

**EXAMINING THE BIBLICAL PERSPECTIVE ON THE ENVIRONMENT IN A COSTLY
CONTRACTING FRAMEWORK**

P. V. VISWANATH
Lubin School of Business
Pace University
1, Pace Plaza
New York, NY 10038
Tel: (212) 346-1817
Fax: (212) 346-1573
E-mail: pviswanath@pace.edu
Web: <http://webpage.pace.edu/pviswanath>

and

MICHAEL SZENBERG
Lubin School of Business
Pace University
1, Pace Plaza
New York, NY 10038
Tel: (212) 346-1921
Fax: (212) 346-1573

June 2002

Forthcoming in Carmel Chiswick and Tikva Lehrer (eds.), *Economics of Judaism*, Bar Ilan
University Press, 2003.

We thank Zal Suldán for helpful comments on an earlier draft.

EXAMINING THE BIBLICAL PERSPECTIVE ON THE ENVIRONMENT IN A COSTLY CONTRACTING FRAMEWORK

Abstract

Jews have been living under the laws of the Bible for several millennia. Hence it is reasonable to hypothesize that these laws are, in some sense, optimal and to analyze them from an optimization perspective. In this paper, we look at the laws in the Bible that apply to environmental matters. We construct a paradigm, wherein God decides on the optimal set of laws to provide mankind. We assume that His Laws must satisfy a comprehensibility criterion and set out a costly contracting framework that would allow us to distinguish between areas where He would choose to set out laws in detail, areas where he would choose to set out general statements, and areas which He would leave to the rabbis to formulate in the light of an expanded human knowledge base.

We suggest that God's solution as embodied in the Bible possesses the following general characteristics. When the optimality of a certain action is clear, given the information set in antiquity, the Bible prescribes detailed laws; when the optimal action depends on other conditions that may not be observable by human beings with a certain knowledge base, the Bible lays out general prescriptions and proscriptions; and when the knowledge base of the first generation of human beings receiving the Word of God was too sparse, He considered it best to leave legislation to rabbinic exegesis and legislation.

Our approach explains two difficult aspects of divine legislation: one, the seeming suboptimality of some laws included in the Bible; and two, why there are differing levels of detail in Biblical Law. We then look at a set of laws in the Bible that might be construed as having environmental content, and examine the consistency between these laws and the implications of our theory.

EXAMINING THE BIBLICAL PERSPECTIVE ON THE ENVIRONMENT IN A COSTLY CONTRACTING FRAMEWORK

I. Introduction

Human beings, in the course of their interactions, frequently act in order to maximize their own well-being. This sometimes leads to situations comparable to a paradigm that is known as the Prisoner's Dilemma.¹ That is, the different parties involved end up taking actions that are undesirable for all of them, even though there are alternatives that would have beneficial outcomes for all of them. The reason is that if any party unilaterally chose the beneficial action, the other parties would gain by choosing the less desirable action. The key, then, is that all of them have to simultaneously choose the beneficial action in order to derive the benefits but they all have incentives to choose the less desirable action, which impoverishes all of them.

¹ The **prisoner's dilemma** is a game invented at Princeton's Institute of Advanced Science in the 1950's. In the basic scenario after which it is named, two prisoners who the police know to have committed crime A, but whom they wish to convict of the more serious crime B, are held in separate cells and offered a deal:

- o The one who testifies implicating the other in crime B will go free, while the other will receive 3 years in prison (the "sucker's payoff").
- o If they both testify against each other, each will receive two years.
- o If they both remain silent, they will both be convicted of crime A and serve one year.

Thus there are two choices--usually known as to cooperate, in this scenario remain silent, or to defect, which here means to confess. And there are four possible outcomes, depending on your partner's move: you may serve 0, 1, 2 or 3 years in prison.

