Law enforcement and wrongful arrests with endogenously (in)competent officers *

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Abstract

Economic intuition suggests that enforcement errors incentivize crimes, therefore officers must be penalized for committing such errors. Legal scholars argue that if penalties for errors are severe, officers may become timid while policing (thereby encouraging crime). We evaluate these arguments in a model where officers invest in competence. Competence increases the officer's ability to identify criminals. Low sanctions for errors encourages bold policing by officers but may still raise the equilibrium level of crime because it also discourages investments in competence. Granting immunity to only competent officers ("qualified immunity") reduces both errors and crimes when competence is observable.

Keywords: Mistakes in law enforcement, immunity, detection

1 Introduction

Law enforcement agents are not incapable of making enforcement errors; that is, arresting or detaining innocent citizens ("wrongful arrests"). This issue has gained much attention recently, especially in light of several high profile cases involving police misconduct. Many of these cases have occurred in the U.S., but there is ample evidence that wrongful arrests occur routinely in almost every country. Indeed, a recent news article found that only a small fraction of arrests lead to actual convictions, while the majority of the cases brought against those arrested were dropped.[1]

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[1]By some measures, around 47% of those arrested were never convicted (As Arrest Records Rise, Americans Find Consequences Can Last a Lifetime, Wall Street Journal, August 18, 2014). Another measure of

The economic literature on wrongful arrests, or enforcement errors more broadly, has shown that mistakes weaken the deterrent effect of criminal sanctions because they lower the opportunity cost of committing a crime (Png 1986, Posner 1999). Thus, a regulator will want to discourage these errors by penalizing officers for such errors. While such disincentives for errors appear reasonable, it has also been argued that these penalties may themselves weaken enforcement because it could make officers overly cautious in encounters with criminal suspects (for fear of being punished if the individual turns out to be innocent).[2] For example, a police spokesman recently stated that if sanctions are large, then officers may "drive around and put blinders on and not investigate suspicious circumstances."[3] Importantly, this argument is also acknowledged in judicial opinions concerning cases of policing errors. In *Wyatt v. Cole* (504 U.S. 158 [1992]) the U.S. Supreme Court stated that some form of immunity was necessary in order to prevent public servants from being "unduly timid in the performance of their duties." Thus, these arguments suggest that regulators recognize that there is a trade-off because, while strict penalties for errors will reduce errors and strengthen the deterrent effect of criminal sanctions, they could also weaken the intensity of enforcement efforts (or probability of arresting criminals) by making officers more hesitant or timid in encounters with criminal suspects.

The primary goal of this paper is to develop a model of enforcement to study this trade-off between disincentivising wrongful arrests and incentivising proactive enforcement efforts that may sometimes lead to "honest (enforcement) mistakes." We study the effects of this trade-off on crime under three penalty regimes: full immunity from penalties, where officers face little or no penalty for wrongfully arresting an innocent citizen; no immunity, where officers face harsh penalties for wrongful arrests; and third, "qualified immunity" where officers are penalized for a wrongful arrest only if they acted incompetently. The justification behind qualified immunity or conditional penalties is based on the legal idea that officers should not be penalized for honest mistakes especially since they often have to make "split second decisions" in many situations.[4] For example in a case involving a Los Angeles Sherrif's detective who erred in executing a search warrant without probable cause, the court sided with the detective stating that "the officers were not so plainly incompetent so as to be denied qualified immunity" (*Messerschmidt v. Millender* 565 U.S. 704 [2012]).[5] Thus, the

wrongful stops is the hit rate, the rate at which police searches (usually of drivers) have turned up evidence of crime. Persico and Todd (2006) find that the hit rate for men is around 22%.

[2]This is especially true since there is usually no sanction against 'inaction' (see Geest 2012).

[3]Can mandatory insurance solve the problem of policing errors?, Insurance Business in America Magazine, June 28, 2016.

[4]"Standton v. Sims: A new standard for qualified immunity?" Jurist, March 2 2014.

[5]It should be noted that we focus on immunity from penalties imposed on officers by either an internal

presumed rationale behind qualified immunity is that if officials are competent, then they will be very unlikely to apprehend innocent individuals. Hence, by only granting immunity to officers who act competently, fewer innocent victims will be harassed by wrongful arrests and the perverse effects of wrongful arrests can be minimized, while also allowing for the possibility of honest mistakes. We use our model to examine the validity of these legal arguments, and whether qualified immunity mitigates some of the problems that arise from granting officers full immunity.

To study these issues we develop a model in which officers choose to become competent or remain incompetent. Becoming competent is a form of human capital acquisition which entails investing in policing skills.[6] Competent officers are, therefore, able to distinguish between innocent individuals and criminals with a higher probability than incompetent officers. Since a competent officer can more frequently distinguish between criminals and innocents, such officers are unlikely to arrest innocents.[7] Incompetent officers, however, cannot distinguish between these two types, and therefore, may frequently arrest innocent individuals.[8] Innocents who are arrested are, at some cost to themselves, eventually acquitted by the judicial system but criminals are punished. Further, officers who charge or arrest innocent individuals also incur some costs (to their reputation and liability) which depends on the liability regime: no immunity, qualified immunity, or full immunity. Whereas, officers who correctly arrest a criminal obtain a reward.[9]

Within this framework we find that there is indeed a trade-off between pro-active policing and mistakes because there are two opposing effects on officers' behavior. The mechanism of the first effect, which we term the *timidity effect* is as follows. If officers do not enjoy

disciplinary board or a supervisor. However, these sanctions could also be interpreted as the damages paid within the "tort" system - which are often viewed as a form of privatized sanctions.

[6] We use the term effort here very broadly to include investments by the officer in learning, human capital, or skill acquisition relevant to the case or generally. David Simon (former crime reporter for the Baltimore Sun and writer of the TV crime drama "The Wire" notes that: " There is a real skill set to good police work," (Simon 2015) but notes that it requires hard work by police officers to obtain these skills, and DeAngelo and Owens (2015) also make a similar claim.

[7] Although, we use the term arrest, the actions of the police in our model could be also defined as "investigatory detention" (Dix 1985; Dery and Meehan 2015). At least within the U.S., the distinctions between arrests, detention, and apprehension are increasingly difficult to distinguish. Since apprehension is a relatively broad term, for the purposes of this paper we consider an arrest or apprehension as someone being questioned without a warrant, or investigated without being charged. In section 4 we consider an extension that incorporates such "Fourth Amendment" issues.

[8] Dharmapala and Miceli (2012) consider false arrests as situations where officers 'plant evidence' during search and seizures. To avoid confusion we use the term "wrongful arrests" instead.

[9] It is worth noting that the idea that up-front investment in skills that make future decisions more accurate also appears in else where in the literature. Arlen and MacLeod (2005) study a model where doctors invest in skills that make them better at determining the right treatment later. Similarly, in Sandford (2010) experts invest in skills that help them identify what the client needs.

immunity and the penalty for wrongful arrests is sufficiently large, then neither competent nor incompetent officers will choose to make arrests when they are uncertain about whether a citizen is a criminal or innocent (i.e. they will be too "timid"). Since incompetent officers are always uncertain about the citizen's identity (innocent or criminal), they never make arrests, while competent officers make arrests only when they are certain. If the equilibrium fraction of incompetent officers is sufficiently large many criminals will escape detection, because officers are too "timid" to take action under uncertainty, and this inaction weakens deterrence. On the other hand, if officers are fully immune, then they will act "boldly" in the sense that they will make arrests even when they are uncertain about a citizen's identity, which *ceteris paribus* strengthens deterrence. Thus, in contrast to the canonical Beckerian model of enforcement and much of the literature on enforcement errors (e.g. Png 1986), here preventing wrongful arrests (through no immunity) can negatively impact enforcement because officers will choose inaction in situations where they are uncertain about the agent's identity.

The positive impact that immunity can have on raising compliance (the timidity effect identified above) is, however, offset by a *competence effect.* This second effect arises because the immunity regime also affects the officer's endogenous choice of becoming competent. When the damages are large and there is no immunity, then although officers are afraid to make arrests under uncertainty, it gives them a stronger incentive to become competent because competence prevents them from making mistaken arrests. Whereas, when penalties are low (or officer's fully immune), although they are not afraid to make arrests, a large fraction choose to be incompetent, which in turn weakens enforcement (by inducing more wrongful arrests and consequently higher opportunity cost of criminality). Thus, although giving officers immunity does prevent them from being "too timid" when carrying out their duties (which strengthens enforcement), it could also encourage incompetence (which weakens enforcement). Since these two effects offset each other, the effect of enforcement errors on compliance is ambiguous.

Indeed, we show that under some conditions if the competence effect is sufficiently strong, it discourages officers from making human capital investments in competent policing, which reduces deterrence. Thus, rather counter intuitively we find that although granting law enforcement broad powers and immunity can make them "bold" to take action under uncertainty, it may actually raise rather the level of crime because it also simultaneously incentivizes incompetence and less effective policing.

Our paper also offers insight into validity of legal arguments that claim that officials with more complex discretionary responsibilities must enjoy more leniency for mistakes than those with less complex responsibilities (*Harlow v. Fitzgerald* 457 U.S. 800 [1982]). Comparative static results from our model suggest that when there is full immunity, if cases become more complex officers will choose to become less competent and crime will rise. Whereas, when there is no immunity then more complex criminal cases may encourage competence. This suggests (consistent with the legal opinion) that the immunity regime must be tailored to the level of complexity of the case that the official encounters. However, because (as we show) the relationship between deterrence, immunity, and case complexity is not straightforward, incentives must be structured carefully in order to avoid stifling competence and raising crime. To our knowledge our paper is the first to formally study this relationship.

