On the Economics of Interrogation: The Big 4 Versus the Little Fish Game

Walter Enders* and Paan Jindapon†
Department of Economics, Finance and Legal Studies
University of Alabama
Tuscaloosa, AL 35487-0224

November 2010

Abstract

While military protocol requires that POWs provide only Name, rank, serial number, and date of birth (the so-called Big 4), it is naive to think that all detainees, including terrorists, behave in this fashion. We model two different types of games between the interrogator and the detainee. In particular, we compare the Big 4 game to a two-stage game (the Little Fish game) in which the detainee is permitted to reveal low-level information to the interrogator. We also compare the optimal interrogation levels resulting from the two games.

Keywords: Interrogation Strategy, Counter-terrorism Strategy, Terrorism, Moral Values

*wenders@cba.ua.edu
†pjindapo@cba.ua.edu

1 Introduction

The recent events at Abu Ghraib and Guantanamo have brought the issue of the appropriate ways to treat and interrogate detainees to the fore. Now, U.S. law (i.e, the Detainee Treatment Act of 2005 also called the McCain Amendment) prohibits inhumane treatment of prisoners and requires that all military interrogations to be performed according to U.S. Army Field Manual 2-22.3 (Human Intelligence Collector Operations). One of President Obama's first tasks on coming to office was to issue Executive Order 13491 Ensuring Lawful Interrogations that extended these limitations to the CIA and other agencies. The order does allow certain harsh interrogation methods, but explicitly requires that all persons under the custody of U.S. representatives be treated humanely.[1]

Many believe that restrictions on interrogation techniques serve to undermine the ability of the authorities to acquire information that might be vital to national security interests. For example, former Vice-President Dick Cheney launched a recent media campaign arguing that harsh interrogation techniques, such as water-boarding, are vital for the national interest.[2] Of course, some restrictions are necessary because they reflect the sense of society's moral values. Moreover, as evidenced by Abu Ghraib, torture and harsh interrogation practices can backfire in the sense that they can be used as recruiting tools by enemies of the interrogating nation. Yet, the public remains conflicted on the issue. Shortly after the Abu Ghraib photos were released, Newsweek (2005) reported that 44 percent of Americans believe that torture is a justifiable way to obtain important information and that 58 percent support torture as a means to thwart an imminent terrorist attack.

The aim of this paper is to investigate two different interrogation strategies using a game-theoretic framework. In the Big-4 game, the detainee gives only name, rank, serial number, and date of birth. At that point, the interrogator has to decide whether

[1] Specifically, EO 13491 states that persons under U.S. control "... shall in all circumstances be treated humanely and shall not be subjected to violence to life and person (including murder of all kinds, mutilation, cruel treatment, and torture), nor to outrages upon personal dignity (including humiliating and degrading treatment)..."

[2] For details see the BBC News (2009) article "Cheney Enters Torture Memo Row" news.bbc.co.uk/2/hi/8009571.stm.

to question the detainee more intensively in order to extract potentially withheld information. We compare the outcome of this game to that of a two-stage game we call the "Little Fish" game. In the first stage, the detainee actually provides the interrogator with some useful information (i.e., a little fish). In a sense, the detainee gives up a little fish in the organization in order to protect some more valuable information (i.e., a big fish). The interrogator then makes a determination of (1) whether or not the detainee is withholding other important information and (2) whether or not to use more extreme interrogation methods. If the more extreme method is used, the detainee may "crack" and provide the additional information. In both games, the interrogation process is costly in that it uses the resources of the human intelligence collector (HIC), possibly causes moral outrage, and can make it easier for terrorists to recruit new members.

Although the analysis of terrorist interrogation methods is rather new, our work is complementary that of to several recent papers. Enders and Su (2007) and Baccara and Bar-Isaac (2009) show that terrorists will alter their network structures as the authorities adopt better (or more severe) means of acquiring information about the network. As the authorities become more able obtain information about a network, optimally structured networks will restructure themselves to be more secure. Dresher, Gassebner and Siemers (2010) use a panel of 111 countries and show that terrorism leads to degradation of human rights including the use of torture. Moreover, Regan (2010) analyzes a data set with 5400 country-year observations and finds that extreme interrogation methods (that can be classified as torture) are "successful" in that they act to reduce terrorism in the subsequent year. Mialon, Mialon and Stinchcombe (2009) and Wantchekon and Healy (1999) explicitly consider some of the negative consequences of torture while, at the same time, indicating that it can be attractive to intelligence officials. In our view, these findings mean that alternative interrogation methods need to be thoroughly examined in order to find attractive, yet effective, alternatives.

In Section 2, we describe some of the legal issues involved with interrogations, some of the techniques used by interrogators, and justify the rationale for the 2-stage game. In Section 3, we formalize both games and derive the optimal rules for each player. In Section 4, we show that the Big 4 game may not be optimal for either player or

for the overall well-being of the interrogating nation. In Section 5, we show how the intensity level of the interrogation selected by the HIC may not be optimal from a social perspective. In particular, we show how the socially optimal level of intensity must be balanced by such factors as the moral values of the society and the recruiting potential of the terrorists versus the likelihood of obtaining important information. Section 6 contains our concluding remarks. The Appendix shows how the game can be generalized to multiple sender types.

2 Background

Article 17 of the Geneva Convention Relative to the Treatment of Prisoners of War (GC) states:

> "Every prisoner of war, when questioned on the subject, is bound to give only his surname, first names and rank, date of birth, and army, regimental, personal or serial number, or failing this, equivalent information."

Even though the restriction is a lower bound on the amount of information that a POW is required to provide, military protocols universally require that soldiers provide no more than this minimum amount. For example, the Article V of the Code of the U.S. Fighting Force currently states:

> "When questioned, should I become a prisoner of war, I am required to give name, rank, service number and date of birth. I will evade answering further questions to the utmost of my ability. I will make no oral or written statements disloyal to my country and its allies or harmful to their cause."

Although the U.S. code was only altered twice since its inception in 1955, there has been substantial disagreement about its relevance to a modern fighting force. In 1977, President Carter modified the Code such that the words "bound only" were replaced by the word "required."[3] In light of the treatment U.S. soldiers received in Viet Nam,

[3] In March 1988, President Ronald Reagan issued Executive Order 12633 making the code gender-neutral.

the intent was to make the Code more of an ethical guide rather than an absolute requirement.

The epitome of a soldier following the Code is U.S. Vice Presidential candidate James Stockdale. After parachuting from his A-4E Skyhawk over North Vietnam on September 9, 1965, he was held as a POW for seven years. He was locked in leg irons and tortured repeatedly. When Stockdale was to be paraded in public, he slit his scalp and disfigured his face so that the North Vietnamese would not be able to use him as propaganda.[4] Clearly, it is naive to believe that all hostages can behave in this manner or that governments will automatically choose to prosecute all violators of the Code. The North Korean capture of the USS Pueblo in international waters is a case in point. After being tortured, Commander Mark Bucher issued a written "apology" critical of the U.S. and admitted that the Pueblo was spying. Only after Navy Secretary John Chafee intervened was a recommendation of a court marshal against Commander Bucher dropped. In a similar incident, in March 2007, 15 British sailors were taken into custody by Iran. Lamenting Seaman Faye Turney's televised reading of a statement "apologizing" for the British Navy's trespass of Iranian waters, the Daily Mail (2007) states "A British prisoner must still avoid betraying secrets, but is now trained to cooperate with their captors if they think it will help... Whatever the advantages, the new doctrine (Conduct After Capture) makes it easier for captors to exploit prisoners for propaganda purposes." Not only did Seaman Faye Turney serve no jail time, she sold her story to ITV1 and the Sun newspaper for a reported six-figure sum.

In order to cope with the problem of cooperation with the enemy, many governments now provide their personnel with Conduct After Capture–also called Survival, Evasion, Resistance, and Escape (SERE)–training. Although many of the details are classified, in addition to teaching survival skills, the ultimate aim of such training is to expose potential prisoners of war (POWs) to the methods used by interrogators so as to maintain secrecy.[5]

[4] Many of the concerning details of Stockton's capture are contained in the New York Times (2005).

[5] A justification for the Big 4 strategy can be found in the current *Code of Conduct After Capture for the Canadian Forces* (2004): [the aim is to] "... to conserve our personnel resources, deny military intelligence to the enemy, to ensure interoperability with our allies and to continue offensive action

In contrast to teaching its members the Big 4, it is likely that members of al Qaeda receive a very different type of interrogation training. In particular, it appears that they are taught a strategy of partial cooperation. In an interview, Richard Clark, former U.S. National Coordinator for Security, Infrastructure Protection, and Counter-terrorism, stated:

> "Before Viet Nam it was only Name, Rank, and Serial Number. After the experience with the Viet Nam War, the U.S. army said 'No, that doesn't work' because people will break down and they will tell more under pressure so let's tell them how to say more. You say things that are of low value and can be corroborated ... and then you say things of higher value that can't be corroborated and the interrogator then does not really know if you are cooperating or not. I think, perhaps, that's what some of those al Qaeda prisoners are doing in Guantanamo and elsewhere."

Corroborating evidence is provided by Marc Theissen (2010), former speech writer for George Bush. According to Theissen (p. 82) when senior al Qaeda leader Abu Zubaydah was first captured, he provided some:

> "... nominal information that he thought we already knew, in order to give the impression he was cooperating. Some of this nominal information turned out to be extremely important. For example, Zubaydah identified Khalid Sheikh Mohammed as the mastermind behind the 9/11 attacks ... So the CIA took over Zubaydah's interrogation and began to apply the first enhanced interrogation techniques... It was under these circumstances that Zubaydah provided additional information about an al Qaeda terrorist [Jose Padilla]... captured thanks to information provided by Zubaydah."

