police officers and motorists, the probability that a drunk motorist from group \( i \) will be tested is \( 1 - Q_i \left( \tilde{\theta}(\pi_i) \right) \). Hence, a motorist from group \( i \) will drink and drive if the expected benefit from such state exceeds the cost of driving while impaired.

\[
\beta_i \left( \tilde{\theta}(\pi_i) \right) \equiv Q \left( \tilde{\theta}(\pi_i) \right) \left[ V - \lambda H \right] - \left[ 1 - Q \left( \tilde{\theta}(\pi_i) \right) \right] F > e
\]

(4)

Where \( \beta \left( \tilde{\theta}(\pi_i) \right) \) is the expected payoff from drinking and driving. Observe that this expected payoff is increasing in the threshold level. Therefore, \( \beta(1) = V - \lambda H \), and \( \beta(0) = -F \), which implies that if the sobriety checkpoint’s policy is to set the highest possible threshold, every motorist from group \( i \) will decide to drink and drive. Otherwise, if the strategy is to set the lowest possible threshold, then no motorist will engage in illegal behavior. This is true when \( \bar{\pi} \leq V - \lambda H \). By simplicity, we assume \( \bar{\pi} = V - \lambda H \), which means that the highest driving cost for drunk drivers is equal to the expected benefit from drinking and driving.

By condition (4), we can find the proportion of motorists from group \( i \) that will engage in an alcohol impaired driving behavior

\[
\pi_i = G_i \left( \beta \left( \tilde{\theta}(\pi_i) \right) \right).
\]

Therefore, the more pessimistic prior beliefs against motorists from group \( i \), the more lower the threshold, and the less will be the true proportion of motorists that will drink and drive.
3 Fairness Vs. Statistical Discrimination

We define an equilibrium notion using a perfect Bayesian equilibrium approach. Accordingly, this equilibrium will be self-confirming because the proportion of motorists from group $i$ who choose to drink and drive confirm the prior belief regarded by traffic police officers. Conversely, the prior beliefs conditionate the sobriety checkpoint policy and the behavior of motorists in exactly the same rates postulated by the prior beliefs. In other words, the prior beliefs for groups $A$ and $B$ modify the strategies adopted by motorists, and the rates in which motorists from both groups engage in an alcohol impaired driving conduct establishes the sobriety checkpoint policy.

The following definition of equilibrium is proposed:

**Definition.** A Perfect Bayesian Equilibrium is a pair of beliefs $(\pi^*_A, \pi^*_B)$ held by traffic police officers satisfying:

$$\pi^*_i = G_i \left( \beta \left( \tilde{\theta} (\pi^*_i) \right) \right) \quad \text{for } i = \{A, B\} \quad (5)$$

The following proposition establishes the existence and uniqueness of equilibrium.

**Proposition 1.** The Perfect Bayesian Equilibrium exists and is unique.

**Proof.** In order to proof existence, we define the following mapping

$$H (\pi) = \pi_i - G_i \left( \beta \left( \tilde{\theta} (\pi_i) \right) \right) \quad \text{for } i = \{A, B\}$$

Observe that, if $\pi_i = 1$, then $H (1) = 1 - G_i \left( \beta \left( \tilde{\theta} (1) \right) \right) = 1 > 0$. On the other hand, if $\pi_i = 0$, then $H (0) = 0 - G_i \left( \beta \left( \tilde{\theta} (0) \right) \right) = -1 < 0$. Therefore, by a fixed point argument, there exist at least one value $\pi_i^*$ such as $H (\pi_i^*) = 0$, so a perfect Bayesian equilibrium exist. Additionally, because of $\pi_i^* \neq 1$ and $\pi_i^* \neq 0$, the solutions are interior. In order to proof uniqueness, by the application of the chain rule, observe that $H' (\pi_i) = 1 - g \left( \beta \left( \tilde{\theta} (\pi_i) \right) \right) \beta' \left( \tilde{\theta} (\pi_i) \right) \tilde{\theta}' (\pi_i) > 0$, so $H (\pi_i)$ is a monotone increasing function of $\pi_i$. Thus, the perfect Bayesian equilibrium is unique. 