The next set of results we derive examine whether qualified immunity improves outcomes relative to either full or no immunity. Here we find that whether qualified immunity improves outcomes depends on whether the disciplinary agency (henceforth, "court") can determine whether the officer acted competently or not. If the court can observe the officer's choice of becoming competent (and grant immunity only to competent officers who made errors), then qualified immunity does improve outcomes and reduce the arrest of innocent citizens. If there is judicial uncertainty in the sense that courts cannot observe the officer's choice, then the impact of qualified immunity is less clear. Specifically, if courts base their decision to grant immunity purely on their belief that the officer acted competently (conditional on the charges being dropped against a citizen), then even qualified immunity discourages officers from becoming competent, and consequently the level of compliance (and apprehension of innocent citizens) doesn't improve. The kernel of the reasoning is that under uncertainty qualified immunity is no longer granted conditional on an individual officer's competence decision, but is rather conditioned upon the average level of competence. This effectively creates a "lemons problem" that results in all officers choosing to remain incompetent.[10]

Our paper contributes to the literature on enforcement errors, and is closely related to DeAngelo and McCannon (2016). Specifically, in their paper officers can be both skilled and unskilled, which is similar to our notion of competence. Further, similar to our framework skilled officers rarely make enforcement errors. But, because reputation matters to officers, when there are a large fraction of criminals, unskilled officers over-enforce by sanctioning citizens that they believe to be innocent in order to improve their reputation.[11] Thus, in both

[10] This finding is related to Dharmapala and Miceli (2012) who show that if (some) officers are bad and can "plant evidence", a tort liability system for officers need not always be better than other warrant based regimes. In contrast to their model where bad officers willfully plant evidence, in our model officers make mistakes because they are simply incompetent.

[11] Their model is one of bureaucratic "squawks" (Leaver 2009) in which officers try to preserve their

papers unskilled (or incompetent officers) are the source of most of the enforcement errors. However, there are several important differences. First, an important difference between their model and ours is that in their model both the fraction of criminals and the fraction of skilled officers are exogenous. Whereas in our model both these fractions are endogenously determined, and importantly, these fractions are very sensitive to the sanctioning regime. Thus, in contrast to their paper where errors always lower deterrence, in our paper the level of crime may rise or fall depending on the relative strength of the competence and timidity effects. Second, in their model the reputation benefit that the officer receives from being competent or skilled depends on the posterior beliefs of the court. In this sense, their model is formally similar to the special case of our model where competence is unobserved under qualified immunity. However, because skills are endogenously chosen in our model, the results are different. Third, their model focuses on the "behavioral motivation" of officers, whereas ours falls within a more standard enforcement framework. A final important distinction is that their model does not offer any comparative static results regarding how case complexity can affect the endogenous decisions to invest in competence.

Besides this literature on enforcement errors our paper is also related to the broader literature on judicial errors and wrongful convictions (Lando 2006, Polinsky and Shavell 1989, 2007, and Png 1986). In this literature wrongful convictions are the result of limitations in the detection technology so that with some probability there are always type 1 errors. While Png and Polinsky and Shavell find that wrongful convictions always lower deterrence, Lando shows that wrongful convictions matter only if mistakes are about the act as opposed to the identity of the criminal. This occurs because mistakes about the act affect the marginal cost of committing the crime (relative to not committing), whereas mistaken identity does not (since one could be mistaken for committing a crime regardless of whether one has committed a crime or not). However, Garoupa and Rizzolli (2012) point out that every instance of mistaken identity must lead to a "one-for-one" increase in a mistaken acquittal (where a guilty person walks free). This second effect will weaken deterrence, and therefore errors of mistaken identity will almost always weaken deterrence.[12]

In all of these papers the probability of a wrongful arrest is exogenous, whereas in our model wrongful arrests occur mostly due to the incompetence of officers, where competence is chosen endogenously. We believe that endogenizing this decision is important for analyzing conditional punishment schemes such as qualified immunity because as Bendlin (2012)

reputation by minimizing complaints (squawks) by citizens about officer misconduct.

[12]Mungan (2015) shows that punishments for attempts can give rise to wrongful convictions, therefore, reducing the value of punishing attempted crime. We do not consider attempted crime in our framework.

argues,

> "Qualified Immunity" gives government officials breathing room to make reasonable but mistaken judgments, and protects all but the *plainly incompetent* [emphasis added] or those who knowingly violate the law.

Thus, in order to understand the impact of various immunity regimes on enforcement, their effect on competence needs to be understood explicitly.[13] To our knowledge, our paper is the first to explicitly formalize the concept of qualified immunity in a model with endogenous competence.

Following the introduction, in Section 2 we present the formal model, characterize the full set of equilibria, and study the equilibria under full and no-immunity. Section 3 studies the impact of qualified immunity. In Section 4 we discuss several extensions to our model. The fifth section concludes.

2 The model

Consider a model with two types of risk-neutral players: citizens (agents) and law enforcement officers (henceforth, officers). Officers choose whether to exert effort to become competent (1) or not (0), where E denotes the decision to become competent, and $E \in \{0, 1\}$. Competent officers are better at law enforcement in a way that will be defined precisely below. The cost of becoming competent is e' where $e' \sim U[0, 1]$, and where e' may be interpreted as the intrinsic cost of acquiring policing skills. The fraction of competent officers is denoted by θ, which is endogenously determined.

Agents choose whether to be law abiding (innocent) or to commit a crime, where $g' \sim U[0, G]$ is their distribution of gains from committing a crime. An individual agent's choice to commit a crime or remain innocent is private information. However, officers possess a belief that a fraction α of agents are innocent (non-violators). For example, if an officer believes that half the agents are violators, then when confronted with an individual agent he believes that with probability .5 the agent is a criminal. An officer is randomly assigned to or matched with a citizen who might have committed a crime. A competent officer is informed about the citizen's type (criminal or law-abiding) with probability δ, and with probability $(1 - \delta)$ he remains uninformed. This probability may represent the ability with

[13] Things might be different when there is little or full compliance. For example, in a city where everyone speeds, the officer can "sweep the streets" by giving tickets to almost everybody with impunity because the likelihood of "issuing a ticket wrongly" is very low. However, in our model the level of compliance is also endogeneously determined by this action.

which a competent officer can infer or interpret some (exogenous) “signal" emitted by the citizen. It could also capture the complexity of the situation or case, so that when δ is low officers have difficulty assessing citizens' choices. An incompetent officer is always completely uninformed (i.e. can never interpret the signal), and therefore is guided by a (commonly held) belief α about the citizen being innocent.[14] Once the decision to become competent or not is made, officers then choose whether or not to arrest an agent.[15] If the agent is a criminal, the arrest results in penalty f and the officer receives a reward of $r < f$ for arresting a criminal.[16] Note that f may represent the expected fine, if the court system is imperfect and the possibility of a type 2 error is not zero. For an innocent citizen all charges are eventually dropped (or she is eventually acquitted) at some cost $c < f$ to herself, which may represent the legal fees associated with proving her innocence. Further, we assume that $c > 0$ either because typically not all legal fees are compensated (as suggested in Daughety and Reinganum 2013), or because there is some probability that a false arrest will lead to a wrongful conviction.

It is worth emphasizing that there are two situations in which wrongful arrests occur in our model. A wrongful arrest can occur when a competent officer is uninformed (with probability $1-\delta$) or because an incompetent officer chooses to make an arrest.[17] However, regardless of whether the officer is competent or not, an officer who wrongfully arrests an innocent individual is faces an expected penalty d, $d \geq 0$. As we show later, the nature of the immunity regime depends on the value of d. *Lower values of d can be identified with full immunity and high values of d are associated with no-immunity, neither of which are granted conditional upon the officer's choice of E.* In the next section we formalize the concept of qualified immunity which allows for the possibility that immunity is granted only if $E = 1$.

The timing of the game is as follows.

1. Officers realize their cost of acquiring competence (e') and choose whether to become competent or not (using their belief about the fraction of innocents). The individual officers' choices are not observable.

[14] Our assumption that incompetent officers are completely uninformed does not affect any of our results, and is only introduced to simplify our analysis. All our results are valid as long as the competent officers are informed with a higher probability.

[15] While we use the term arrest, it in reality captures a weaker form of detention or allegation.

[16] Here, r need not represent monetary compensation but instead represent promotions or other career benefits for officers who are succeed in apprehending criminals.

[17] Wrongful arrests by incompetent officers has often been described as “harassment" in other regulatory settings (Mishra 2009). For example, a competent consular officer can determine easily who is eligible for a visa but the incompetent "harass" by requiring excessive costly documentation (c) even to those who are eligible. We discuss these broader applications in the conclusion.

2. Agents realize (and privately observe) g' and then choose whether to commit a crime or remain innocent based on their beliefs about the fraction of competent officers (θ) and the model's parameters and immunity regime.

3. An officer is randomly paired with an agent and the officer chooses whether to "arrest" the agent or not.

4. Courts acquit an innocent agent with certainty at cost c to the agent while guilty agents are punished f. Officers receive receive a reward of r for arresting a criminal and incur a penalty d for arresting an innocent.

A few assumptions in the above model are worth assessing. First, our model's results are not sensitive to the assumption that e' and g' are distributed uniformly. The results we present are robust to any distribution function that is increasing in e' and g'. Second, note that because the officers' choice is unobservable, the game is formally equivalent to the officer and citizen moving at the same time. Third, we assume in stage 3 that all agents are paired with officers. However, our model can easily be extended to the case where criminals are more likely to be matched with an officer than an innocent agent. We consider this last issue more carefully in section 4.

2.1 Equilibrium

We solve for the Perfect Bayesian Nash equilibrium of this game for all values of d, therefore, inter alia for both the full and no immunity regimes. Our focus is on the equilibrium levels of competence and compliance. Thus, we identify an equilibrium pair (e^*, g^*) where all officers with e'^* choose to be competent and all citizens with g'^* choose to commit the crime (non-compliance) and their beliefs are mutually consistent.

Two types of pure strategy equilibria are possible. In the *uninformed arrests equilibrium* uninformed officers always make arrests based on their beliefs α, and informed officers make arrests only when they encounter a criminal. In the *informed arrests equilibrium* only informed (hence competent) officers make arrests, and uninformed officers never make arrests. Note that in the uninformed arrest equilibrium since not all agents are criminals some fraction (determined in equilibrium) of these uninformed arrests will lead to "wrongful arrests" (i.e. arrests of innocents). Since both competent and incompetent officers can be uninformed, wrongful arrests will be committed by both types of officers. However, competent officers make such errors at a lower probability than incompetent officers (since, $1-\delta<1$). In addition to these two pure strategies, there exists a mixed strategy equilibrium where uninformed officers make arrests some of the time.