Similarly, the New York Times (2010a) reports that Faisal Shahzad, the Times Square bomber, began cooperating with investigators immediately after his arrest and revealed that he received bomb-making training and financing from the Pakistani Taliban.

against the enemy."

As we show in Section 3 below, a strategy of partial cooperation can lead to very different outcomes than a strategy of "The Big 4 and Nothing More." In particular, we show that the Little Fish game can Pareto-dominate the Big 4 game. If so, the al Qaeda strategy is superior to that used by the U.S. and other military forces.

2.1 Methods Used by Interrogators[6]

Police, military, and intelligence agencies necessarily employ various interrogation strategies to obtain information from criminal suspects, enemies, crime victims and witnesses. Although crime victims and witnesses are often willing to provide vital information to further the investigation, much of the information can be unreliable. On the other hand, criminal suspects, enemy military personnel and enemy combatants typically withhold information and may deliberately try to provide false information. As such, HICs are often trained in psychological tactics and social theory so as to better ferret out useful information and to separate truthful from dubious statements. Although most interrogation techniques are benign, trained human intelligence collectors use a variety of methods to induce detainees to provide useful information. Initially, the HIC tries to build a "rapport" with the detainee so as to enhance his/her willingness to cooperate. Although not necessarily friendly, the aim is to establish the HIC as a "realistic persona designed to evoke cooperation from the source." The simplest interrogation approach is the direct method, in which the interrogator simply asks straightforward questions. Although detainees are not required to answer anything more than the so-called Big 4, (name, rank, serial number, and date of birth), as indicated in Table 1, this approach is surprisingly effective.

Once the direct approach no longer seems to be effective, the HIC might switch to offering incentives for information. Incentives can be anything from an emotional reward to extra privileges to direct financial payment. Other more intense approaches include playing on the detainee's love of family and country, fears, pride, and/or frustrations. Under the Geneva Conventions, there are many instances in which it is permissible to trick the detainee into revealing information. In the Establish Your Identity approach,

[6] Much of the material in this section comes from U.S. Field Manual 2-22.3.

the detainee is purposely misidentified as a person wanted on serious charges (such as a war crime). In trying to prove his/her identity, the detainee might reveal some important information. However, not all trickery is permitted. For example, under the Geneva Conventions, detainees must be interviewed in their own language. As such, it is not permissible to have the interviewer speak only in the language of a country friendly to the detainee's country in an effort to trick the detainee into thinking he was actually captured by friendly troops.

FM 2-22.3 contains explicit restrictions to prevent the types of abuses that occurred at Abu Ghraib.[7] However, in replacing FM 34-52 with FM 2-22.3, a number of severe restrictions on the HIC were imposed. For example, FM 34-52 describes the Fear-UP (Harsh) approach in which the interrogator uses a loud and threatening voice and "may even feel the need to throw objects across the room to heighten the source's implanted feelings of fear." Although the manual goes on to indicate that "Great care must be taken when doing this so ... not to violate the prohibition on coercion and threats contained in the GPW, Article 17", the Fear-UP (Harsh) approach is no longer permitted in FM 2-22.3. Field Manual 2-22.3 indicates that some approaches are permissible but require additional authorization from higher-ups in the chain of command. For example, the HIC may speak with an accent so that the detainee mistakenly believes the HIC is actually from a friendly nation. The Mutt and Jeff approach (also called Good Cop, Bad Cop) is used by police departments across the country, but requires additional authorization, as well. The most severe of the allowable approaches, Separation, involves prevents the detainee from communicating with other detainees.

The point is that the severity of interrogation is a choice variable. Up to some level of intensity, increasing the severity in stages can result in higher levels of informational revelation.

Lying: In the public media, it is often thought that simply lying to interrogators is

[7] Section 5-75 explicitly prohibits (1) forcing the detainee to be naked, perform sexual acts, or pose in a sexual manner, (2) Placing hoods or sacks over the head of a detainee; using duct tape over the eyes, (3) Applying beatings, electric shock, burns, or other forms of physical pain, (4) Waterboarding, (5) using military working dogs, (6) Inducing hypothermia or heat injury, (7) conducting mock executions (8) Depriving the detainee of necessary food, water, or medical care.

a generally successful counter-interrogation strategy. While detainees undoubtedly lie during interrogations, we do not model lying directly. Former National Security Advisor Steve Hadley is quoted by Theissen (p. 103, 2010) as stating:

> "So the whole argument that people tell you lies under torture misses the point. [The purpose is to] bring them to the point when they are willing to cooperate, and once they are willing to cooperate, then the techniques stop and you do all the things the FBI agents say you ought to do to build trust..."

A skilled HIC is trained to be wary of any information that cannot be corroborated. Sections 9-25 and 9-26 of U.S. Military Field Manual 2-22.3 describe a number of techniques that a HIC may try when suspecting that the source is lying. For example, the HIC may gain time to formulate pertinent questions and possibly break the source's concentration by asking nonpertinent or repeat questions. Similarly, control questions (to which the HIC knows the answer) can be used to check the truthfulness of answers. As the HIC should not offer anything that is clearly not within his power to give (see Incentive in Table 1), detainees cannot realistically provide information unlikely to be known by someone of their rank or location. Similarly, the HIC is trained to look for inconsistencies in the time line of reported events and will carefully seek to elicit the chain of events from the detainee. A good example is provided by Umar Farouk Abdulmutallab, the so-called Christmas Day Bomber (or Underwear Bomber). As reported by the New York Times (2010b), Mr. Abdulmutallab's family persuaded him to provide information concerning his explosives training and the people he worked with in Yemen. An unnamed federal official is quoted as saying "He's retracing his activities over there [Yemen]. You run to ground what he tells you, validate it and follow up. You build a relationship. It's a pretty standard process."

3 The Model

We assume that the detainee (i.e., the sender) has a piece of information indexed by i, drawn from a finite set $\Omega = \{0, 1\}$. The detainee with information i is also called type

i sender. For simplicity, we let one piece of information be of low value and the other be of high value. The value of this information to the HIC (i.e., the receiver) is denoted by $u(i)$ where $u(0) < u(1)$. The sender's type is not observable to the receiver but the distribution of type is common knowledge. Let p_i denote the probability that the sender is of type i so that $p_0 + p_1 = 1$. If the receiver interrogates the sender, a type i sender will reveal information i with probability p. The nature of the model is such that the detainees themselves do not know whether they will "crack" under duress. As such, if an interrogation occurs, $(1-p)$ percent of the individuals will reveal nothing more, but p percent will reveal all they know. We do not formally consider an intermediate case where a detainee of type 1 cracks and simply reveals information 0. Although senders with a relatively large amount of information may try to conceal themselves, our reading of the interrogation literature indicates that this strategy is not likely to be successful. Once an individual has cooperated with the interrogator, anecdotal evidence indicates that a competent HIC will often be able to extract all that the detainee knows. Consider, an example taken from page 2-1 of the *Code of Conduct After Capture for the Canadian Forces* (2004, p. 2-1):

> "A prisoner who accepted an egg, a fistful of tobacco from a Chinese in return for some tiny act of betrayal was half-doomed already. His own self-respect was cracked. It remained only for his captors to make the treason absolute, to extract some hint about an escape plan, secret religious services, 'hostile attitudes.' "

Naturally, there are costs involved with the interrogation process. For the time being, we assume that the HIC views the cost of the interrogation as the fixed sum $w > 0$. This cost will include the direct costs of the interrogation (such as the cost of time to the HIC) as well as any indirect costs. From a social perspective, the indirect costs would include those arising from any negative publicity surrounding an overly harsh interrogation and the ability of terrorists to use such publicity to their advantage. At this point in the analysis, we assume that the HIC internalizes all direct and indirect costs into w so that w represents the full social cost of the interrogation. As such, if type i is interrogated, the expected payoff to the HIC is $pu(i) - w$. Senders who are interrogated are put

under duress and may not be able to control the amount of information they reveal to the HIC. We let v denote the psychological and physical costs of being subjected to the interrogation. Detainees are loathe to reveal information but know that they might provide the HIC with $u(i)$ with probability p. Without loss of generality, we assume that if type i sender is interrogated, his expected payoff is $-pu(i) - v$.[8]

3.1 The Big 4 Game

The nature of what we call the Big 4 game is straightforward. The HIC uses the direct method to question detainees. However, at this point in the game, senders abide by the Code of Conduct and do nothing more than provide name, rank, serial number, and date of birth to the interrogator.[9] If the HIC interrogates, the expected value of the game to the HIC is

$$p[p_0 u(0) + (1 - p_0)u(1)] - w \tag{1}$$

The HIC will interrogate only if (1) is positive. Since the sender type is not observable, the solutions to this game are corner solutions such that all detainees are either interrogated or no one is interrogated. All else equal, the value of the game to the HIC (and the likelihood of interrogation) increases when:

- the probability of cracking under interrogation, p, is high
- the value of either piece of information, $u(0)$ and $u(1)$, is high
- the proportion of the population with the low-value information set, p_0, is low
- the cost of interrogation, w, is low.

[8] It appears that the transfer of intellegence is a zero sum game since the sender loses $-pu(i)$ while the receiver gains $pu(i)$. Nothing of substance would be altered of we simply set the cost to the sender equal to v or to v plus a general function of $pu(i)$. Our notation is designed to illustrate the point that senders are relectuant to reveal information.

[9] Of course, if the detainee violates the Code, he/she is playing the Little Fish Game.