Cooperation either means you serve one or three years. The results of defection straddle this: you may serve 0 or 2 years. Because you do not know whether you can trust your partner (there is no opportunity to communicate when deciding your move), most rational players will choose to defect in order to maximize the upside (0 years) and minimize the downside (only 2 years instead of 3). Yet the outcome consistently is better for two cooperating players than for two defecting players. (Tyson (1995); also found at <http://www.spectacle.org/995/pd.html>)

One well-known application of the Prisoner's Dilemma is the Tragedy of the Commons. This relates to the tendency of commonly owned pasture land to be overgrazed. Even if all the shepherds in the region decided to restrict the number of animals that they let loose to graze on the commons, there would be a great incentive for any one farmer to violate the agreement, since the benefit of allowing his additional animal to graze is all his, while the cost, due to overgrazing is shared by all the shepherds.²

Because the world is owned (or at least enjoyed) in common by mankind, problems relating to the environment tend to have externalities and there is the tendency to misuse environmental resources. Many of these environmental problems have been

² The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility *to me* of adding one more animal to my herd?" This utility has one negative and one positive component.

- a. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly + 1.
- b. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsman, the negative utility for any particular decision-making herdsman is only a fraction of - 1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another.... But this is the conclusion reached by each and every rational herdsman sharing a commons. (Taken from Hardin's (1968) expostulation of the problem originally presented by William Forster Lloyd (1794-1852).

addressed by various philosophers and economists³ with varied prescriptions. In a sense, the problem would be easily solved if everybody would agree to a common set of rules in the use of environmental resources and thereafter abide by them. Obviously, this solution is not so simple because it is not always clear as to what this common set of “optimal” rules should be, and furthermore, who could be trusted to enforce the rules!

In this paper, we suggest that the Bible⁴ represents an effort to address the problem of common use of environmental resources. The essence of our argument will be that the Bible is to be treated as a sort of Constitution that we can think of either as being adopted by a set of human beings or as being given by God.⁵ With the second interpretation, the question of enforcement of the rules becomes somewhat less important, since, for most believers, the expected benefit from following the rules is sufficiently high that following the rules becomes optimal.⁶ In any case, we restrict ourselves to the question of the right set of rules to be adopted ab initio. In what follows, we adopt the second alternative since we do not really address the enforcement question (aside from some comments), and since the Bible is believed by many people to be the Word of God.

In order to better understand the approach of the Bible, we will model God as an economic agent, who maximizes a utility function, which is increasing in human welfare.

³ See <http://members.aol.com/trajcom/private/trajcom.htm> for a collection of articles related to the problem of the Commons.

⁴ In what follows, we use the term Bible primarily to refer to the Five Books of Moses.

⁵ Jewish commentators categorize Biblical laws as either *beyn adam le-khaveyro*, between man and fellow-man or *beyn adam le-makom*, between man and God. Given our interest in the use of laws to resolve externality problems, we are concerned here with the first category of laws.

⁶ And if you accept Pascal’s wager, this is true for non-believers as well. Cf., though, <http://www.update.uu.se/%7Efbandz/nogod/pascal.htm> for convincing refutations.

This will necessitate the use of language, which seems to be prescriptive, such as, for example, discussing which actions are optimal for God. However, our approach is not meant to be prescriptive at all. Rather, we approach our problem in a positivistic manner, with the goal of describing the Bible as well as possible; this issue is discussed in more detail in Appendix B. Section II lays out a formalization of the problem faced by God in laying out an optimal set of laws. Section III briefly develops the implications of the model, and tries to present the evidence from the environmental field. Section IV concludes.

II. A Formalization of the Biblical Approach

The problem then is for God to come up with a set of optimal rules for circumstances where human actions have significant externalities, such as the use of the environment. Of course, since most views of God ascribe omniscience to Him,⁷ the original problem we raised – that of not knowing what the globally optimal set of rules are – does not really apply to Him. However, these rules have to be interpreted and implemented and followed by human beings and they would lack the ability to do this unless they actually had the same information set as the Creator. Hence, God faces the problem of coming up with an optimal set of rules that could maximize human welfare, subject to the constraint that they should be comprehensible to human beings.