To identify these equilibria, consider the decision of an uninformed officer, who may be competent or incompetent. For a given belief α that the citizen is innocent, an uninformed officer will make an arrest if,

$$\alpha < \frac{r}{r+d}. \tag{1}$$

When condition 1 is satisfied in equilibrium, uninformed officers always make arrests. Therefore, 1 must be satisfied in an uninformed arrests equilibrium, and reverse strict inequality must be satisfied in the informed arrests equilibrium. In the mixed strategy equilibrium 1 is satisfied with a equality.

First, we study the uninformed arrests equilibrium (i.e. assuming 1). An officer chooses to be competent if

$$\alpha\delta 0 - \alpha(1-\delta)d + (1-\alpha)r - e' \geq \alpha(-d) + (1-\alpha)r,$$

Using e to denote the marginal officer, the previous equation simplifies to,

$$e' \leq \delta\alpha d \equiv e. \tag{2}$$

Turning to the citizens, an agent chooses to commit a crime if

$$g' - f \geq (1-\theta\delta)c.$$

Using g to denote the marginal citizen, the previous equation simplifies to,

$$g' \geq f - c(1-\delta\theta) \equiv g. \tag{3}$$

where θ is the probability of meeting a competent officer. Given our distributional assumption, in equilibrium $\theta = e$, where e denotes the marginal officer's effort cost defined in 2.

Let the subscript u denote an uninformed arrests equilibrium and $\epsilon(g)$ the best response function for compliance (given the fraction of criminals). Then from 2

$$\epsilon_u(g) = \delta d\frac{g}{G} \tag{4}$$

Similarly, let φ denote the best response for crime as a function of competence. Then from 3,

$$\varphi_u(e) = f - c + \delta c e. \tag{5}$$

The intersection of 4 and 5 yield the equilibrium pair $(e_u^*,\, g_u^*)$.

We now turn to the informed arrests equilibrium and use the subscript i to identify this equilibrium. Using reasoning analogous to the uninformed arrests equilibrium, we can easily characterize the best responses here. Officers choose to become competent if $(1-\alpha)\,\delta r - e' \geq 0$, which yields

$$\epsilon_i(g) = \delta r(1 - \frac{g}{G}). \tag{6}$$

Similarly, citizens choose to become criminals only if $g' - \delta\theta f \geq 0$, which yields

$$\varphi_i(e) = \delta e f. \tag{7}$$

Finally, in the mixed strategy equilibrium the uninformed officer is indifferent between arresting and not arresting and arrests with probability ρ.

Equations 4, 5, 6, and 7 along with 1 can be used to characterize all the equilibria in our model, which we identify in the following proposition.

Proposition 1 *Depending on the values of r, d, there always exists at least one of the following equilibria.*

- ***Uninformed arrests equilibrium:*** *In an uninformed arrests equilibrium, the levels of competence and compliance are,*

$$e_u^* = \min\{\frac{\delta d(f-c)}{G-\delta^2 cd}, 1\}$$
$$g_u^* = \min\{\frac{G(f-c)}{G-\delta^2 cd}, f-(1-\delta)c\}.$$

- ***Informed arrests equilibrium*** *In an informed arrests equilibrium the levels of competence and compliance are,*

$$e_i^* = \min\{\frac{G\delta r}{G+\delta^2 fr}, 1\}$$
$$g_i^* = \min\{\frac{G\delta^2 fr}{G+\delta^2 fr}, \delta f\}.$$

- ***Mixed strategy equilibrium*** *In a mixed strategy equilibrium, the levels of compliance,* *competence, and the probability of arrest are,*

$$e_m^* = \frac{r}{r+d}\delta d$$
$$g_m^* = \frac{r}{r+d}$$
$$\rho^* = \left[\frac{rG}{r+d} - \theta\delta f\right]\frac{1}{(1-\theta\delta)(f-c)}; \theta = e_m^*$$

Furthermore, there always exists values of r and d for which each of the above equilibria are unique, and where multiple equilibria consisting of both informed and uninformed equilibria can exist.

Proof. Appendix ■

The existence of these equilibrium depend on the values of r and d and is fully characterized in figure 1. In the region where $d < \min\{d_u, d_i\}$ (the diagonal striped region of the graph) immunity is strong, ceteris paribus. Hence, the uninformed arrests equilibrium exists in this parameter space. In the region where $d > \max\{d_i, \min\{d_u, \overline{d}\}\}$ (light gray region) immunity is weak so that only informed arrests occur. This area reflects higher values of d, signifying extremely low immunity. For example, consider $d > d_i$, if either $d > d_u$ or $d > \overline{d}$ or both, then we obtain this region where wrongful arrests do not occur (i.e. only informed arrests take place). Thus, we can identify the uninformed arrests equilibrium with the full (or strong) immunity regime, while the informed arrests equilibrium can be identified with the low (or no) immunity regime. In the former case the timidity effect is weak (but the competence effect strong), while the later case the opposite is true. In addition, there are two other regions to be noted. When $d_i < d_u$, then for $d \in [d_i, min\{d_u, \overline{d}\}]$ both informed and uninformed equilibria co-exist (the multiple equilibria region). Instead, when $d_u < d_i$, then for $d \in [d_u, d_i]$ the only equilibrium is in mixed strategies (this equilibrium exists in the dark gray region of figure 1).

[FIGURE 1 about here.]

Figure 1 also allows us to identify an important characteristic of the uninformed arrests equilibrium. In an uninformed arrests equilibrium with only competent officers, wrongful arrests only occur with probability $1 - \delta$. Nevertheless, these mistakes are in some sense unavoidable because they reflect the limitations that arise perhaps due to the complexity of the case, which can never fully be ruled out. Indeed, these appear to be the kinds of mistakes that judges appear to be willing to allow in order to prevent officers from being too timid. Thus, the key question is whether wrongful arrests occur as a result of incompetence. It is clear that this is feasible when $e_u^* < 1$, which is equivalent to $d < \frac{G}{\delta(f-c+\delta c)} \equiv \underline{d}$. Combining this with the condition $d < d_u$, figure 1 shows that wrongful arrests by informed officers occur when r is high but d is low. Further since $\underline{d} > 0$, such equilibria always exist.

We now compare the various equilibria identified in proposition 1. The qualitative difference between the informed and the uninformed arrests equilibrium can be observed by comparing figure 2 a and b where the two best responses are drawn in the competence-compliance (e, g) plane. In figure 2a, which depicts the uninformed arrests equilibrium, compliance and competence are complementary. When $e = 0$ there is still some compliance because uninformed officers can make arrests. However, the compliance level is very low, because all officers are uninformed and therefore commit many wrongful arrests, which weakens deterrence for reasons identical to Png (1986). However, as competence increases, there are fewer uninformed officers which leads to fewer wrongful arrests thereby improving compliance. Thus, $\varphi_u(e)$ is increasing in e everywhere. For officers, as compliance increases, the incentive for officers to invest effort in becoming competent also increases because officers want to avoid the costs d from wrongful arrests. Hence, $\epsilon_u(g)$ is increasing in compliance.

[Figure 2 a and b here]

These characteristics of the uninformed arrests equilibrium stand out in sharp contrast to the characteristic features of a standard inspection game (e.g. Tsebelis 1989, Mookherejee and Png 1995). In a standard inspection game, when the enforcer's effort is 0 no criminals are caught so the compliance level is 0. In our model compliance is strictly positive even when effort is 0. Further, in the standard inspection game as compliance increases, the incentive to exert effort decreases. Thus compliance and effort are substitutes, whereas in our model they are complementary. Both these results arise because we allow uninformed officers to make arrests, and these uninformed arrests occur in equilibrium when 1 is satisfied. Hence, not surprisingly, in the informed arrests equilibrium (figure 2b) the results are much closer to the standard inspection game, where when competence effort is 0, compliance is 0, and further effort is decreasing in compliance ($\epsilon(g)$ is decreasing in g).

Although, in the uninformed arrests equilibrium there will be more wrongful arrests, yet from the standpoint of compliance it is not always clear which regime yields a lower crime rate. It can be seen from proposition 1 that when $e_u^* = 1$, at this corner solution compliance is $f - (1-\delta)c > \delta f > \frac{G\delta^2 fr}{G+\delta^2 fr}$. Thus, compliance is always higher with the uninformed arrests equilibrium. This is so because when all officers are competent ($e^* = 1$) or competence exogenous, then only the "timidity effect" matters. Thus, encouraging competent officers to act when they are occasionally uninformed (with probability $1-\delta$) strengthens enforcement.

When not all officers are competent ($e^* < 1$) then both the competence and the timidity effects matter. Consequently, because of the tension between these two effects, the level of compliance in the informed arrests equilibrium may be higher or lower than the level in an uninformed arrests equilibrium ($g_u^* \gtrless g_i^*$). That is, when d is small even uninformed arrests discover criminals sometimes which strengthens deterrence, but fewer officers become competent (which weakens deterrence). Whereas when d is large then officers do not act boldly (which weakens deterrence), but because many are competent, deterrence is strengthened. Turning to the mixed strategy equilibrium, note that compliance in this equilibrium is always $r/(r+d)$, hence it can never be higher than g_u^* when $e_u^* = 1$. We summarize these findings in the following proposition.

Proposition 2 *The level of compliance may be higher or lower in the uninformed arrests equilibrium relative to the informed arrests or the mixed strategy equilibrium. Specifically, if $e_u^* = 1$, then the level of compliance in an uninformed arrests equilibrium is always higher than the level of compliance in an informed arrests equilibrium. If $e_u^* < 1$, then the level of compliance in an uninformed arrests equilibrium may be higher or lower than the level of compliance in the informed arrests equilibrium.*

Proposition 2 points to a critical difference between our paper and DeAngelo and McCannon (2016). In their paper, the reputation costs are analogous to our sanction d. When these costs are high then in their paper (and ours) officers become more "cautious" and, therefore, are discouraged from enforcing the law. In their paper this causes deterrence to weaken, which in turn increases crime. In contrast, in our model *because competence is endogenous*, although a high d makes officers more timid (which weakens enforcement), this effect is offset by the competence effect which strengthens deterrence. When the competence effect is stronger, crime rates may actually fall. Thus, our model shows that their results may not apply when competence is endogenous.