3.2 The "Little Fish" Game

In the two-stage game, the detainee is allowed to partially cooperate with the interrogator by revealing some information. Specifically, in period 1, the sender discloses all or part of the information in their possession. Of course, the detainee cannot report more verifiable information than he/she has so that a type 0 individual sends report 0, while a type 1 individual can send report 0 or 1. In stage 2, the HIC can try to force the detainee to report 1 with a costly interrogation technique, or let the detainee go and the game ends. If the detainee who has reported j is not interrogated, his payoff will be $-u(j)$ and the HICs' payoff will be equal to $u(j)$.

The extensive form of the Little Fish game is depicted in Figure 1 wherein Nature (N) chooses the sender type (0 or 1) with probabilities p_0 and p_1, respectively. Sender type 0 (S_0) can send only message 0 (m_0) while sender type 1 (S_1) can send either message 0 (m_0) or message 1 (m_1). Since the receiver (R) cannot observe the sender's type, upon receiving m_0 he can choose to accommodate the sender (a) or to interrogate (t). If the receiver chooses t, then N determines whether the sender "cracks" with probability p or does not "crack" with probability $(1-p)$. Note that if the receiver chooses to interrogate a type i sender who sends m_i, the value of information that the receiver gains is $u(i)$ with certainty. The net payoff for each player is given at each end node of the diagram (sender's payoff, receiver's payoff).

In order to make the game interesting, we want to rule out corner solutions wherein there is no incentive to interrogate or wherein detainee always tries to conceal information. To ensure that the receiver has the incentive to interrogate, we assume that the receiver's perceived cost, w, is less than the expected gain from interrogation, *i.e.*,

$$w < p_1 p[u(1) - u(0)]. \tag{2}$$

Similarly, to ensure that the sender does not always conceal information, we assume that the detainee's cost if interrogated, v, is greater than the expected gain from hiding information given that he is interrogated, *i.e.*,

$$v > (1-p)[u(1) - u(0)]. \tag{3}$$

Together the assumptions embedded in (2) and (3) mean the solution to the Little

Fish game entails a mixed strategy. It is obvious that the HIC will not interrogate if the received message is 1. If detainees adopt a separating strategy, i.e., type 0 sender reports 0 and type 1 reports 1, the receiver will not interrogate, and type 1 sender will have an incentive to deviate. Similarly, if both types pool on 0, the receiver will interrogate upon receiving message 0 and type 1 sender will again have an incentive to deviate. Hence, there is no pure-strategy perfect Bayesian equilibrium.[10]

Now consider a mixed strategy such that type 1 detainees sometimes try to conceal information by sending report 0. Let $\sigma = [\sigma_{ij}]$ denote the set of probabilities that a detainee who knows i actually reports j. Since a type 0 sender in the Little Fish game will always report 0, it follows that $\sigma_{00} = 1$, and $\sigma_{01} = 0$. A type 1 sender may report either 0 or 1 so that $\sigma_{10} + \sigma_{11} = 1$. The HIC will pursue a mixed strategy as well. Let θ_j denote the probability that a detainee who reports j is interrogated and let μ_{ij} denote the HIC's perceived probability that the detainee is of type i given that his report is j. Hence, the receiver's mixed strategy is $\theta = [\theta_j]$ given his set of beliefs $\mu = [\mu_{ij}]$.

Type i sender's expected payoff from reporting $j \leq i$ is[11]

$$S_{ij}(\theta) = -(1 - \theta_j)u(j) - \theta_j[pu(i) + (1 - p)u(j) + v]. \tag{4}$$

Since a type 0 sender cannot report 1, upon receiving report 1, the receiver knows with probability 1 that the sender is of type 1. Therefore, $\mu_{01} = 0$ and $\mu_{11} = 1$. The expected payoff to the HIC who has received report 0 and interrogates the sender, R_0, is[12]

$$R_0 = \mu_{00}u(0) + \mu_{10}[pu(1) + (1 - p)u(0)] - w. \tag{5}$$

[10] In other words, there is not a conjectually consistent pure strategy that entails an equilibrium. Banks, Grove, Ito, and Toivanen (2006) find a similar result using a very different type of model.

[11] Hence, if type 1 reports 1, S_{11} is simply the cost of reporting 1: $S_{11} = -u(1)$. If type 0 reports 0, $S_{00} = -u(0) - \theta_0 v$ (the cost of revealing information level 0 plus the probabilistic cost of the being interrogated, $\theta_0 v$). Note that S_{10} can be written as $-u(0) - \theta_0 p[u(1) - u(0)] - \theta_0 v$ [the certain cost of revealing information level 0 plus the probability of being interrogated multiplied by the probability of cracking and revealing the additional amount $u(1) - u(0)$ plus the probabilistic cost of the being interrogated].

[12] Note that (5) can also be written as the certain value receiving report 0 plus the probability that the individual reporting 0 is actually of type 1 multiplied by the probability that the individual cracks and reveals the value of the extra information $u(1) - u(0)$ less the cost of the interrogation. Hence, $R_0 = u(0) + \mu_{10}p[u(1) - u(0)] - w$.

Our goal is to find a profile of strategies and beliefs $\{\theta, \sigma, \mu\}$ that constitutes a perfect Bayesian equilibrium. As such, we need to solve for the following three parameters: θ_0, σ_{10}, and μ_{10}. Although the algebra gets a bit messy, the solution methodology is straightforward. In order for a type 1 detainee to mix his actions, on the margin, he must be indifferent between reporting 0 an reporting 1. Hence, in equilibrium, it must be the case that $S_{10} = S_{11}$:

$$-(1-\theta_0)u(0) - \theta_0[pu(1) + (1-p)u(0) + v] = -u(1), \tag{6}$$

and hence,

$$\theta_0 = \frac{u(1) - u(0)}{pu(1) - pu(0) + v}. \tag{7}$$

Notice that the probability of interrogating a detainee reporting 0 is such that: $\theta_0 > 0$ because $u(1) > u(0)$ and $\theta_0 < 1$ because of (3). Also note that (7) describes the essential difference between the two types of games. In the Big 4 game, a report of 0 by a type 1 sender signals that he/she is weak. In the Little Fish game, if the sender reports 0, the probability of further interrogation is positively related to the informational differential value of the two pieces of information: $u(1) - u(0)$. Hence, by providing information on the little fish, the incentive for the HIC to extract the additional information is reduced. According to (7), the HIC tends to interrogate the detainee who reports 0

- when the differential value of information, $u(1) - u(0)$, is high
- when the probability of cracking, p, is low
- when the sender's cost of interrogation, v, is low

For the receiver to mix his actions given a report of 0, in equilibrium, he must be indifferent between interrogating and not interrogating. In order for R_0 to equal the payoff from not interrogating and obtaining the sure return $u(0)$, it must be the case that

$$\mu_{00}u(0) + \mu_{10}[pu(1) + (1-p)u(0)] - w = u(0). \tag{8}$$

Using Bayes' rule, we have $\mu_{10} = \sigma_{10}p_1/(p_0 + \sigma_{10}p_1)$ and $\mu_{00} = 1 - \mu_{10}$. Therefore,

$$\left(\frac{p_0}{p_0 + \sigma_{10}p_1}\right)u(0) + \left(\frac{\sigma_{10}p_1}{p_0 + \sigma_{10}p_1}\right)[pu(1) + (1-p)u(0)] - w = u(0), \tag{9}$$

and the probability that a detainee that knows 1 and reports 0 is given by

$$\sigma_{10} = \frac{p_0 w}{p_1[pu(1) - pu(0) - w]}. \tag{10}$$

We find that $\sigma_{10} \in (0, 1)$ because of (2). Notice that (10) indicates that a detainee that knows 1 will tend to report 0

- when the differential value of information, $u(1) - u(0)$, is low
- when the probability of cracking, p, is low
- when the cost of interrogation, w, is high
- when the proportion of type 0 senders, p_0, is high

Finally, the probability that a sender who reports 0 is actually of type 1 is

$$\mu_{10} = \frac{w}{pu(1) - pu(0)}. \tag{11}$$

Note that (7), (10), and (11) constitute a perfect Bayesian equilibrium. The equilibrium is necessarily an interior solution and it is unique.

4 Expected Utility Comparisons

4.1 Receiver's Expected Net Benefit

Given the solutions for the two different games, it is possible to compare them in terms of the expected benefits to each player. In order to keep the notation as simple as possible, we define $\Delta = u(1) - u(0)$ so that (1), the expected net benefit of the Big 4 game to the HIC, can be written as

$$pu(0) + p_1 p\Delta - w \tag{12}$$

In the 2-stage Little Fish game, the analysis is somewhat more complicated because the players use mixed strategies. In the first stage, type 0 senders always report 0 and σ_{11} percent of type 1 senders report 1 so that this portion of the expected payoff to the HIC is $p_0 u(0) + p_1 \sigma_{11} u(1)$. The net benefit must also account for the σ_{10} percent of the type

1 individuals who report 0 in the first stage. The proportion not interrogated is $(1-\theta_0)$ so that we must add $p_1\sigma_{10}(1-\theta_0)u(0)$ to the expected payoff. The proportion of these people who are interrogated is θ_0 and the proportion of those revealing the additional information is p. Thus, from those using strategy σ_{10}, the additional expected payoff to the HIC is $p_1\sigma_{10}\theta_0[pu(1)+(1-p)u(0)]$. Given that the HIC interrogates only θ_0 percent of those reporting 0, the expected interrogation cost is $(1-p_1\sigma_{11})\theta_0 w$. Thus, the expected net payoff to the HIC in the Little Fish game can be written as

$$p_0u(0)+p_1\sigma_{11}u(1)+p_1\sigma_{10}(1-\theta_0)u(0)+p_1\sigma_{10}\theta_0[pu(1)+(1-p)u(0)]-(1-p_1\sigma_{11})\theta_0 w$$

or, on simplifying

$$u(0)+(p_1\sigma_{11}+p_1\sigma_{10}\theta_0 p)\Delta-(1-p_1\sigma_{11})\theta_0 w. \tag{13}$$

Using (7), (10), and the fact that $\sigma_{11}=1-\sigma_{10}$, (13) can be written as

$$u(0)+(p_1p\Delta-w)\left(\frac{\Delta}{p\Delta-w}\right). \tag{14}$$

Hence, the net benefit to the HIC is greatest when

- the proportion of individuals with type 1 information, p_1, is high
- the costs of interrogation, w, are low
- the probability of cracking, p, is high
- $u(0)$ is large for a given Δ and when Δ is large for a given $u(0)$.