However, in addition to being sufficiently comprehensible to human beings in the sense that they should be able to follow it, we also impose the condition that the rules

⁷ Again, for convenience, we will use the masculine gender, although in most religions following the Bible, God exists outside the notion of gender and form. (See the third of the thirteen principles of faith, summarized in most Orthodox prayer books, right after the section on the weekly morning prayers; cf. for example, *The Complete ArtScroll Siddur* (1985, p. 179))

should make sense to the generation of human beings for whom the legislation is intended. Of course, this makes complete sense in the Human Interpretation, but, one may ask, why should we impose this restriction in the Divine Interpretation. In Jewish tradition, the laws or commandments of the Bible are divided into *dinim* and *khukim*, variously interpreted as laws whose rationale can be comprehended by human beings, and laws whose rationale cannot be comprehended by humans. Some biblical commentators interpret the comprehensibility requirement simply as a statement that with the appropriate knowledge, *dinim* laws can be understood by the human mind, while *khukim* laws can never be understood by human beings. This allows for the possibility that some generations, who have a limited ability to understand some aspects of nature, would not be able to comprehend *dinim* laws. However, according to many commentators, such as the Rambam,⁸ one of the fundamental commandments is to study the commandments/laws and to try to understand them. Inherent in this is the requirement that the laws are capable of being understood. Laws that are *ben adam le-khaveyro*, between man and fellow-man, including the environmental laws that we deal with in this paper are understood by most commentators, to fall in the category of *dinim* laws, and, as such, it would be appropriate to impose the comprehensibility requirement, even in the Divine Interpretation.⁹ In any case, we impose this additional restriction in our formulation of God's problem.¹⁰

⁸ Moshe ben Maimon (12th century), practiced as a jurist and physician in the court of the Fatimid Caliph in Egypt; also known as Maimonides.

⁹ In fact, the very categorization of a law as an environmental law would seem to imply that it has an (at least partly) understandable purpose. On the other hand, many commentators put the law of *sha'atnez* (the prohibition on wearing clothes made of a mixture of woollen and linen fibres), which one may think of as an extension of the law against interbreeding, and hence an environmental law, in the category of *khukim*.

¹⁰ The *Sefer haKhinukh*, a compendium of the laws of the Torah, compiled ostensibly by R. Aharon haLevi of Barcelona, has this to say regarding the comprehensibility doctrine (in the middle of his discussion on the prohibition on mating

A: The Model

God's problem at the time of the giving of the Bible, can now be formulated thus:

$$\text{Max}_{\Phi} F(HW_1(\Phi), HW_2(\Phi), \dots, HW_t(\Phi)),$$

such that $\Phi \in I_1$,

where HW_i represents human welfare in the i^{th} generation, which depends on Φ_i , the initial set of commandments formulated by God at the time of the giving of the Bible to the first generation after Egypt.¹¹ F is a super Human Welfare function that God uses to aggregate the human welfare of different generations, and $x \in y$ indicates that x is comprehensible to individuals with the information set y , where an information set is to be interpreted as a function mapping the set of actions, A , to the set of consequences. I_1 is the information set available to the first generation, that is, in the Biblical context, the generation to whom the Bible was initially given. Note that an act is defined here, as an act in a context. Thus, killing, per se, is not defined as an act; rather, killing a mammal that chews its cud and has split hooves, and that has no offspring, etc. on *shabbat* – that would be defined as an act. Hence, killing, per se, would be a collection of acts. The set

two animals of different species; taken from Charles Wengrov's translation, Feldheim Publishers):

The Torah, however, speaks to people in words understandable to them, and ascribes to the Eternal Lord, thinks like those which are ascribed to them. For it is impossible to speak with a human being in any other terms but those known to him, because who will understand what it does not lie in his power to understand?