Next we study the comparative statics at an interior equilibrium with respect to key policy parameters in our model.

Proposition 3

- *In an uninformed arrests (full immunity) equilibrium e_u^* and $g_u^*$are increasing d, f , and δ, decreasing in c, and unaffected by r.*

- *In an informed arrests (no immunity) equilibrium, e_i^* is increasing in r, decreasing in f, ambiguous in δ, and unaffected by d and c, while g_i^* is increasing in r, f,and δ, and unaffected by d and c.*

- *In a mixed strategy equilibrium, compliance is always increasing in r, decreasing in d, and unaffected by f or δ. Competence is always increasing in d, δ, and r and unaffected by f.*

Proof. Follows from the derivatives of e^*, g^* identified in proposition 1. ■

It is insightful to contrast these comparative static results with those in a standard inspection game where larger fines can reduce inspection effort (Tsebelis 1989, Mookherjee and Png 1995). Here, in an uninformed arrests equilibrium compliance and effort are complements. Therefore, larger fines increase equilibrium effort (because it encourages compliance which in turn encourages effort). Whereas not surprisingly in the informed arrests equilibrium (where effort and compliance are substitutes) the results are closer to the standard inspection game. However, regarding compliance higher fines improve compliance (in the informed and uninformed equilibria) in line with the Beckerian enforcement model (Becker 1968).

Second, in an uninformed arrests equilibrium, compliance and competence are increasing in δ. One interpretation of δ is that it reflects the complexity of the cases which officials encounter (low δ implying more complex case), so that when δ approaches 1 a competent officer can identify a criminal easily, whereas with complicated cases he cannot identify the criminal with such ease. Our analysis suggests that when there is full immunity, enforcement institutions that face difficult cases (i.e. on average encounter cases with a low δ) will have fewer competent officers than those institutions that encounter cases with a high δ. For example, our model predicts that an agency dedicated to illegal arms dealing (presumably facing on average low δ cases) will have fewer competent officers than those departments that deal with relatively easier cases. Thus, to encourage competence, in these cases a regulator may want to reduce rather than increase the level of immunity (and raise the corresponding penalty d). Importantly, in this equilibrium competence and compliance are not affected by r. Thus, large rewards for solving these complex cases will not be able offset these effects. In contrast in the no-immunity regime, competence may decrease with δ, so that institutions that encounter more complex cases will have more competent officers than those that don't. We discuss the implications of δ more extensively in the conclusion.

3 Qualified immunity

We now turn our attention to studying qualified immunity. Under qualified immunity officers are granted immunity as long as they acted competently. For example, police officers enjoy certain degree of immunity unless there is evidence of gross incompetence (Bendlin 2013).

In this section we consider the impact of qualified immunity on competence and compliance. We show that in some cases qualified immunity can reduce the impact of the timidity effect without reducing competence.

3.1 Judicial certainty

We begin our analysis of this policy by assuming that the courts or the judicial system can perfectly observe whether an officer is competent. Thus, within the context of our model, if $E = 1$, the officer is not penalized, therefore, 1 can be rewritten as,

$$\alpha \leq \frac{r}{r + (1 - E)d} \tag{8}$$

Note that under qualified immunity a competent officer always arrests for any value of α, whereas an incompetent officer arrests only when $\alpha d < (1 - \alpha)r$. Thus, under this immunity regime it is possible to incentivize a competent officer to make an arrest under uncertainty, but disincentivize an incompetent officer doing so. Using this insight, it follows that an officer will choose $E = 1$ if and only if

$$e' \leq \min\{\alpha d, (1 - \alpha)r\}. \tag{9}$$

Like before, the nature of the equilibrium depends on the value of d and r.[18] However, unlike the analysis of the previous section, the competent officer always makes an arrest when uninformed. Additionally, when d is sufficiently small ($\alpha d < (1 - \alpha)r$), incompetent officers are also willing to make arrests. Thus, this equilibrium is similar to the uninformed arrests equilibrium of proposition 1. When d is large ($\alpha d > (1-\alpha)r$), only competent officers make uninformed arrests (with probability $1 - \delta$) and incompetent officers do not make any arrests. This is somewhat different from the earlier informed arrests equilibrium in the sense that now competent officers make arrests even when they are uninformed. In this second type of equilibrium outcome, qualified immunity allows competent officers to make arrests when uninformed, but now incompetent officers never make arrests. Thus, while competent officers are highly effective, incompetent officers no longer contribute towards deterrence. We consider each of these cases in turn below.

Case 1:Uninformed arrest equilibrium. First, consider the equilibrium outcome where both competent and incompetent officers make wrongful arrests. Using 8 it is easy to verify that the equilibrium levels of competence and compliance are given by,

[18]It is possible to offer a characterization of all the equilibria, similar to the one in proposition 1. But, here we focus on the two pure strategy equilibrium outcomes.

$$e^*_{u(QI)} = \min\{\frac{d(f-c)}{G-\delta cd}, 1\} \quad (10)$$

$$g^*_{u(QI)} = \min\{\frac{G(f-c)}{G-\delta cd}), f-(1-\delta)c\} \quad (11)$$

Observe that $e^*_{u(QI)} \geq e^*_u$ and $g^*_{u(QI)} \geq g^*_u$ implying that the levels of competence and compliance under qualified immunity are higher than the corresponding levels in the uninformed arrests equilibrium as given in proposition 1. Because only incompetent officers are punished for making wrongful arrests, qualified immunity incentivizes competence. Thus, even though qualified immunity does not completely eliminate harassment (i.e. wrongful arrests by incompetent officers), it still reduces the frequency of wrongful arrests (relative to the wrongful arrests equilibrium of proposition 1) because the fraction of competent officers is higher.

Case 2: Competent officer's arrest equilibrium. Next, consider the case where an incompetent officer does not make an arrest (because d is high). This case is similar to the informed arrests equilibrium discussed earlier, except here only the competent officer always arrests. Innocent citizens are arrested to the extent that technology (or case complexity) does not allow competent officers to be fully informed (with probability $(1-\delta)$). The equilibrium levels of competence and compliance are given by,

$$e^*_{i(QI)} = \min\{\frac{rG}{G+r[f-(1-\delta)c]}, 1\} \quad (12)$$

$$g^*_{i(QI)} = \min\{\frac{rG[f-(1-\delta)c]}{G+r[f-(1-\delta)c]}, f-(1-\delta)c\}$$

One can show that $g^*_{i(QI)} \geq g^*_i$, implying higher compliance compared to the informed arrest equilibrium in proposition 1. However, a similar claim cannot be made regarding the competence levels. This is evident in the two figures 3a and 3b. It is straightforward to observe that compliance rises in both cases, but that the level of competence may not rise in Case 2. In Case 1 the incentives for the citizens are identical to the wrongful arrest equilibrium in proposition 1, but the incentive for competence is now stronger because of qualified immunity. Thus both compliance and competence rise in equilibrium (relative to the case without qualified immunity). In Case 2 only competent officers make wrongful arrests and incompetent officers do not make any arrests. Thus, deterrence is stronger relative to the informed arrests equilibrium (of section 2) because now uninformed competent officers make arrests. However, the effect on competence is ambiguous because although qualified immunity strengthens the incentives for competence there is also more compliance, which weakens the incentives for competence.

[**Figures 3a and 3b about here.**]

Using the equilibrium values of compliance and competence, we now state the following result.

Proposition 4 *Consider the uninformed arrest and informed arrest equilibria in proposition 1. For any given set of parameters, compliance is always higher but competence may be lower in a regime with Qualified Immunity. Further, compliance is always increasing in δ but competence may be increasing or decreasing in δ.*

Proof. When $(1-\alpha)r \leq \alpha d$, then

$$e^*_{u(QI)} = \frac{d(f-c)}{g-\delta cd} > \frac{\delta d(f-c)}{G-\delta^2 cd} = e^*_u, \text{ and } g^*_{u(QI)} = \frac{G(f-c)}{G-\delta cd} > \frac{G(f-c)}{G-\delta^2 cd} = g^*_u,$$

because $\delta < 1$.

When $(1-\alpha)r > \alpha d$, then

$$g^*_{i(QI)} - g^*_i = f(1+\delta) - c > 0 \text{ and } g^*_{i(QI)} - g^*_i = G - r\delta(f-c) > / < 0.$$

The comparative statics follow directly from the derivatives of the equilibrium values with respect to δ. ■

Further, it follows from the equilibrium values of $g^*_{i(QI)}$ and $e^*_{i(QI)}$ that compliance is always increasing in δ, but competence is increasing in δ in Case 1 but it is decreasing in δ in Case 2. It is interesting to note that an increase in δ can lower competence with qualified immunity. This arises because an increase in δ reduces enforcement errors which makes compliance more attractive. This in turn makes competence less attractive since there are fewer criminals and also because mistakes are not punished. We discuss the implications of this result more extensively in the conclusion.

3.2 Judicial uncertainty

The previous section showed that qualified immunity allows the legal system to eliminate the timidity effect only for competent officers. This effectively created a new equilibrium (case 2) where the competent always arrest (regardless of whether they are informed), and the incompetent never make arrests. It remains to be seen whether this rather desirable equilibrium can be sustained when the judge possesses some uncertainty regarding the officers type.