The difference between the net expected payoffs in the two games, (12) - (14), is

$$-(1-p)u(0)-(p_1p\Delta-w)\left(\frac{(1-p)\Delta+w}{p\Delta-w}\right) \tag{15}$$

which is always negative because of (2).

Hence, the HIC always prefers the 2-stage game. This result is quite intuitive since the two-stages of the game do not in any way constrain the interrogator's behavior. Since the interrogator receives $u(0)$ at no cost, the interrogator is necessarily better off in the Little Fish game. Figures 2 and 3 provide a sense of the sensitivity of (15) to the

parameters of the model. In Figure 2, we plot the values of (15) for various values of p and $u(1)$ holding $u(0), p_1, w$, and v constant.[13] It should be clear that as Δ increases from 2 to 10 for a given $u(0)$ [i.e., increasing $u(1)$] the relative value of the Little Fish increases as differential becomes more negative. Increasing p, however, has a U-shaped effect on the relative value of the games. Figure 3 indicates that the relative desirability of the Little Fish game to the HIC decreases in w, and is independent of changes in v (as 15 does not contain v). Recall from (10), when $\Delta = u(1) - u(0)$ low and when w is large, the proportion of detainees who know 1 and report 0 (i.e., σ_{10}) is large. Hence, the HIC tends not to receive the more valuable report in the Little Fish game when Δ is low or when w is large.

4.2 Sender's Expected Net Loss

To a type i sender, the expected loss in the Big 4 game is the probability of cracking and revealing i plus the cost of the duress of the interrogation. Thus, the expected loss to the randomly selected detainee is $p_0 p u(0) + p_1 p u(1) + v$, or, since $p_0 + p_1 = 1$,[14]

$$p u(0) + p_1 p \Delta + v \tag{16}$$

Analogously to (13), the expected loss to senders in the Little Fish game is

$$u(0) + (p_1 \sigma_{11} + p_1 \sigma_{10} \theta_0 p)\Delta + (1 - p_1 \sigma_{11})\theta_0 v \tag{17}$$

As such, using (7), (10), and the fact that $\sigma_{11} = 1 - \sigma_{10}$, the differential loss comparison between the two games in equilibrium, (16)-(17), can be shown to be

$$v - (1-p)u(0) - \frac{(1 - p_1 p)\Delta v + (1-p)p_1 p \Delta^2}{p\Delta + v}. \tag{18}$$

The sign is ambiguous so that the sender, as well as the interrogator, may prefer the 2-stage game. To explain, providing the interrogator with some information in the

[13] In all of our figures, we set $u(0) = 0$ and $p_1 = 0.25$. Figure 1 sets $v = 1$ and $w = 0.1$. In Figure 1, the range of Δ and p are such that $p_1 p \Delta - w$ is always positive. In Figure 2, the range of v and w are such that $p_1 p \Delta - w$ is always positive.

[14] Of course, the loss to a type 0 detainee is $p u(0) + v$ and the loss to a type 1 detainee is $p u(1) + v$. As such, the loss to the randomly selected detainee is given by $p_0 p u(0) + p_1 p u(1) + v$.

first stage acts as a disincentive to interrogate. The key point is that the additional information provided by the interrogation can be no greater than $u(1) - u(0)$. Thus, providing the HIC with the little fish can serve to protect the big fish since the HIC may not find it worthwhile to pursue the investigation further.

Two special cases can provide some insight into (18). If we let $p = 1$, (18) can be written as

$$v\left(\frac{p_1\Delta + v}{\Delta + v}\right), \tag{19}$$

which is positive. The expected disutility of the sender is greater in the Big 4 game and hence the sender prefers the 2-stage game when p is large. After all, if the probability of cracking under interrogation is large, the sender prefers to play the game in which the probability of interrogation is lowest. Also, if we let $\Delta = 0$, the sender essentially reveals all in the Little Fish game. In this special case, (18) can be written as $v - (1-p)u(0)$. The differential between the two games is the certain cost of being interrogated (v) in the Big Four game versus the expected value of information that is concealed by not cracking, $(1-p)u(0)$, in the Big Four game.

Figure 4 shows the values of (18) for various values of p and $u(1)$ holding $u(0), p_1, w$, and v constant. Notice that increasing Δ from 2 to 10 for a given $u(0)$ [i.e., increasing $u(1)$] acts to increase the relative value of the Little Fish game as the differential becomes more negative. The sender clearly prefers the opportunity to try to conceal the big fish as Δ increases.Also notice that increases in p act to increase the relative value of the Big 4 game. Figure 5 shows the relative values obtained by altering v and w; the value of (18) is increasing in v and is invariant to w.

4.3 Expected Information Gain/Loss

It is also of interest to examine the expected value of the information revealed in each of the two games. The expected value of the information revealed in the Big 4 game is equal the expected value from receiving report 0 [i.e., $p_0 p u(0)$] plus the expected value from receiving report 1 [i.e., $p_1 p u(1)$], or

$$pu(0) + p_1 p\Delta. \tag{20}$$

The expected value of information revealed in the little fish game is the certain value $u(0)$, plus the σ_{11} percent of type 1 individuals revealing signal 1 ($p_1\sigma_{11}\Delta$) plus the θ_0 percent of type 1 individuals pursuing strategy σ_{10} who are interrogated and crack ($p_1\sigma_{10}\theta_0 p)\Delta$):

$$u(0) + (p_1\sigma_{11} + p_1\sigma_{10}\theta_0 p)\Delta \tag{21}$$

The difference, (20)-(21), in equilibrium, is

$$-(1-p)u(0) + \frac{(1-p_1p)\Delta vw - (1-p)p_1p\Delta^2(p\Delta - w + v)}{(p\Delta - w)(p\Delta + v)}. \tag{22}$$

The sign is ambiguous. However, if we let $p = 0$, (22) degenerates into $-u(1)$ which is clearly negative. Alternatively, if we let $p = 1$, (22) can be written as

$$\frac{(1-p_1)\Delta vw}{(\Delta - w)(\Delta + v)}, \tag{23}$$

which is positive. Hence, the expected information gain to the HIC tends to be larger in the Big 4 game (Little Fish) when p is large (small). It is interesting to note that the detainee's government should prefer that they play the Little Fish game when p is high. This result is surprising in that the governments universally press their soldiers to play the Big 4 game. Nevertheless, this strategy could be against their own interests if p is high. Terrorist groups, on the other hand, do seem content to let their members play the Little Fish game.

Figure 5 shows that the differential value of the games decreases in p and in $u(1)$. Figure 6 shows that the differential value increases in w and is relatively insensitive to v.

5 Optimal Intensity

Clearly, much of the controversy concerning interrogations involves intensity of the interrogation. One one hand, the U.S. Senate Committee on Armed Services (2008) reports:

> "Experts in the field of interrogation indicate the most effective interrogation strategy is a rapport-building approach. Interrogation techniques that rely on physical or adverse consequences are likely to garner inaccurate information and create an increased level of resistance... There is no evidence that

the level of fear or discomfort evoked by a given technique has any consistent correlation to the volume or quality of information obtained."

However, in addition to the type of anecdotal evidence provided by Thiessen (2010), Regan (2010) provides econometric evidence that torture acts to prevent subsequent terrorism. Although we do not explicitly model torture, we are interested in the effect of increasing the level of intensity of an interrogation. In our view, sequentially using the methods discussed in the lower portion of Table 1 provides increasing (although diminishing) amounts of additional information. As such, we assume that the HIC can choose the level of intensity (v) and let p and w be twice-differentiable functions of v. Specifically, the receiver can choose $v \in (0, \bar{v})$ where $\bar{v}$ is the maximum intensity level allowed by law. Let $p(0) = w(0) = 0$ and $p(\bar{v}) < 1$. Also $p'(v), w'(v) \geq 0$, $p''(v) \leq 0$, and $w''(v) \geq 0$.

5.1 The HIC's Problem

If the receiver in the Big 4 game can choose the optimal level of v, he will choose v to maximize

$$p(v)[p_0 u(0) + p_1 u(1)] - w(v). \tag{24}$$

The solution for this optimal level of v, called $\tilde{v}$, satisfies

$$p'(\tilde{v}) = \frac{w'(\tilde{v})}{\bar{u}}, \tag{25}$$

where $\bar{u} = p_0 u(0) + p_1 u(1)$.