¹¹ Even though it might seem strange to give God a utility function as if He were part of the species *homo economicus*, nevertheless, the strangeness is solely in the formal fact of giving him a utility function. In essence, all we are saying is that he cares for the welfare of his creation. As it says in Psalms 145, v. 9, "God is good to all; His mercies are on all His works," and again in v. 16, "You open Your hand, and satisfy the desire of every living thing." All translations from the Bible are from the Stone Edition *Tanach*. However, wherever the Stone Edition uses the word HaShem (the Name) to refer to the Deity, it has changed to God, for increased comprehensibility.

Φ of commandments can then be usefully interpreted as a mapping from the set of actions, A to a set of penalties or punishments, P .

Clearly, the comprehensibility requirement as used here is quite vague, and could encompass a whole range of interpretations. We now suggest a specific interpretation that is easy to understand and not unreasonable, given our earlier discussion. Assuming that the acts of previous generations of human beings affects the welfare of current and future generations, the restated problem with the specific interpretation of the comprehensibility requirement is as follows:

$$\underset{\Phi}{Max} F(HW_1, HW_2, \dots, HW_t)$$

$$\text{where } HW_1 = HW_1 \left(\int_{\gamma_1} \gamma_1 (a_1^*(\Phi)) f_1(\gamma_1) d\gamma_1 \right),$$

$$HW_2 = HW_2 \left(\int_{\gamma_2} \gamma_2 (a_2^*(\Phi, a_1^*)) f_2(\gamma_2; a_2^*) d\gamma_2 \right), \dots,$$

$$HW_t = HW_t \left(\int_{\gamma_t} \gamma_t (a_t^*(\Phi, a_{t-1}^*, \dots, a_1^*)) f_t(\gamma_t; a_t^*) d\gamma_t \right)$$

$$a_i^* = \arg \max_{a_i} U(a_i; \Phi) \text{ for all } i = 1, \dots, t$$

$f_i(\cdot)$ represents the density function over the societal consequences γ_i , and $U(\cdot)$ is the common individual utility function that all human beings maximize in order to decide how to act. Under the comprehensibility requirement that we propose here, God takes into account in His super Human Welfare function, F , the same density functions, f_i , for each generation, as is known to the human beings of that generation; for example, f_i is the

density function of the societal consequences as known and understood by the i^{th} generation, given their knowledge base.¹²

At this point, we need to clarify the optimization problem of the individual. Clearly, the individual takes into account the laws and the attached penalties in his decision-making. However, the essence of the problem that we are discussing here is the fact that an individual's acts in the environmental realm have private costs that are less than the societal costs. This means that the individual would not use the public or societal consequence function, γ , that we have in the *HW* function. Rather than model the individual's decision making and the resulting societal problems in detail, we simply assume that the individual utility function, U , incorporates the benefits of the individual's acts, a , and the private costs, as well as the divinely ordained penalties for various acts, as embodied in the Law.¹³ In particular, then, the individual, while he may be aware of the societal consequence function, γ , and its density, f , does not use it in his decision-making. Rather his behavior is Nash, which takes other individuals' actions as given.

The simple solution to this problem is that God should set out the most detailed laws that maximize human welfare over all time, and that are consistent with the requirement that the laws be comprehensible to the initial generation receiving the Bible.¹⁴ If the global optimal solution to a particular environmental problem is within

¹² Note that a given generation may not be able to distinguish between acts and, hence, between their consequences. For example, invisible heart defects may not be observable without the appropriate measuring devices, and hence a generation without such devices may not realize that banging on a person's heart is dangerous only if he has a certain kind of heart defect.

¹³ We will, sometimes, use Law with a capital L to indicate the set of laws, Φ_0 .