To formalize this notion assume that the court observes E with probability λ and with probability $(1-\lambda)$ it does not observe E. When the court does not observe E it must formulate posterior beliefs about the officer's competence based its priors. Let μ be the posterior probability that the officer who arrested the citizen is competent $(E=1)$. Clearly, μ must depend on the reporting strategies of competent as well as incompetent officers and the prior θ. Therefore, consider the beliefs of the court in case 1 where both officers follow identical strategies.[19] In this case the beliefs are given by,

$$\mu = \begin{cases} E \text{ with probability } \lambda \\ \frac{\theta(1-\delta)}{\theta(1-\delta)+(1-\theta)} \text{ with probability } (1-\lambda) \end{cases}$$

from which it follows that $\mu^{/}(\theta) > 0, \mu \leq 1$ when the court does not receive a signal. By contrast, if the competent officer always arrests and the incompetent officer does not (as in case 2), then the only errors come from competent officers, hence when E is not observed $\mu = 1$ (when E is observed $\mu = E$).

Using this framework we characterize qualified immunity as a standard μ^* such that immunity is granted only if $\mu \geq \mu^*$. We now state the following proposition which shows that qualified immunity is effective only if the court is sufficiently informed.[20]

Proposition 5 *There exists a $\overline{\lambda} < 1$ and a $\underline{\lambda} < \overline{\lambda}$ such that qualified immunity allows competent officers to make arrests (and strengthens deterrence) if $\lambda > \overline{\lambda}$. If $\lambda < \underline{\lambda}$, then qualified immunity is ineffective in the sense that it leads to the same compliance level as the informed arrests equilibrium without qualified immunity g_i^*.*

Proof. Consider the equilibrium (similar to case 2) where only the competent make uninformed arrests. When E is not observed, which happens with probability $(1-\lambda)$ the court believes that $\mu = 1$. So the court grants immunity whenever it does not observe the officer's type (for any μ^*). This can be sustained as an equilibrium if incompetent's expected payoff from arrest is $(1-\alpha)r - \alpha[\lambda d + (1-\lambda)0] < 0$. Equivalently, the incompetent officer will not arrest if and only if $\lambda \alpha d \geq (1-\alpha)r$. Solving for the equilibrium value of α it is

[19] Note that the competent officer does not arrest an innocent citizen when informed. When we say identical strategies we are comparing competent but uninformed and incompetent officers.

[20] In a different context, Geest (2012) also shows that uncertainty about the 'standards' of liability leads to inefficient levels of care.

straightforward to check that there exists an equilibrium identical to the competent's arrest equilibrium (as given in 12)

$$\lambda > \frac{G}{d[f-(1-\delta)c]} \equiv \overline{\lambda} \tag{13}$$

Now,suppose the court does not grant immunity whenever E is not observed. Here even the competent officer will not make any uninformed arrests if and only if $(1-\lambda)d\alpha > (1-\alpha)r$. If this is satisfied, the incompetent officer will also not make any arrests as $\alpha d > (1-\lambda)\alpha d > (1-\alpha)r$. This means that in equilibrium no innocent citizens will be arrested and we can specify the out-of-equilibrium belief by the court whenever a citizen is found innocent to be $\mu = 0$. In this equilibrium, $\alpha^* = \frac{g_i^*}{G}$ the compliance level of the informed arrests equilibrium in proposition 1. From this it follows that when $\lambda \leq 1 - \frac{G}{d\delta^2 f} \equiv$, the competent will make no uninformed arrests. ■

Finally, we consider the uninformed arrests equilibrium where both types of officers make arrests. Like before, the competent officer gets immunity with a positive probability and incentive for competence will depend on the extent of this. However, it will be always be lower than the certainty case and accordingly, both compliance and competence will be lower relative to the judicial certainty case. When there is full judicial uncertainty ($\lambda = 0$) an officer's decision to become competent and subsequently arrest depends on the aggregate level of competence (in addition to δ). It is easy to observe that for any μ^*, there exists a corresponding θ^* so that for any $\theta \geq \theta^*$, the arrest condition 8 is always satisfied and there is no incentive to choose $E = 1$. In other words, if $\mu \geq \mu^*$ then everyone receives immunity, but in this case there is no incentive for anyone to be competent, therefore, $\mu = \theta = 0$ and violates the requirement that $\mu \geq \mu^*$. In this case the crime level is the highest possible level at $(f - c)$.

It should be noted that we do not characterize the entire set of equilibria under qualified immunity. Our objective here has been simply to argue that to the extent court's decision to grant immunity is based on subjective beliefs about an officer's competence, qualified immunity does not work.[21] Both competent and incompetent officers will benefit from this immunity and consequently, there will be no incentive for competence. Thus, uncertainty introduces a lemons problem, which results in all officers being of "low quality" in the sense of being incompetent. It is worth noting here that in DeAngelo and McCannon (2016) skill levels (i.e. competence) are exogenous, hence there is no lemons effect in their model. Again, this emphasizes the importance of endogenous competence.

[21] When $\lambda \in (\underline{\lambda}, \overline{\lambda})$

4 Discussion and extensions

The results from the preceding sections suggest that the relationship between various immunity regimes and crime is not obvious once competence choices are recognized. We now examine whether these rather surprising results are robust to alternative assumptions, and consider extensions to this framework.

4.1 Enforcement effort

In our model the role of effort is slightly different from the role it occupies in most models of enforcement (e.g. Mookherjee and Png 1995) where the probability of detecting a criminal is continuous and increasing in enforcement effort e, where for simplicity e is the cost of effort. Our model can be written within this framework. Specifically, let $m(e)$ be the probability of detecting a criminal (for effort level e). Then the officer chooses e to maximize $r - g(1-m(e))d - e$. Clearly, the optimal e is now increasing in the fraction of compliant agents. Thus, the complementarity between effort and compliance remains, and the results that follow are identical to our model. Nevertheless, the legal scholarship implicitly considers competence as a binary choice (i.e. a judge rules whether an officer acted "competently" or "incompetently"). Thus, to better relate to this literature, we choose to model effort in this way.

4.2 Criminals versus innocents

We also assume that the probability that an officer is matched with a citizen is 1. However, an officer may be more likely to encounter a criminal rather than an innocent, perhaps because criminals are closer to the crime scene. To recognize this possibility, let $\overline{\gamma}$ ($> \underline{\gamma}$) be the probability that a criminal (innocent) encounters an officer. Then when uninformed arrests can occur, an agent chooses to be a criminal if

$$g' \geq \overline{\gamma}f - \underline{\gamma}c(1-\delta\theta) \text{ or, } \varphi(e) = \overline{\gamma}f - \underline{\gamma}c(1-\delta\theta)$$

Likewise, an officer chooses to be competent if

$$e \leq \underline{\gamma}\alpha\delta d \text{ or, } e^*(.) = \underline{\gamma}\alpha\delta d.$$

Comparing these with (2) and (3), it is clear that all the essential features of our model are preserved.[22] And, interestingly, now in an uninformed arrests equilibrium if $\underline{\gamma} = 0$, then

[22] Condition 1 is now $\alpha \leq \frac{r\overline{\gamma}}{r\overline{\gamma}+\underline{\gamma}d}$.

there is no incentive for the officer to become competent, but compliance is high because criminals are always arrested (when they encounter the police).[23]

4.3 The role of warrants and "search and seizure" law

The model in section 2 and 3 overlooks the role of search and seizure law in limiting the incidence of enforcement errors. In light of this, in this section we compare the effectiveness of our policy (of internal sanctions) with the effectiveness of using "search and seizure" law to minimize enforcement errors and crime.[24]

Warrants are the primary tool that search and seizure law employs to minimize Fourth Amendment violations. The model of section 4.2 can be re-interpreted to account for warrants. Specifically, let $\overline{\gamma}$ ($\underline{\gamma}$) be re-interpreted as the probability that a judge grants a warrant to a criminal (innocent). Since a judge is more likely to grant a warrant for a criminal rather than for an innocent citizen, it implies that $\overline{\gamma} > \underline{\gamma} \geq 0$ (assuming that these probabilities are exogenous). In this case, a criminal is fined f with probability $\overline{\gamma}$ while an innocent citizen incurs costs c with probability $\underline{\gamma}(1-\delta\theta)$. Similarly, an officer is competent only if $e \geq \underline{\gamma}\alpha\delta d$. Clearly, this results in conditions that identical to those derived in section 4.2, therefore, the key results of our model are still preserved.

However, a straightforward calculation of this equilibrium offers an interesting finding: the presence of warrants does not necessarily increase the level of competence. Intuitively, this result arises because the judge granting the warrant now shares some of the risk of the enforcement error.[25] Consequently, the incentive to become competent is weaker. Because competence may be lower, the enforcement errors and crime rates may rise. Thus, our model shows that warrants on their own are not sufficient to reduce enforcement errors when competence is endogenous.

Besides warrants, the exclusionary principle is another aspect of search and seizure law that can discourage wrongful arrests. Under the exclusionary principle judges can exclude evidence if they believe that the evidence obtained by the police violated the suspect's

[23] A similar outcome arises when officers target repeat offenders with a higher probability. Our model could be extended to study this issue as in Miceli (2013) and McCannon (2009).

[24] Additionally many legal decisions, especially concerning qualified immunity, revolve around officers executing search warrants that were later determined to be invalid. For example, in Messerschmidt v. Millender (2012) a boyfriend threatened to kill his (ex)girlfriend and fired at her with his shotgun. Officers applied for a warrant to search the house of the acquaintance (Millender) he was living with. The search did not find the particular weapon, but it did find other weapons and evidence of gang activity by Millender and other household members. Under the doctrine of qualified immunity the Supreme Court granted the officers immunity concluding that an officer would have reasonably concluded that the boyfriend could have used a different weapon to harm Kelly and hence seizing all firearms from the house was reasonable.

[25] See Dharmapala and Miceli (2012) for a similar argument.

constitutional rights. Mialon and Mialon (2008) develop a model to evaluate the effectiveness of the exclusionary principle. In contrast to much of the economic literature in this area, in their paper (as in ours) crime is endogenous. Because crime is endogenous they find that applying the exclusionary principle more strictly can raise crime rates. Intuitively, if judges apply the exclusionary principal "strictly," it will reduce officers' incentives to investigate because they know that it will lead to fewer convictions. However, fewer convictions will result in more crime, which increases the officers' incentives to investigate. If the first effect is stronger than the second, crime will rise when the exclusionary principle is applied more strictly.