In the Little Fish game, in equilibrium, the HIC's expected utility (EU) is

$$u(0) + \left(\frac{p_1 p(v)\Delta - w(v)}{p(v)\Delta - w(v)} \right) \Delta. \tag{26}$$

Taking derivative with respect to v yields

$$\frac{p_0 \Delta [p'(v)w(v) - p(v)w'(v)]}{[p(v)\Delta - w(v)]^2}. \tag{27}$$

The first-order condition shows that the optimal level of intensity in the Little Fish game, v^*, is such that (27) is equal to zero, that is,

$$\frac{p'(v^*)}{p(v^*)} = \frac{w'(v^*)}{w(v^*)}. \tag{28}$$

The above equation implies that v^* is such that the elasticity of p is equal to the elasticity of w. Taking derivative of (27) with respect to v yields

$$\frac{p_0\Delta[(p\Delta - w)(p''w - pw'') - 2(p'w - pw')(p'\Delta - w')}{(p\Delta - w)^3}, \tag{29}$$

which is negative at v^*; the receiver's EU function is concave around v^*. To compare v^* to $\tilde{v}$, divide (25) by $p(\tilde{v})$, so that

$$\frac{p'(\tilde{v})}{p(\tilde{v})} = \frac{w'(\tilde{v})}{p(\tilde{v})\bar{u}}. \tag{30}$$

Because of (2), we have $p(\tilde{v})\bar{u} > p_1 p(\tilde{v})\Delta > w(\tilde{v})$. Therefore,

$$\frac{p'(\tilde{v})}{p(\tilde{v})} < \frac{w'(\tilde{v})}{w(\tilde{v})}. \tag{31}$$

Comparing (31) to (28), we find that $\tilde{v} > v^*$ because p is concave and w is convex. As such, the HIC will use a greater level of intensity in the Big 4 game than in the Little Fish game. The explanation lies in the fact that by receiving information in the first stage of the Little Fish game, the incentive for the HIC to extract the additional information, Δ, is reduced. As such, the level of intensity of the interrogation is reduced as well.

5.2 The Social Optimum in the Little Fish Game

The level of intensity selected by the HIC may not be socially optimal if the perceptions of the full cost of an interrogation differs from those of the society. For example, an HIC who focussed on extracting information from a particular detainee may not be concerned about the fact that a harsh interrogation may aid recruiting efforts by the terrorist network. In the extreme, suppose that the interrogator who does not care about the cost of interrogation in (14) is the one who chooses the intensity level. This interrogator will try to maximize the expected information gain from the game. Using (7), (10), and the fact that $\sigma_{11} = 1 - \sigma_{10}$, the expected information gain, (21), can be written as

$$u(0) + \left(\frac{p_1 p(v)\Delta - w(v)}{p(v)\Delta - w(v)} + \frac{p_0 p(v)\Delta w(v)}{[p(v)\Delta - w(v)][p(v)\Delta + v]}\right)\Delta. \tag{32}$$

Let $\hat{v}$ maximize (32). The derivative of $\frac{p_0 p(v)\Delta^2 w(v)}{[p(v)\Delta - w(v)][p(v)\Delta + v]}$, which is the difference between (32) and (26), with respect to v can be written as

$$\frac{p_0\Delta^2[v(p^2\Delta w' - p'w^2) - p^2\Delta^2(p'w - pw')]}{(p\Delta - w)^2(p\Delta + v)^2}. \tag{33}$$

At v^*, (33) becomes

$$\frac{p_0\Delta^2 v(p^2\Delta w' - p'w^2)}{(p\Delta - w)^2(p\Delta + v)^2}, \tag{34}$$

which is positive because $p'w^2 < p^2\Delta w'$. Therefore, we find that $\hat{v} > v^*$. The point is clear: The level of intensity chosen by the HIC will exceed the socially optimal level. As such, in order to obtain the social optimum, it is necessary to enforce regulations limiting the intensity of interrogations. Unlike the view of the U.S. Senate Committee on Armed Services (2008), in our model, the regulations are necessary because harsh interrogations can provide useful information. The fact that harsh methods can "work" means that the HIC needs to be prevented from utilizing such tactics.

6 Conclusion

We considered two different types of interrogation strategies. In the Big 4 game, detainees provide the interrogator with no more than name, rank, serial number, and date of birth. The interrogator has no way of sorting the detainees and will treat all detainees similarly in that he interrogates everyone or no one. In the 2-stage game, detainees are allowed to provide a small amount of useful information to the interrogator. At this point, the interrogator must decide whether to expend resources so as to try to extract an additional piece of information from the detainee. It turns out that providing a low level information to the interrogator can act as disincentive for additional interrogation. As such, it is possible that the sender and receiver both prefer the 2-stage game even though the expected amount of information received by the interrogator is lower in the 2-stage game.

Perhaps, the most important result is to formalize the internal conflict between the HIC and the society at large. In a limited sense, the more information that the HIC can extract, the lower the risk of future terrorist attacks. However, as evidenced by the events at Au Ghraib and the controversy surrounding the detainees at Guantanamo Bay,

there is a social cost to extremely harsh forms of interrogation. In the context of our model, w represents the full cost of interrogation. As such, w includes the costs involved with the fact that torture is morally offensive and that harsh interrogation methods can serve as a recruiting tool for the terrorists. Rather than being discrete, we allow these costs to be increasing in the level of intensity used by the HIC. The notion is that once the HIC begins to use a Fear Up (Harsh) or a Separation approach, some (but not all) in the society will recoil at the way detainees are treated. Further increases in the level of intensity cause additional moral revulsion. Moreover, once the harsh practices become public knowledge, terrorists will use this information to undermine the moral authority of the interrogating nation. The point is that the marginal social cost of extreme forms of interrogation can exceed the perceived cost to an interrogator focussed only on extracting information from a detainee. As such, it becomes socially optimal for society to impose firm restrictions on the behavior of interrogators. Of course, some will view these restrictions as "tying the government's hands" in the fight against terrorism. Nevertheless, some restrictions are necessary if HICs select intensity levels such that the marginal value of information obtained exceeds the marginal cost of the interrogation.

It is also the case that the type of interrogation that occurs is important. In the Big 4 game, the HIC selects an intensity level that exceeds the level selected in the Little Fish game (i.e., $\tilde{v} > v^*$). In a sense, there is an internal check on the HIC in the Little Fish game, but not in the Big 4 game. If interrogation is too harsh, the Little Fish game degenerates into the Big 4 game. However, the HIC prefers the Little Fish game since all detainees reveal, at least, $u(0)$ at no cost to the interrogator. Although our model contains a single HIC, unless terrorism abates suddenly, there are likely to be many different HICs operating simultaneously. Of course, these individuals will have different dispositions, different perceptions of the social costs of interrogations, and will be working with detainees knowing very different types of information. Unfortunately, as stated by the Committee of Armed Services (p. xii, 2008), "al Qaeda and Taliban terrorists are taught to expect Americans to abuse them." As such, it is important to establish a clear set of rules so that detainees know that they can play the Little Fish game instead of the Big 4 game.

7 Appendix: Three Sender Types

It is straightforward to generalize the game to allow for multiple players all having different levels of information. In the three-player game, we denote the information set by $\Omega = \{0, 1, 2\}$. The players' strategies are given by

$$\sigma = \begin{bmatrix} 1 & 0 & 0 \\ \sigma_{10} & 1-\sigma_{10} & 0 \\ \sigma_{20} & \sigma_{21} & 1-\sigma_{20}-\sigma_{21} \end{bmatrix} \text{ and } \theta = \begin{bmatrix} \theta_0 & \theta_1 & 0 \end{bmatrix}.$$

For type 1 sender to mix his strategies, we must have $S_{10} = S_{11}$. Let θ_0^1 denote the probability of interrogation given report 0 such that $S_{10} = S_{11}$. We have

$$-(1-\theta_0^1)u(0) - \theta_0^1[pu(1) + (1-p)u(0) + v] = -u(1) - \theta_1 v, \tag{35}$$

or equivalently,

$$\theta_0^1 = \frac{u(1) - u(0) + \theta_1 v}{pu(1) - pu(0) + v}. \tag{36}$$

The above equation implies that for a given θ_1, if the receiver wants type 1 sender to mix his strategies, the receiver must choose $\theta_0 = \theta_0^1$.

For type 2 sender to mix all three strategies, we must have $S_{20} = S_{21} = S_{22}$. Note that $S_{22} = -u(2)$ because $\theta^2 = 0$. Let θ_0^2 and θ_1^2 denote the probability of interrogation given reports 0 and 1 such that $S_{20} = S_{22}$ and $S_{21} = S_{22}$, respectively. We have

$$-(1-\theta_0^2)u(0) - \theta_0^2[pu(2) + (1-p)u(0) + v] = -u(2), \tag{37}$$

and

$$-(1-\theta_1^2)u(1) - \theta_1^2[pu(2) + (1-p)u(1) + v] = -u(2). \tag{38}$$

Therefore,

$$\theta_0^2 = \frac{u(2) - u(0)}{pu(2) - pu(0) + v}, \tag{39}$$

and

$$\theta_1^2 = \frac{u(2) - u(1)}{pu(2) - pu(1) + v}. \tag{40}$$

In general, the receiver has to choose $\theta_0 = \theta_0^1$ or $\theta_0 = \theta_0^2$ (so that type 1 mixes 0 with 1 and that type 2 mixes 0 with 2). The HIC, however, will always choose $\theta_1 = \theta_1^2$ in

equilibrium. Substituting (40) in (36), we have

$$\theta_0^1 = \frac{p[u(2)-u(1)][u(1)-u(0)]+[u(2)-u(0)]v}{[pu(2)-pu(1)+v][pu(1)-pu(0)+v]}. \tag{41}$$

We find that (41) - (39) is positive. So $\theta_0^1 > \theta_0^2$. If $\theta = [\theta_0^1, \theta_1^2, 0]$, then type 1 sender mixes his strategies between 0 and 1 and type 2 sender mixes his strategies between 1 and 2. As such

$$\sigma = \begin{bmatrix} 1 & 0 & 0 \\ \sigma_{10} & 1-\sigma_{10} & 0 \\ 0 & \sigma_{21} & 1-\sigma_{21} \end{bmatrix} \text{ and } \mu = \begin{bmatrix} \frac{p_0}{p_0+\sigma_{10}p_1} & 0 & 0 \\ \frac{\sigma_{10}p_1}{p_0+\sigma_{10}p_1} & \frac{(1-\sigma_{10})p_1}{(1-\sigma_{10})p_1+\sigma_{21}p_2} & 0 \\ 0 & \frac{\sigma_{21}p_2}{(1-\sigma_{10})p_1+\sigma_{21}p_2} & 1 \end{bmatrix}.$$