¹⁴ The requirement is that the details of the laws are comprehensible to the people. Most people would accept that our scientific knowledge today is better than the scientific knowledge of earlier generations; this means that earlier generations would not have understood laws that were formulated using physical and other scientific concepts

the comprehension of the initial generation, then that would be incorporated into the set of Biblical commandments. This global optimal solution is defined as follows. Denote by Φ_n , the solution to God's problem, above, under the constraint $\Phi \in I_n$ (rather than $\Phi \in I_1$); that is, the laws that God would set out if He were giving His commandments to the n^{th} generation of human beings, counting from the generation that left Egypt. Then global optimal solution refers to the optimal solution to God's problem under the constraint $\Phi \in \lim_{n \rightarrow \infty} I_n$, call it Φ^∞ .

In any case, it is clear that God's solution to the above problem will depend upon the knowledge base of the generation to which He is giving His commandments. We can now make the following reasonable statement. Suppose the set of consequence functions over time, $\gamma_1(a), \gamma_2(a), \dots, \gamma_n(a), \dots$ possess the characteristic that the consequence function of a later generation is described by a finer partition of the act set A, than that of an earlier generation. That is, for each generation, if we partition the set A into subsets, A_i , such that the consequence $\gamma(a)$ of all acts $a \in A_i$ are the same, such a partition would be finer for the $n+1^{\text{st}}$ generation than for the n^{th} generation.¹⁵ Then, it is reasonable to assume that the commandments in the set Φ_n would be less detailed than those in the set Φ_{n+1} .

that we know about, but that were not known to them. For example, a law using terms such as genes and DNA would not have been understood by the people of the first generation. There is no implication that earlier generations were deficient in their understanding of logic, or were in any way less rational than later generations.

¹⁵ A simple, but imprecise way of explaining this assumption is in this way – reality is, in its nature, complex; and, as time goes by, humankind better understands this complexity. Of course, this is not to say that every generation believes that reality is more complex than the previous generation, but we presume that it is, by and large, so. This characterization is broadly consistent with casual empiricism. Note that this characterization of our model is not meant to apply to Jewish knowledge; rather, it applies to scientific and technological knowledge – that is, knowledge of the relationships between physical causes and effects.

We will return to this question later in the next chapter. However, for now, under God's problem as we have currently defined it, He has to come up with a set of laws that is comprehensible to the people of the very first generation with their limited knowledge.

B: The Role of the Rabbis

The difficulty, however, is that such a set of laws would be pretty restrictive in terms of its ability to favorably impact the generations of mankind. These laws would have to be phrased in terms of very general commandments, which, after the first couple of generations, would not impose serious restrictions on human behavior and hence would not constitute useful solutions to environmental problems. One alternative would be to update the Constitution/Bible continuously. Thus, as soon as human beings acquire knowledge about the environment, that knowledge would be incorporated into the laws. For example, suppose human beings realized that engineering of human genes was dangerous, because of the possibility of uncontrolled growth of rogue genes, God would modify the Bible to prohibit genetic engineering. Later on, when more information became available as to the precise circumstances in which rogue gene growth would be possible, genetic engineering would be permitted to the extent to which it would be safe.

However, if we consider that the cost of continuous revelation is high, particularly given the restriction on free will, it is clear that God would want an alternative mechanism that would be intermittent rather than continuous.¹⁶ Furthermore, since human knowledge is probabilistic, it would be unrealistic to imagine that the

¹⁶ One question that arises, here, is: Why did revelation cease in Israel? According to the Jewish tradition, there were prophets that revealed the Word of God to Israel, up to a certain point in time, when revelation ceased. Of course, the prophets were not given modifications to the Bible, and it is not clear if they even interpreted the Bible in the way that the rabbis of the Talmud (and current day rabbis) did.

commandments could be modified in such a precise manner as envisioned in the previous paragraph. Thus, sometimes, human beings believe that they have discovered truths that turn out, on further inspection, to be false. Hence, incorporation of laws depending on a given body of knowledge would be optimal only if the probability of the correctness of that body of knowledge passed a certain critical value.¹⁷ However, even under this process, it would be possible for the body of knowledge to be eventually demonstrated to be false, and hence for the incorporated laws to require excision.¹⁸ Clearly, excision of laws revealed directly by God would clearly be undesirable, especially considering the effect on human belief in the validity of the Law.