Given the properties of the equilibrium from proposition 1, it is necessary to show how traffic law enforcement would adjust the beliefs $\pi_A$ and $\pi_B$ through the equilibrium path $\pi_{i+1} = G_i \left( \beta \left( \tilde{\theta} (\pi_i) \right) \right)$. To do this, suppose that traffic police officers hold an initial pair of beliefs $(\pi^0_A, \pi^0_B)$ such as $\pi^0_A \neq \pi^0_B$. Assuming that $G_i (c) = G (c)$ for $i = \{A, B\}$, regardless
of how different would be these initial beliefs between groups A and B, in equilibrium, the sobriety checkpoint policy will be to set the same beliefs for both groups. Therefore, the following condition holds:

$$\pi^*_A = G \left( \beta \left( \tilde{\theta} \left( \pi^*_A \right) \right) \right) = G \left( \beta \left( \tilde{\theta} \left( \pi^*_B \right) \right) \right) = \pi^*_B$$

(6)

Namely, condition (6) states that, without any type of stochastic dominance between groups A and B the equilibrium will be fair, in a sense that both groups will be treated equally. Indeed, no matter how large would be the difference between these beliefs for both groups, always they will converge to the same value at equilibrium.

Nonetheless, other types of equilibrium may be possible. In fact, assume that $G_A(c) > G_B(c)$ for all $c$, which implies that at a given cost level $c$ the rate of drunk motorists is greater for group A than for group B. In other words, motorists from group A are more skilled in driving while impaired by alcohol, relative to motorists from group B. Although $\pi^0_A = \pi^0_B$, the existing stochastic dominance on the distribution of the driving cost means that the traffic police force will target motorists from group A more frequently than motorists from group B. Hence, under that situation the following inequality holds:

$$\pi^*_A = G_A \left( \beta \left( \tilde{\theta} \left( \pi^*_A \right) \right) \right) > G_B \left( \beta \left( \tilde{\theta} \left( \pi^*_B \right) \right) \right) = \pi^*_B.$$  

(7)

The policy implication from condition (7) is to stop and search with more intensity motorists from the group with the highest alcohol impaired driving rate. It is important to show that this equilibrium is not fair in a sense that, due to the existing stochastic dominance, group A is treated with more severity than group B. Even in the case of mandatory equal treatment, in equilibrium, traffic police officers will engage in group profiling explained by statistical discrimination.

It is necessary to observe the implicit normative implications from these results. If available data from alcohol impaired violations supports condition (6), a fair equilibrium will be achieved, no matter how biased the beliefs would be. On the other hand, if the data supports condition (7), applying the same treatment for both group is useless and suboptimal, in a sense that an equilibrium with group profiling will be always achieved. Thus, whether a fair policy should be advocated or not depends on the existence of statistical discrimination.
between groups.

4 Concluding Remarks

Traffic police departments might be tempted to engage in group profiling in policing. This may be particularly true for alcohol impaired driving, one of the major causes of death in the United States. However, whether or not this practice should be supported by society depends if there are disparities in the driving skills of motorists while they are impaired across population. In this paper, we develop a theoretical framework that describes the rational decision process made by motorists to drinking alcohol and drive. Moreover, this contribution allow us to find the optimal policy for the sobriety checkpoint operated by the traffic police department. In particular, due to the equilibrium properties, we show that if there is no statistical evidence of differences between groups in the ability of driving while impaired, traffic police officers should follow a fair policy, by stopping and testing motorists without any concerns on group membership. Hence, any observed disproportion in the treatment of the police might be explained by taste-based discrimination. Conversely, if differences in the driving while impaired abilities exists, traffic police officers should stop and test more those motorists from groups with higher observed violation rates. Accordingly, this discriminatory procedure will be attributed to statistical discrimination.

However, it is necessary to recognize some limitations of this approach. Primarily, this model is designed to describe the decision of being impaired by alcohol while driving. Nonetheless, motorists may resort to other kind of strategies to avoid engaging in illegal behavior, such as not to drive, or to use other types of transport where the driving task are delegated. Hence, the implications from this model are conditional to drive and not delegating that task. Additionally, in this setting we are assuming that the only observed heterogeneity is due to differences in the driving skills between groups. Nevertheless, other sources of heterogeneity might be possible. For instance, if we suppose that drunk motorists from group A will exceed the minimum threshold required to be tested, relative to drunk drivers from group B, the results may no longer hold. Additional efforts must be devoted to include these relevant cases in further studies.

References