In order that the HIC be indifferent between interrogating and not interrogating given the receipt of reports 0 and 1, we must have

$$\frac{p_0u(0)+\sigma_{10}p_1[pu(1)+(1-p)u(0)]}{p_0+\sigma_{10}p_1} - w = u(0), \tag{42}$$

and

$$\frac{(1-\sigma_{10})p_1u(1)+\sigma_{21}p_2[pu(2)+(1-p)u(1)]}{(1-\sigma_{10})p_1+\sigma_{21}p_2} - w = u(1). \tag{43}$$

Hence

$$\sigma_{10} = \frac{p_0w}{p_1[pu(1)-pu(0)-w]}, \tag{44}$$

and

$$\sigma_{21} = \frac{p_1(1-\sigma_{10})w}{p_2[pu(2)-pu(1)-w]}. \tag{45}$$

Substituting (44) in (45), we have

$$\sigma_{21} = \frac{\{p_1p[u(1)-u(0)]-(1-p_2)w\}w}{p_2[pu(2)-pu(1)-w][pu(1)-pu(0)-w]}. \tag{46}$$

On the other hand, let the receiver choose a different strategy $\theta = [\theta_0^2, \theta_1^2, 0]$. Then, type 2 sender randomizes among 0, 1, and 2. Since $\theta_0^1 > \theta_0^2$, type 1 sender will always report 0. Upon receiving report 0, the receiver will always interrogate. Upon receiving report 1, the receiver knows with certainty that the sender is of type 2 and hence will always interrogate. Hence, this second strategy is not a perfect Bayesian equilibrium. The point is that the first strategy results in a unique equilibrium.

References

[1] Baccara, M. and H. Bar-Isaac (2009). Interrogation methods and terror networks. In *Mathematical Methods in Counterterrorism*, edited by Nasrullah Memon, Jonathan D. Farley, David L. Hicks, and Torben Rosenorn, (New York: NY: Springer). 271-290.

[2] Banks, H.T., S.L. Grove, K. Ito, and J.A. Toivanen (2006). Static Two-player Evasion-interrogation Games with Uncertainty. *Computational and Applied Mathematics* 25, 289-306.

[3] Canada National Defence: Chief of Force Development (2004). *Code of Conduct After Capture of the Canadian Forces*. www.cfd-cdf.forces.gc.ca/sites/page-eng.asp?page=3485. Last accessed May 1, 2010.

[4] Daily Mail Online (2007). Whatever Happened to Name, Rank and Serial Number? www.dailymail.co.uk/news/ article-445562/Whatever-happened-rank-serial-number.html. Last accessed June 9, 2010.

[5] Dreher, Axel, Martin Gassebner and Lasr-H. Siemers (2010). Does Terror Threaten Human Rights? Evidence from Panel Data. *Journal of Law and Economics*. forthcoming.

[6] Department of the Army (2006). *FM 2-22.3: Human Intellegence Collertor Operations*. Available at www.army.mil/institution/armypublicaffairs/pdf/fm2-22-3.pdf. Last

[7] Department of the Army (1992). *FM 34-52: Intellegence Interrogation*. Available at www.loc.gov/rr/frd/Military_Law/pdf/intel_interrrogation_sept-1992.pdf. Last accessed May 1, 2010.

[8] Enders, Walter and Xuejuan Su (2007). Rational Terrorists and Optimal Network Structure. *Journal of Conflict Resolution* 51, 33-57.

[9] Mialon, H.M. and S.H. Mialon, and M.B. Stinchcombe (2009). Torture in Counterterrorism: Agency Incentives and Slippery Slopes. *Emory University Working Paper*. mimeo.

[10] New York Times (2005). *The Prisoner*. www.nytimes.com/2005/12/25/magazine/25stockdale.html?ex=1293166800&en=73206458c3fd7f6d&ei=5090.

[11] New York Times (2010a). *Times Square Bomb Suspect Waives Rapid Court Hearing*. www.nytimes.com/2010/05/06/nyregion/06bomb.html?hp. Last accessed May 5, 2010

[12] New York Times (2010b). Official Says Terrorism Suspect Is Cooperating. www.nytimes.com/2010/02/03/us/03terror.html. Last accessed June 10, 2010.

[13] Newsweek (2005) *The Debate Over Torture*. www.newsweek.com/id/51198/page/1. Last accessed May 1, 2010.

[14] Regan, P.M. (2010). Torture and International Terrorism. *Binghamton University Working Paper*. mimeo.

[15] Thiessen, M. (2010). *Courting Disaster*. (Regnery Publishing: Wash, D.C.)

[16] United States Senate Committee on Armed Services (2008). *Inquiry Into the Treatment of Detainees in U.S. Custody.* Available at: levin.senate.gov/newsroom/supporting/2008/Detainees.121108.pdf. Last accessed May 5, 2010.

[17] Wantchekon, L. and A. Healy (1999). The 'Game' of Torture. *Journal of Conflict Resolution* 43, 569-609.

Table 1: Selected List of Interrogation Approaches in FM 2-22.3

Direct	HIC asks direct questions. Approach had 90% effectiveness in WWII; 95% effectiveness in Vietnam, Grenada, (1983), Panama, (1989), and Kuwait and Iraq (1991). Dramatically less successful in Iraq and Afghanistan.
Incentive	Trading something (material reward, emotional reward, removal of a real or perceived negative stimulus) for information. HIC should not offer anything that is not in his power to give.
Emotional Love	HIC focuses on the anxiety felt by the source about his current circumstances, isolation from those he loves, and feelings of helplessness. For example, if the source cooperates, he can see his family sooner, end the war, protect his comrades, help his country, help his ethnic group.
Emotional Hate	Identify the object of the source's hate and build on those feelings so the emotion overrides the source's rational side. The source may have negative feelings about his country's regime, immediate superiors, officers in general, or fellow soldiers.
Fear-Up	HIC identifies a preexisting fear or creates a fear within the source. He then links the elimination or reduction of the fear to cooperation. Example: "We have heard allegations of atrocities committed in your area and anyone that was involved will be severely punished. If you cooperate with me and answer all of my questions truthfully, I can make sure you are not falsely accused."
Fear-Down	HIC mitigates existing fear in exchange for cooperation.
Emotional-Pride and Ego-Up	Source is flattered into providing information to gain credit and build his ego. Example, the HIC states: "This was a smooth operation. I have seen many previous attempts fail. I bet you planned this. When did you first decide to do the job?"
Emotional-Pride and Ego-Down	HIC attacks the source's ego or self-image. The source, in defending his ego, reveals information to justify or rationalize his actions. Example: "Why did you surrender so easily when you could have escaped by crossing the nearby ford in the river?"
Emotional-Futility	HIC convinces the source that resistance to questioning is futile. Example "it is hopeless for your forces to continue fighting because they can no longer get supplies, but you can help end the war and their suffering."
Establish Your Identity	HIC insists the detainee is an infamous individual wanted by higher authorities on serious charges. In an effort to clear himself of this allegation, the source makes a genuine and detailed effort to establish or substantiate his true identity.
	THESE THREE APPROACHES REQUIRE ADDITIONAL AUTHORIZATION
Mutt and Jeff	Make the source identify with one of the interrogators and thereby establish rapport and cooperation. HIC does not to threaten or coerce the source. Planned use of the Mutt and Jeff approach must be approved by the interrogator's chain of command.
False Flag	HIC convinces detainee that individuals from a country other than the U.S. are interrogating him, and trick the detainee into cooperating with U.S. forces. For example, making the detainee believe that he is actually talking to representatives from a different country, such as a country that is friendly to the detainee's country or organization.
Separation	Denies detainee the ability to communicate with others in order to keep him from learning counter-resistance techniques or gathering information to support a cover story. Separation can be used during the interrogation of specific unlawful enemy combatants for whom proper approvals have been granted. It may not be employed on detainees covered by the Geneva Conventions.