Hence, God would have to set in place a *process* for the modification of His laws through human intervention. This process would result in the gradual, but intermittent modification of the Biblical laws.¹⁹ These intermittent (re)interpretations of the Law can

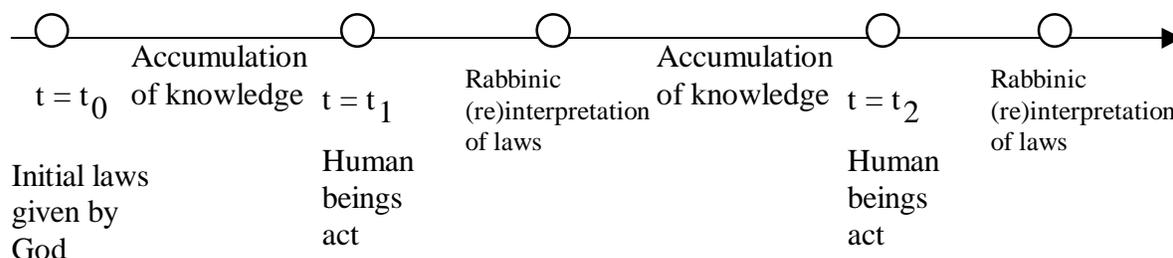
¹⁷ The focus on rules can be related to implicit contracts – the inability to precisely specify costs and benefits up front, even in a probabilistic sense (Knightian uncertainty). This leads to the question of when we have rules and when we have standards. See Eastman and Viswanath (1999).

¹⁸ Excision refers to the case of a law which originally explicitly says that act *a* is forbidden and then is changed to read that act *a* is permitted. Exceptions to the principle of “no excision” do exist, but they are applied sparingly; these involve the principles of *sheyv ve-al ta’aseh* and *’eyt la’asot*. The principle of *sheyv ve-al ta’aseh*, allows the setting aside of a positive commandment in order to prevent a potential greater violation of the Law, while the principle of *et la’asot* allows the performance of an action that is prohibited by Biblical law. The best example of the latter is the decision by R. Judah ha-Nasi allowing the Oral Law to be written down, so that it should not be forgotten by the generations. (This was originally forbidden.)

However, the principle of “no excision” does allow the following sort of reinterpretation: Suppose a set of acts {*a*} defined by some common characteristic is originally forbidden; then, this could be changed to read that only the act $a_0 \in \{a\}$ is forbidden, while all others are permitted.

¹⁹ Since excision of even these human (but divinely directed) modifications to the laws would be undesirable, the standard of proof required of a body of knowledge would be relatively high. Nevertheless, it would still be possible, at times, for these laws to require excision; however, these occasions would be relatively rare. Furthermore,

be identified with various kinds of rabbinical enactments of various kinds, *gezeyrot*, *takanot*, *piskei din*. This process is illustrated in the following time line.



The rabbinic modification of laws takes place mainly as a result of human actions. As a result of the accumulation of knowledge, human beings discover new areas of disagreement with each other that cannot be resolved using existing law. As a result, they go to the rabbis for clarification of the laws. This results in rabbinic interpretation of the Law, which can now be used as an accretion to the existing Law. In order to allow and facilitate rabbinic interpretation, the original Revelation would have to include certain elements: one, a commandment for His people to listen to, and obey, His jurists, i.e. the rabbis;²⁰ and two, tools that the rabbis can use to interpret His desires. In the second set, could be included the various hermeneutic principles, such as the Thirteen rules for the elucidation of the Law,²¹ as well as general principles, such as the rule of majority,²² the rules for dealing with probabilities, etc.²³

given the fuzzily divine origin of these modifications, God could not permit actual, explicit innovations in His laws. Rather, only modifications that could be classified as interpretations or reinterpretations, that were broadly consistent with previous precedents would be permitted.