Increasing d in our model could be viewed as similar to applying the exclusionary principle strictly. Indeed similar to their findings, in our model a larger d results in the timidity effect (which reduces policing) and increases the incentives for crime. But, the higher crime rate encourages policing, which reduces crime. Thus, with both internal sanctions and the exclusionary principle there are two offsetting effects from strengthening the respective policy. However, in contrast to the exclusionary principle, our paper shows that raising d always lowers crime and reduces wrongful arrests. This distinction arises because there are two critical differences between these two policies and their effects on crime and wrongful arrests.

First, the exclusionary principle applies even to criminals in the sense that even if a judge believes that a suspect is guilty, she may still decide that the evidence obtained violated that suspect's Fourth Amendment rights. In contrast, in our model the penalty is imposed on officers only when they have violated an innocent citizens' rights. This distinction is especially important because judges are required to defend a suspect's constitutional rights even if that individual is believed to be guilty. Whereas a police department can, in principle, choose to only penalize officers when they have violated an innocent citizen's rights. Thus, internal sanctions may offer more flexibility than the incentives offered under the exclusionary principle.

Second, although the offsetting "timidity effect" arises under both the exclusionary principal and disciplinary sanctions, because officers' competence choices are endogenous in our model, we identify another effect: *the competence effect*. This third effect is not explored in the existing search and seizure literature.[26]

[26] There are additional differences between Mialon and Mialon (2008) and our model. Specifically, in our model crime can be lower or higher in an equilibrium in which the police always search everyone when compared to a regime in which the police only search when they have probable cause. Whereas in Mialon and Mialon (2008) crime is always higher in an equilibrium where the police always search everyone (when compared to the case where they only search when they have probable cause). This distinction arises

Consequently, because of these differences, raising d unambiguously lowers crime and reduces enforcement errors whereas the two main policies under search and seizure law (warrants and the exclusionary principle) appear to have an ambiguous effect on crime *once competence is endogenized.*

4.4 Victim compensation

In addition to warrants and the exclusionary principle, it has also been argued that compensating victims (of false arrests) can minimize enforcement errors. This compensation is usually implemented through either the tort system, or "exoneree compensation," where the government compensates victims for errors. We now briefly discuss our findings within the context of these two compensation policies.

Our model can be interpreted through the lens of tort law so that a large d is equivalent to a strict liability rule (no immunity case), the case with $d = 0$ no liability (full immunity), and qualified immunity equivalent to negligence. In this framework meeting appropriate standards of care constitutes the officersâ€■ choice to become competent. From this perspective our model can be viewed as extending the literature on torts to the context of law enforcement. In doing so, the probability of harm is endogeneously derived by accounting for the strategic interaction between the citizenâ€■s decision to commit a crime and the officersâ€■ competence decisions. Whereas in much of the liability literature, this is reduced to a single simple probability. As we show, endogeneously deriving this probability allows offers useful insight into how equilibrium competence, crime, and enforcement errors are affected by changes in the liability regime.

When viewed through the lens of tort law our findings suggest that negligence (i.e. qualified immunity) is not always superior to strict liability (see proposition 4). Specifically, under judicial certainty we show that the level of crime under qualified immunity (with judicial certainty) is lower, but competence may not be higher. Consequently, enforcement errors may be higher under negligence. Whereas under judicial uncertainty, this result no longer holds since we show that compliance may be higher or lower than the case with strict liability.

These findings, however, point to a key distinction between the negligence literature (with

because Mialon and Mialon assume that criminals whose 4th amendment rights are violated are never punished. Whereas in our model criminals who are investigated are punished (even if the investigation may have violated their rights). Because of this â€œdragnetâ€Ì affect in our model crime can be lower when the police search everyone (in contrast to their model). We believe that this difference is noteworthy since this assumption of Mialon and Mialon has been criticized elsewhere in the literature as being unrealistic (Kerr 2016).

a unilateral standard of care) and the issues studied in our paper. In general, the goal of liability law is to achieve the socially efficient standard of care; that is, the level of care that minimizes the sum of the cost of care and the expected harm. In contrast, the goal here is to prevent crime while minimizing the expected harm from errors, where both the crime rates and the rate of errors are related in equilibrium.[27] Hence, the objectives here are more complex. In this regard, our findings show that while errors may be lower crime rates may be higher under some regimes, therefore, balancing these two objectives may be challenging. Thus, while the results here are similar to those discussed in the literature on torts, our findings suggest that more research is necessary to understand these tort law within the context of law enforcement, especially when the probability of harm is determined by the equilibrium decisions of criminals and law enforcers.

A related form of victim compensation is exoneree compensation. Klick and Mungan (2016) show that exoneree compensation can be used to reduce the perverse effects of wrongful convictions. Further, they show that citizens who are exonerated are compensated appropriately they will reject plea bargains more often. Thus, fewer false arrests and convictions will occur.

While exoneree compensation can reduce errors (ex-post), the mechanism we propose here is an attempt to alter the ex-ante incentives of officers to become competent, which in turn reduces errors. Specifically, we show that disciplinary action can be used to encourage officersâ€■ decisions to become competent which can prevent wrongful arrests from occurring in the first place. Arguably, encouraging competence is important because it is a human capital investment that affects all of the officerâ€■s subsequent interactions with citizens. In contrast, exoneree payments do not create incentives for officers to become competent (and prevent wrongful arrests ex-ante). Instead, such policies usually transfer the risk of making mistakes away from the officer and towards the taxpayer (see Kerr 2016 for evidence in support of this argument) - which may reduce the incentives for competence. Further, since exoneree payments are made on a per case basis the long term costs could be considerable. Thus, the long term welfare benefits of disciplinary policies could be considerably higher than exoneree compensation. In light of this, our model suggests that there may be a unique value to the disciplinary policies we study, especially from dynamic welfare perspective. We leave it to future work to study this issue more closely.

[27] The cost of taking more care to avoid enforcement errors could also include the higher crime that results from more careful policing. Our framework recognizes that these costs and the expected harm will be related through the equilibrium behavior of both players.

4.5 Bribery

Finally, in other models (e.g. Polinksy and Shavell 2001) a form of wrongful arrests occur when officers frame innocent citizens for crimes they did not commit unless they are paid a bribe (extortion). We study an extension (not reported here) with both bribery and extortion and find that these practices discourage investments in competence, which in turn makes wrongful arrests more likely to occur in equilibrium. Hence, although in other contexts bribery has been shown to encourage enforcement effort (Mendez 2014, Mookherjee and Png 1995) our findings suggest that it may not encourage competence. Additionally, our results also imply that because corruption discourages competence, when officers are corruptible they must be granted less rather than more immunity. This result is particularly interesting because the link between competence and corruption has been identified in other contexts in the literature. For example, Gambetta's (2009) empirical study finds that corrupt bureaucrats often choose to be incompetent at their work in order to prove to criminals that they "lack better alternatives", and therefore will not renege on their corrupt transactions. We leave it to future work to study the relationship between competence and corruption more carefully.

5 Conclusion

Many legal jurisdictions give law enforcement officers considerable immunity from being penalized for wrongful arrests or wrongful detentions of innocent individuals. Support for these immunity policies largely stems from view that it prevents officials from being timid and enhances their ability to detect and arrest criminals or other offenders. However, the results of our model suggest that such policies can have perverse incentives due to the competence effect. Specifically, by reducing the penalty for arresting innocent individuals, full immunity gives officers weak incentives to invest in costly measures that make them more capable of distinguishing criminals from innocents. Thus, instead of decreasing the level of crime, such policies may increase the level of crime by reducing the incentives for officers to invest in human capital that makes them better enforcers. Consequently, decreasing the level of immunity may reduce crime even though it makes more officers more "timid" to take action when they are uninformed about the agent's choices.

Although there is no econometric evidence for this effect, there is some anecdotal evidence that not punishing officers for false arrests can lower competence even though it deters (some) crime. For example, David Simon (the former Baltimore Sun crime reporter), notes that in order to reduce crime Baltimore police began to "sweep the streets" by placing many innocent individuals in jail (Simon 2015). To prevent the police department from being sued for this practice, he notes that "the [police] actually had police supervisors stationed with printed forms at the city jail that said, ...you can go home now if you sign away any liability the city has for wrongful arrest, or you can not sign the form and spend the weekend in jail until you see a court commissioner. And,.. thousands of people signed that form." He argues that while such a practice may have reduced crime, it also allowed officers to avoid becoming competent at identifying criminals.

To disentangle the timidity and the competence effect, we consider whether qualified immunity can mitigate some of these perverse effects of granting full immunity. We find that when the judicial authorities can observe the officer's competence decision, then qualified immunity does raise compliance, reduce harassment and wrongful arrests, and improve the competence of officers. However, when there is judicial uncertainty regarding the officer's competence choice, then qualified immunity may actually lower the overall level of competence and increase harassment and wrongful arrests. We believe that this result is especially important in light of U.S. Court rulings that have concluded that as long as the officers are acting "competently" they are immune from being sued for apprehending an innocent individual. Our model suggests qualified immunity will resolve this tension only when judicial authorities have perfect information regarding the officer's competence choice.

Second, we find that there is an intricate relationship between case complexity and an immunity regime. When there is full immunity, then officers become less competent when they encounter more complex cases (low δ). Further, since rewards r does not affect competence in a full immunity regime, "high powered" incentives for officers who encounter complex cases cannot be easily used to correct this problem (See proposition 3). Whereas, without immunity competence levels may rise with more complex cases. This result is especially interesting in light of Justice Powell (*Harlow v. Fitzgerald* 457 U.S. 800 [1982]), who writing for the court stated that

> that high officials require greater protection than those with less complex discretionary responsibilities.

Thus, according to his reasoning more complex cases require more rather than less immunity. Similarly, many counter terrorism laws that presumably apply to very complex cases, give enforcement officials broad powers of immunity to question and detain suspects.[28] Our findings suggest that these laws can have a perverse affect on the overall competence levels

[28] It is possible that terrorism cases are actually easy "high δ", in which case this would not apply.

in agencies designated to tackle these cases. Indeed, in some cases precisely the opposite policy (to the one suggested by Justice Powell) may need to be adopted in agencies that suddenly encounter more complex (low δ) crimes in order to encourage competence and improve overall compliance.