Figure 1: The Little Fish Game

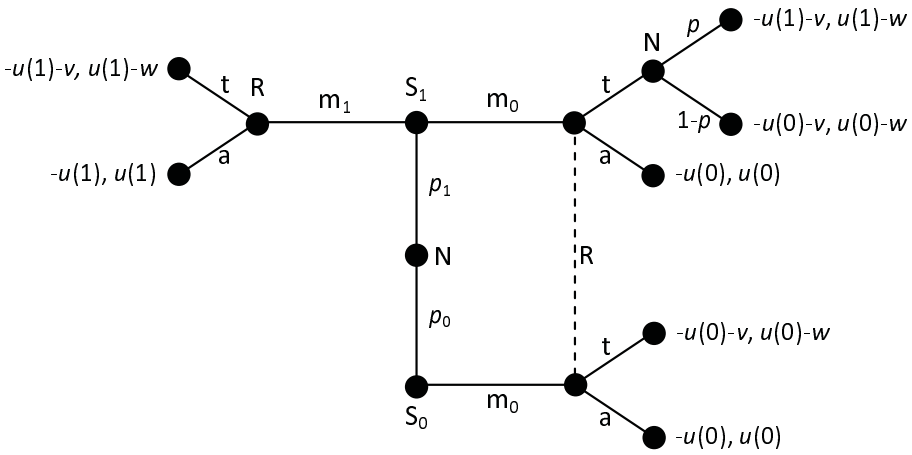

Figure 2: Differential Value to the HIC and Values of *p* and Δ

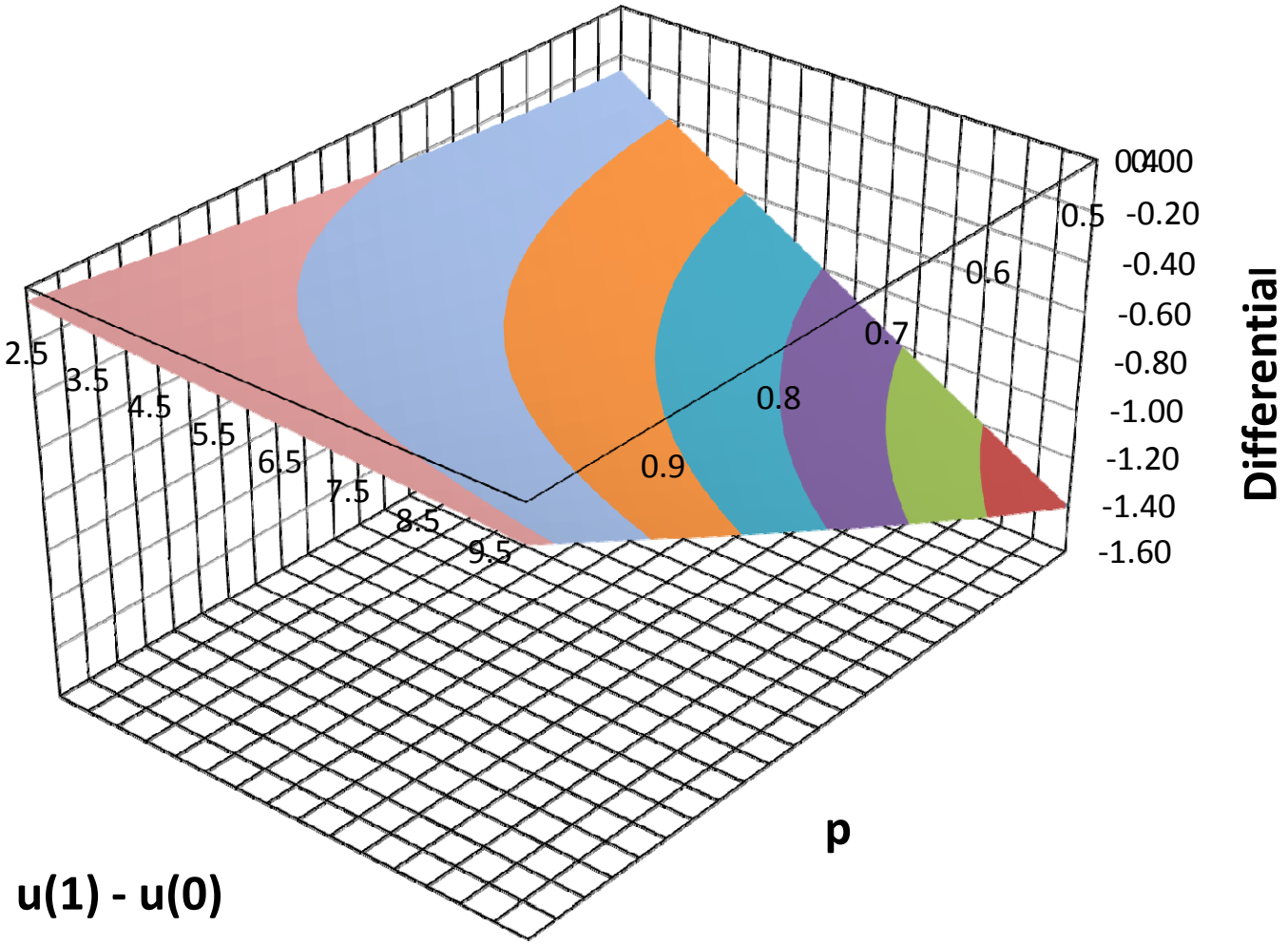

Figure 3: Differential Value to the HIC and Values of p_1 and w

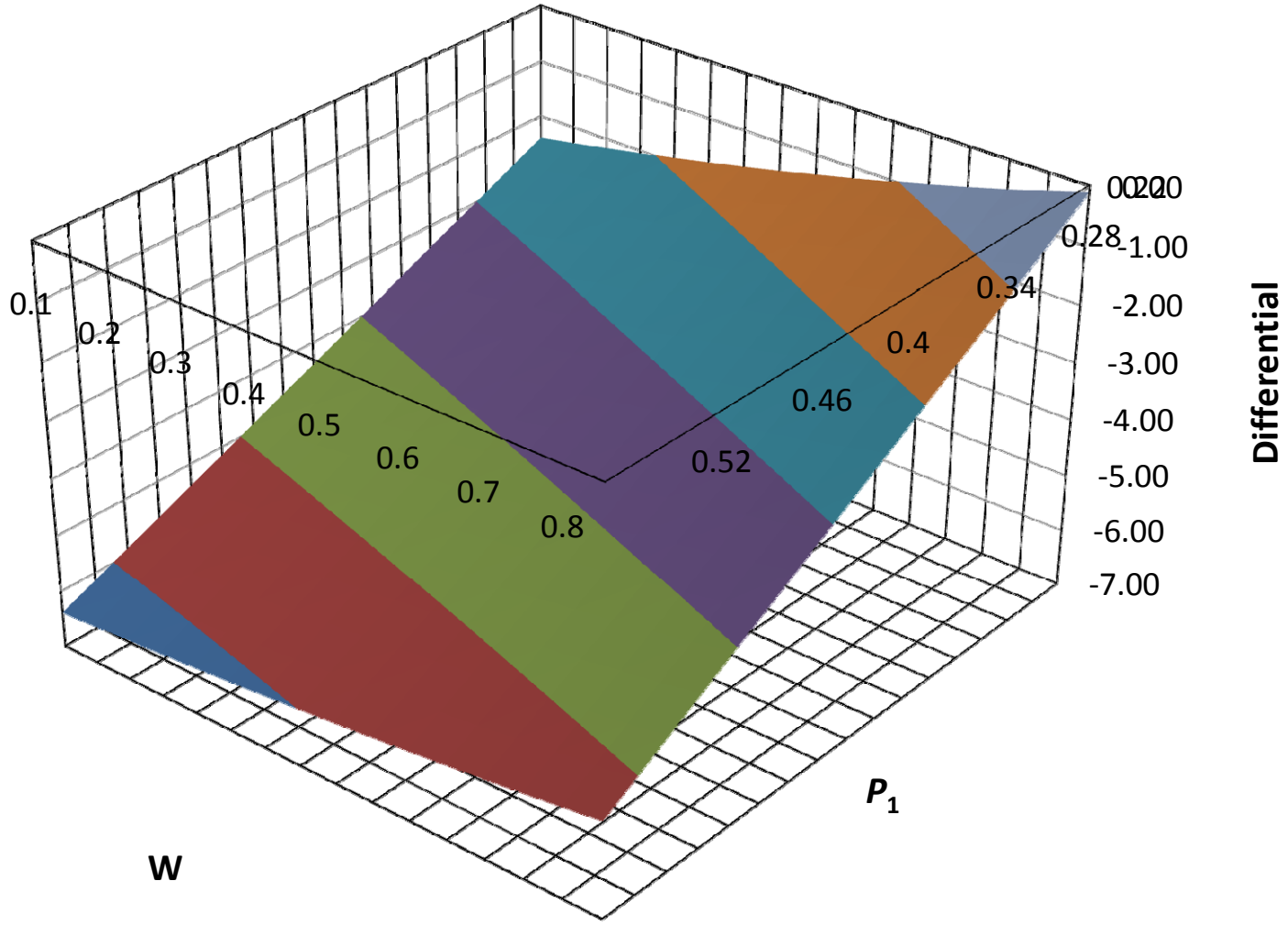

Figure 4: Differential Cost to Detainee and Values of *p* and Δ

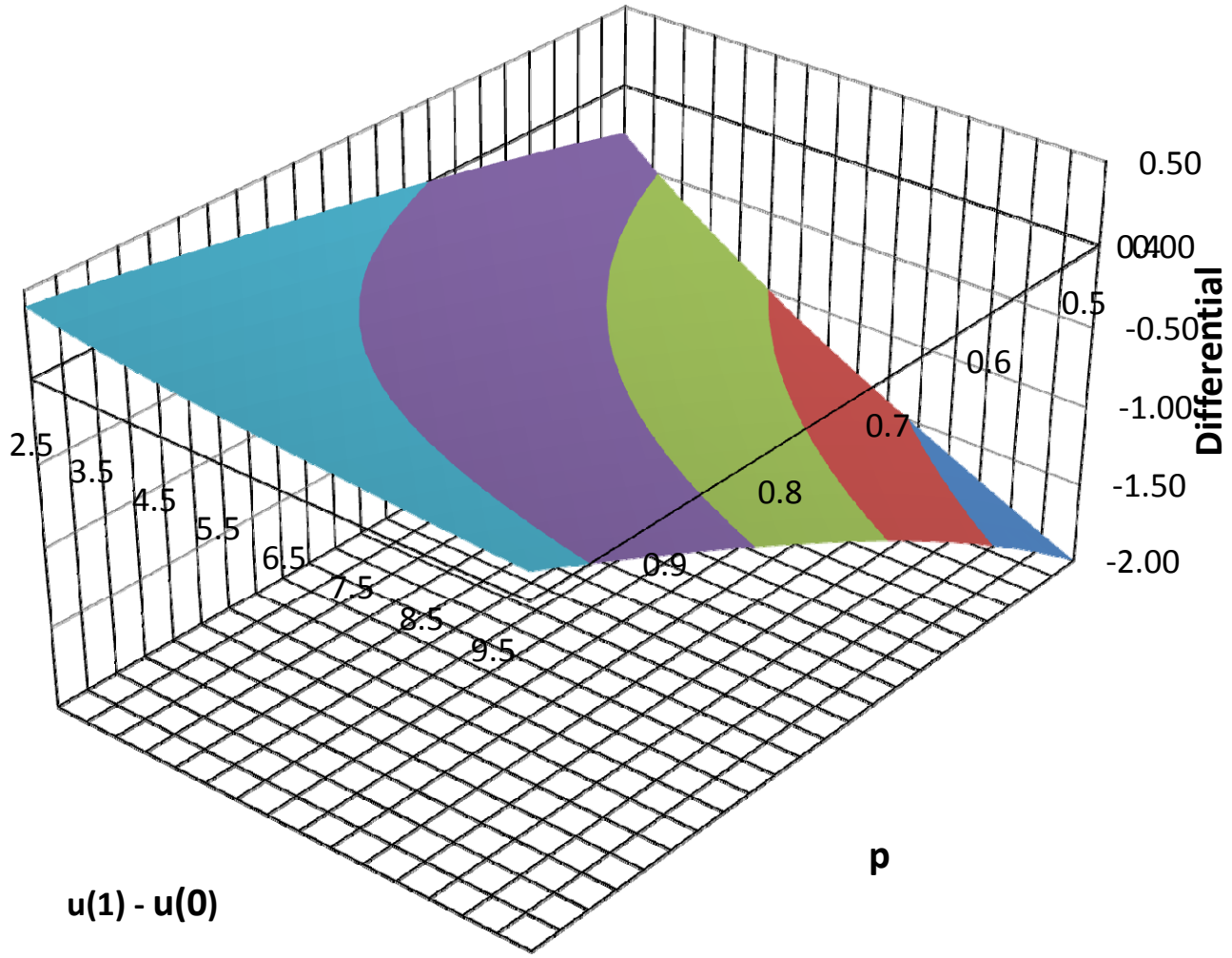

Figure 5: Differential Cost to Detainee and Values of p_1 and v

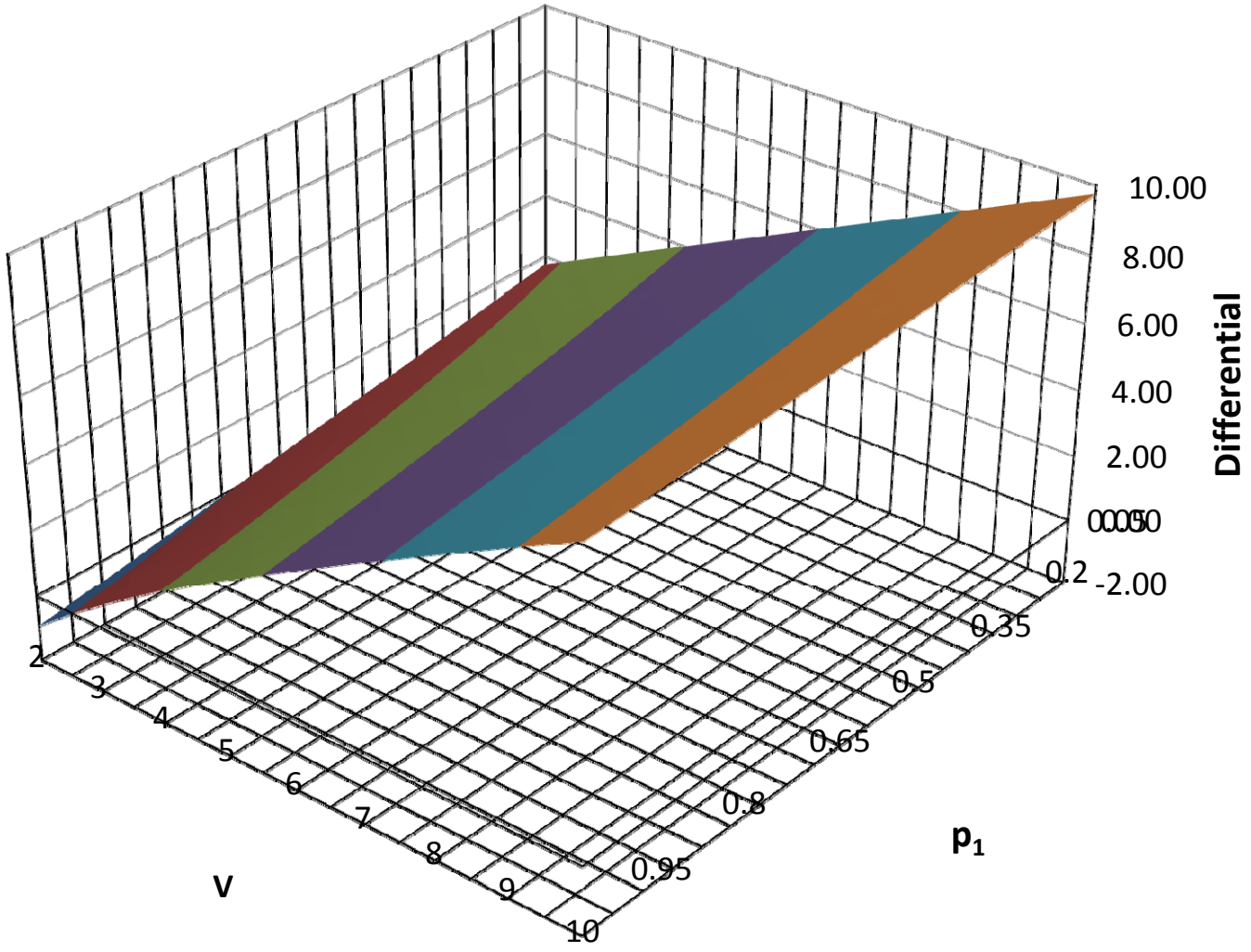

Figure 6: Differential Value of Information and Values of *p* and Δ

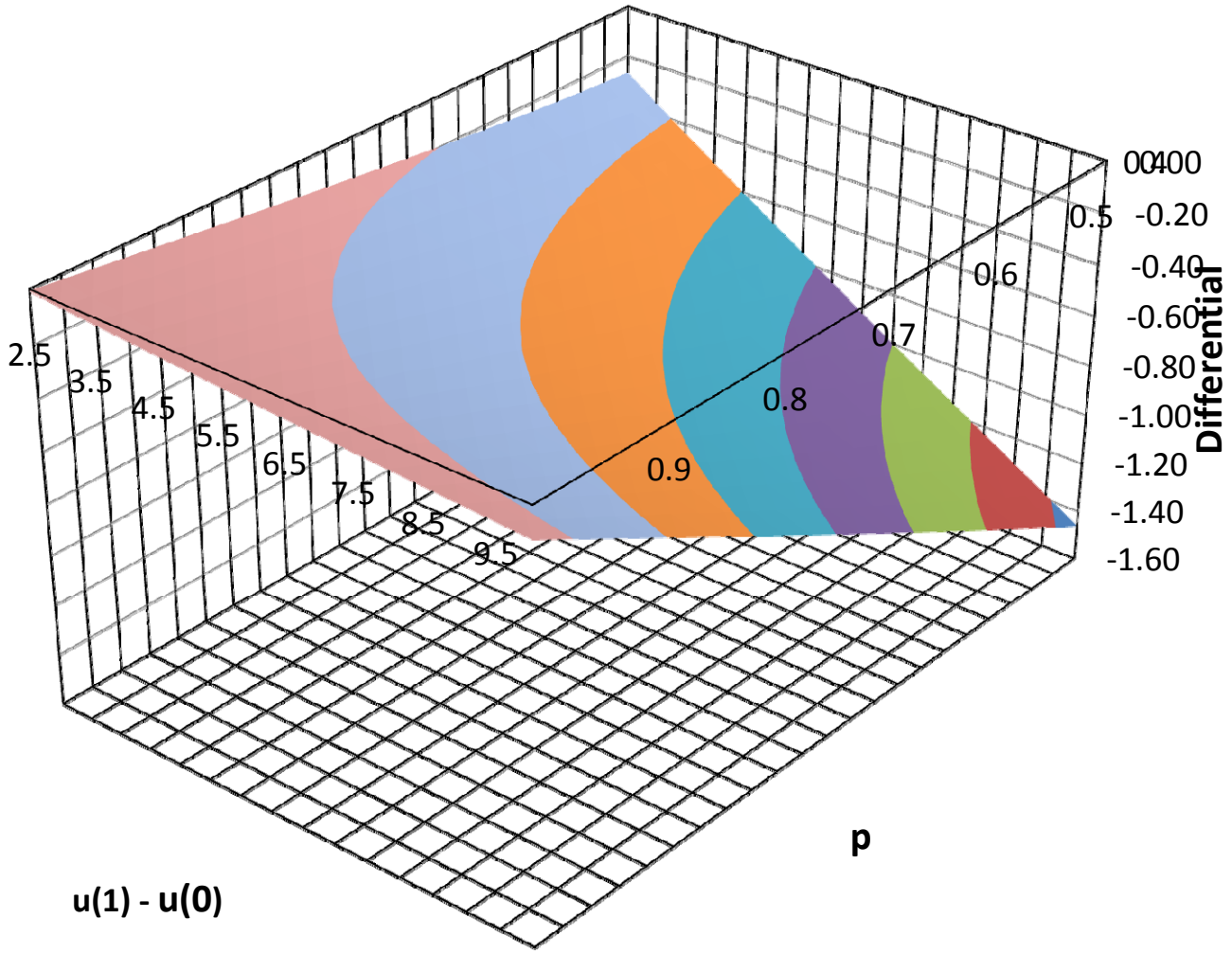

Figure 7: Differential Value of Information and Values of *v* and *w*