If instead δ is interpreted more narrowly as the technology available to reduce type 1 errors, then our model offers insight into the effect of improving the detection technology. We show that the effect of raising δ depends upon the immunity regime, so that in some cases these improvements may "crowd-in" or "crowd out" competence and even weaken deterrence. Specifically, under full immunity the joint probability of wrongful arrests $(1 - e_u^*\delta)$ decreases with an increase in δ, and compliance rises unambiguously with δ. Whereas under no immunity the joint probability of a wrongful arrest $e_i^*(1 - \delta)$ may increase or decrease with δ even though compliance again rises unambiguously with δ. Indeed, in this case even if raising δ lowers the probability with which innocents are arrested, the joint probability of letting a criminal "walk free", $e_i^*(1 - \delta) + (1 - e_i^*)$ may actually rise. Thus, under full or no immunity, technological improvements may not have the desired effect of reducing either type 1 or type 2 errors in policing, even if it does reduce crime.

In contrast to both these regimes, under qualified immunity (with judicial certainty) and with large penalties for incompetent officers the probability of a wrongful arrest $e_{i(QI)}^*(1-\delta)$ always falls with technological improvements. Thus, under qualified immunity technological improvements reduce wrongful arrests and raise compliance, thereby, allowing agencies to reduce errors and raise compliance simultaneously. Taken together, these results show that efforts to reduce type 1 errors through improved technology may not always have the desired effect and depend on the immunity regime adopted by the agency. Furthermore, it suggests that evaluating the success of technological improvements may be quite challenging empirically, since such improvements may be offset by competence choices, which are in turn influenced by the immunity regime in place.

We conclude by discussing some possibilities for future work regarding immunity that this paper raises. First, in our model under qualified immunity with judicial uncertainty, the judge's belief about an officer's incompetence only depends on the current case. In principle a judge may use an officer's reputation (from past cases) to determine whether the officer acted competent in the current case. Our static model does not allow for such belief formation. However, it would be insightful to examine the results of this issue within the context of a repeated game that explicitly modeled officer reputation. Second, we do not examine which of these regimes maximize welfare, but leave this important question as a possible avenue for future research. Third, in our model there is only one level of crime. In a simple extension (available upon request) we show that with three levels of crime (no crime, small and large crime), if there are penalties for wrongful arrests, then officers will "play it safe" by always under reporting the crime level. This occurs because those who have committed a large crime will not challenge the officer (since their sanctions are lower than what their crime demands), while criminals who commit a small crime are appropriately sanctioned. Thus, in general multiple crime levels result in under-enforcement in this context. However, it remains to be seen whether the competence and timidity effects identified here differ in a more general model of marginal deterrence with multiple levels of crime.[29] Finally, recent legal debates have examined whether informers (or private citizens who cooperate with the police or provide them with "crime tips") should also be given immunity along with long enforcement officials (Volokh 2014). Indeed, some legal scholars have argued that granting immunity to informants in such cases could encourage "sloppy policing" where officers are "tempted to rely on easily acquired anonymous tips rather than engage in arduous collection of evidence" (Dery andMeehan 2015). These problems may be especially compounded in counter-terrorism cases where officers may need to rely on "tips" from the community. The framework we developed here could easily be extended to study these issues. We leave it to future work to examine whether immunity in such cases could help or hinder overall law enforcement.

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[29] It will be useful to examine whether immunity for errors made by public officials needs to be stronger for crimes that are cause more harm (such as terrorism). For example, under the Armed Forces Special Powers act, the Parliament of India has given the Army significant immunity in policing regions affected by terrorism. This has, however, remained a highly controversial measure. See Saikia (2014)and "Denied: failures in accountability in Jammu and Kashmir" Amnesty International report, July 2015.

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6 Appendix

6.1 Proof of proposition 1

First consider the uninformed arrests equilibrium. The solution to equations 4 and 5, subject to the constraint that in equilibrium $e_u^* \leq 1$, and $g_u^* \leq f - (1-\delta)c$, provide the interior solution to the "wrongful arrests" equilibrium:

$$e_u^* = \frac{\delta d(f-c)}{G - \delta^2 cd}$$
$$g_u^* = \frac{G(f-c)}{G - \delta^2 cd}.$$

We now determine conditions under which the above solution is an equilibrium. A necessary condition for the existience of this equilibrium is $d < \frac{G}{\delta^2 c} \equiv \overline{d}$. Next, it is straightforward to observe that these expressions are both increasing and continuous in d. Thus, if the solution violates the constraints that $e_u^* \leq 1$, and $g_u^* \leq f-(1-\delta)c$, then $e_u^* = 1$, and $g_u^* = f-(1-\delta)c$. Finally, in equilibrium condition 1 is satisfied, if

$$\alpha = \frac{(f-c)}{G-\delta^2 cd} < \frac{r}{r+d} \Longleftrightarrow d < \frac{r(G-f+c)}{f-c+r\delta^2 c} \equiv d_u.$$

Thus, if $d < min\{\overline{d}, d_u\}$ then there exists an equilibrium in which wrongful arrests occur.

The solution to 6, and 7 determine the equilibrium in the informed arrest equilibrium:

$$e_i^* = \frac{G\delta r}{G + \delta^2 fr}$$
$$g_i^* = \frac{G\delta^2 fr}{G + \delta^2 fr}.$$

At $e^* = 0$, $e_i^*(g_i^*) > g_i^*(e_i^*) = 0$, and at $e^* = 1, e_i^*(g_i^*) < g_i^*(e_i^*) = 0$, if $r < f$ (which we have already assumed). Thus, the above solution is always an interior solution. Turning to the condition 1,

$$\frac{\delta^2 fr}{G+\delta^2 fr} > \frac{r}{r+d} \Longleftrightarrow d > \frac{G}{f\delta^2} \equiv d_i.$$

Hence if the previous inequality holds 1 is violated, and there exists an equilibrium in which no uninformed arrests occur.

Turning to the mixed strategy equilibrium for the case where 1 is satisfied as an equality. The citizen's choice of crime is determined by,

$$g' - \theta\delta f - (1-\theta\delta)\rho f \geq -(1-\theta\delta)\rho c,$$

therefore, the marginal citizen is,

$$g = \theta\delta f + (1-\theta\delta)\rho(f-c)$$

For the officers, the choice of competence is determined by

$$\delta\alpha 0 - \alpha(1-\delta)\rho d + (1-\alpha)\delta r + (1-\alpha)(1-\delta)\rho r - e' \geq \alpha\rho(-d) + (1-\alpha)\rho r.$$

Since in this equilibrium α satisfies $\alpha(-d) + (1-\alpha)r = 0$ the previous expression simplifies to

$$e = \alpha\delta d.$$

Substituting this expression into the expression for g and solving for ρ yields,

$$\rho^* = \frac{r}{r+d}\left(G - \delta^2 df\right)\frac{1}{1 - (\frac{r\delta^2 d}{r+d})(f-c)}.$$

From this it follows that $\rho^* \in [0,1]$ if and only if $d \in [d_u, d_i]$. Hence, this mixed strategy exists only the region specified in figure 1.

Finally, with regards to figure 1, it is worth noting that $\underline{d} < d_i < \overline{d}$. Further, d_i does not depend on r, but d_u is increasing and concave in r and intersects d_i at $\frac{G}{(G-f)\delta^2}$. Hence, the regions depicted in figure 1 always exist.

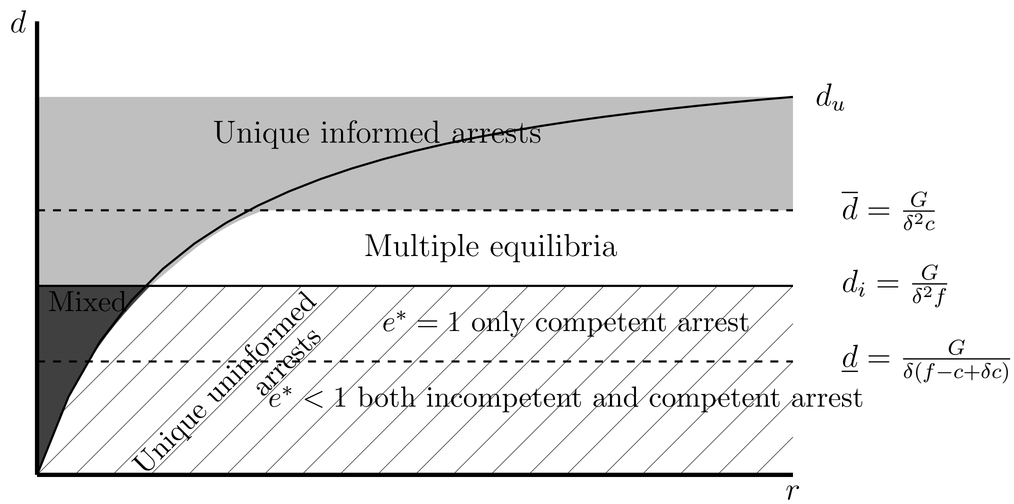


Figure 1: Equilibrium: Note $\overline{d} > d_i > \underline{d} > 0$

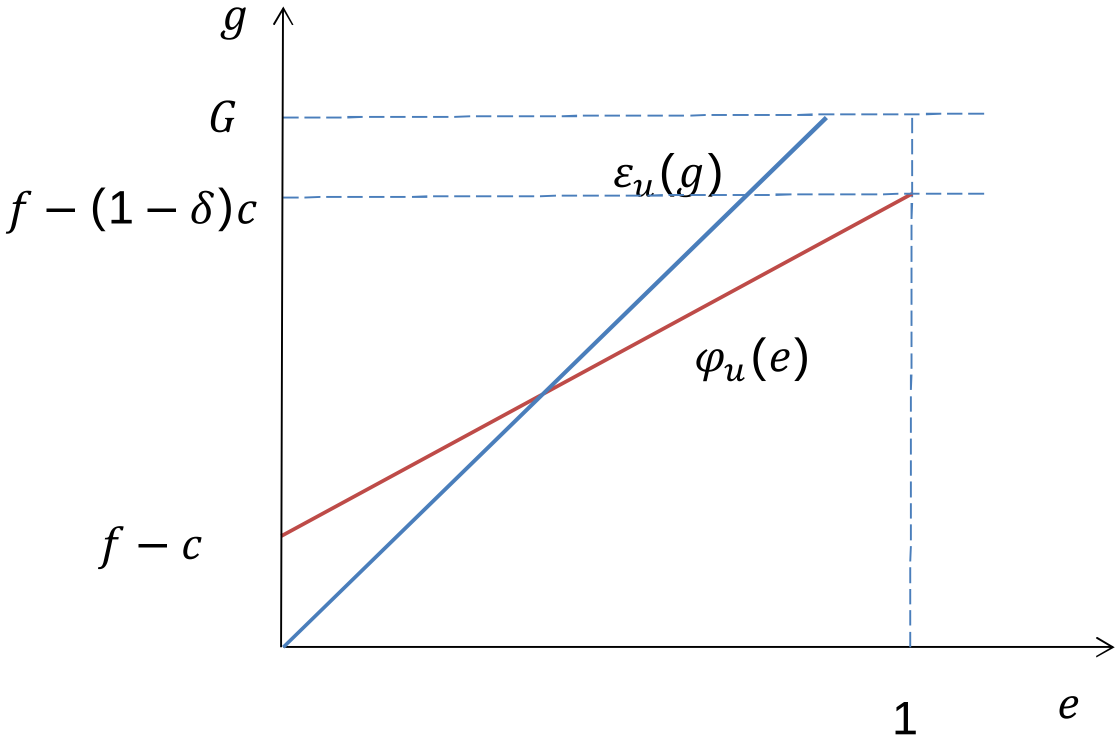


Figure 2 (a)
Competence increases with compliance because officers want to avoid *d*.

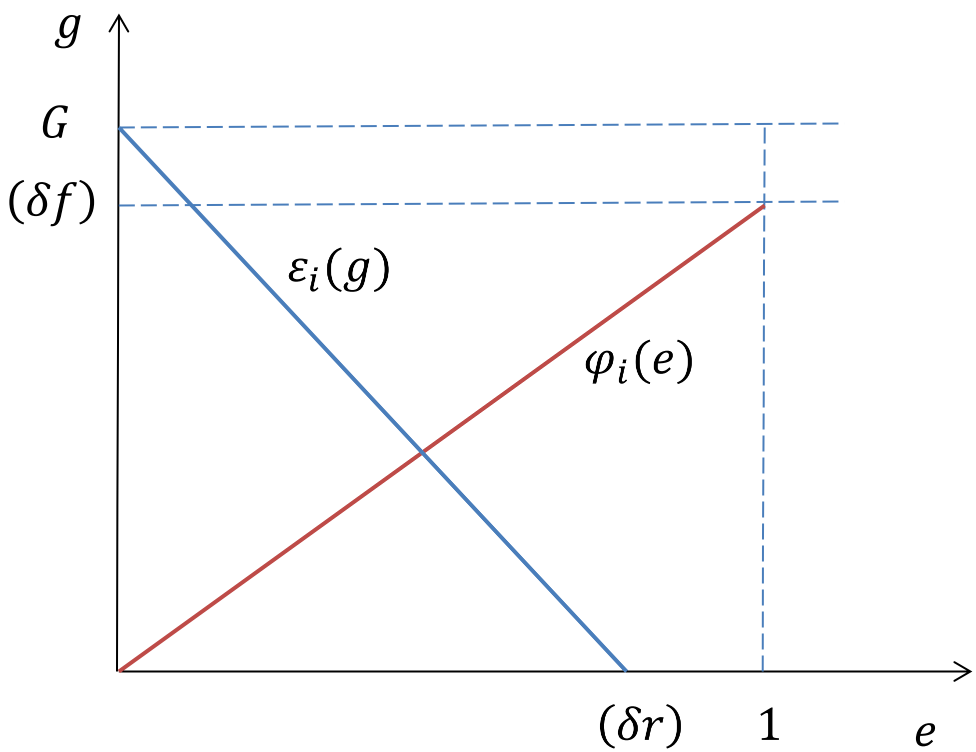
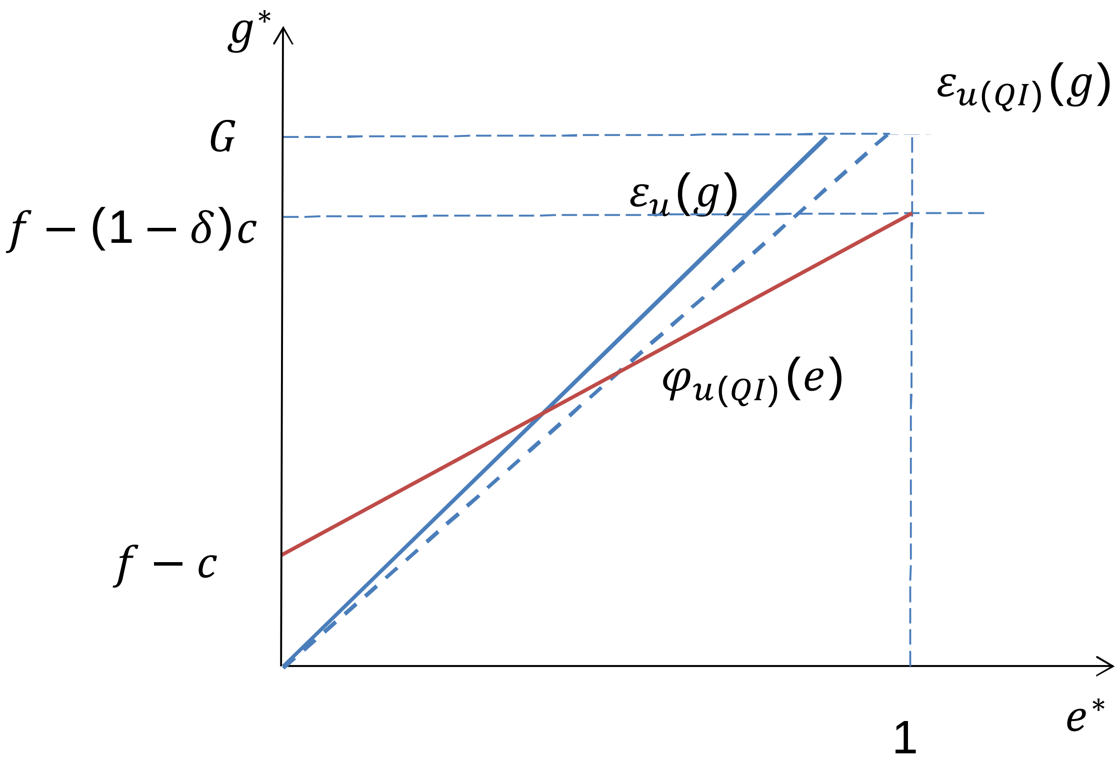
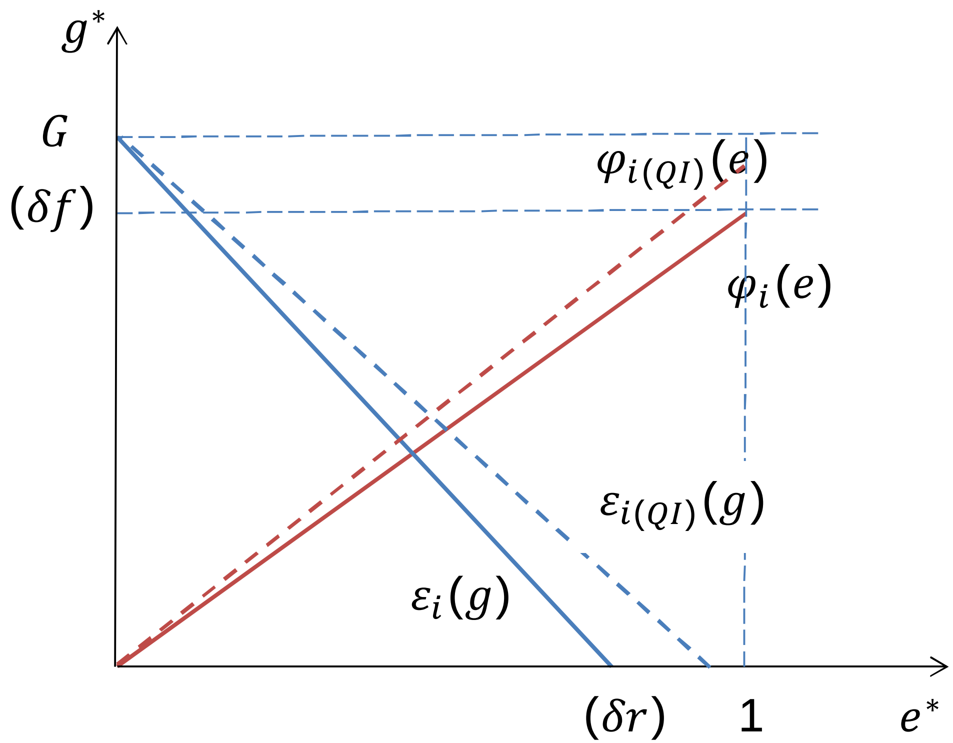


Figure 2 (b)

Competence decreases with compliance because officers the expected reward is low.


g^*
G
$f-(1-\delta)c$
$f-c$
$\varepsilon_{u(QI)}(g)$
$\varepsilon_u(g)$
$\varphi_{u(QI)}(e)$
1
e^*

(Figure 3a)


g^*
G
(δf)
$\varphi_{i(QI)}(e)$
$\varphi_i(e)$
$\varepsilon_{i(QI)}(g)$
$\varepsilon_i(g)$
(δr)
1
e^*

(Figure 3b)