²⁰ Negative commandment 312 of the Rambam derived from Deuteronomy 17:11, usually abbreviated in the Hebrew phrase, '*lo tasur*.' "According to the teaching that they will teach you and according to the judgment that they will say to you, shall you do; you shall not deviate from the word that they will tell you, right or left." (Deuteronomy, 17:11)

²¹ See the Introduction to *Sifra*, a midrashic work that interprets the Book of Leviticus.

If we allow for the possibility of Biblical reinterpretation, God now has two alternatives for each area of legislation, an ex-ante alternative and an ex-post alternative: one, to ex-ante explicitly provide a list of permitted actions and a list of forbidden actions with their associated punishments, and two, to leave the issue to ex-post rabbinic interpretation of the Law, following the different hermeneutic and other principles. The advantage of the ex-ante alternative is that there is small chance of the commandment being misunderstood. A statement like: “A man who lies carnally with another man shall die”²⁴ has very little chance of being misunderstood. On the other hand, if the law being

²² *Akharei rabim lehattot*. This principle is exegetically inferred by from Exodus 23:2, “Do not be a follower of the majority for evil; and do not respond to a grievance by yielding to the majority to pervert [the law].”

²³ There are two major principles that lay out the rules for dealing with probabilities; both are found in the Babylonian Talmud, Tractate Ketubot, 15a. The first one is *Kol de-parish, me-ruba parish*, and the second one is *kol kavu’a, ke-mekhtseh al mekhtseh dami*. Brief explanations of these rules are given below, based on *Background on the Daily Daf*, published by Kollel Iyun haDaf, Jerusalem, Israel.

Kol de-parish, me-ruba parish: When there is a doubt as to the source of a certain item, i.e. from where it comes or to which group it belongs, this rule tells us to assume that an item comes from the largest group. For instance, if a piece of meat is found lying on the street (or in the hands of a non-Jew in the street), and most of the meat in the town is kosher, it can be assumed that the meat came from a kosher source. The rule of *halokh akhar ha-rov* or “go with the majority,” (Babylonian Talmud, Tractate Khullin, 11a) then renders the meat permissible for consumption by Jews. The principle of *halokh akhar ha-rov* is based on Exodus 23:2 (see footnote 22 **Error! Main Document Only**.above).

Kol kavu’a, ke-mekhtseh al mekhtseh dami. If, however, the nature of the item is in doubt while it is still “in its place,” or *kavu’a*, (i.e. it was not separated from the other items of its kind), we do not follow the *rov*. Instead, we remain in doubt as to the status of the item. For instance, if a person buys meat and then forgets whether he bought it at a kosher or non-kosher store, we cannot assume that the meat is kosher just because most of the stores in the town are kosher, since we are questioning its status while it is still in its proper place (i.e. the store) before it was separated from the other pieces of meat in the store.

²⁴ You shall not lie with a man as one lies with a woman, it is an abomination,” (Leviticus 18:22) and “A man who lies with a woman as one lies with a woman, they have both done an abomination; they shall be put to death, their blood is upon themselves. (Leviticus 20:13)

propounded needs to include many conditions that are not yet within the knowledge base of the first generation, God may need to state it in much more general terms.²⁵ While this may be better than the alternative of leaving the issue unlegislated, there may be situations where the blanket commandment might lead to globally undesirable outcomes.

For example, one might imagine that a blanket prohibition on usury (lending at interest, not necessarily exorbitant) would be suboptimal. Debt finance might be the only possible way of raising funds in certain circumstances, such as if state verification costs are high.²⁶ Furthermore, only debt might provide the risk-sharing desired by lenders and borrowers. However, the agency costs of debt finance (such as taking excessive risk) may be very high.²⁷ Furthermore, by encouraging actions by businessmen that are based on the expropriation of wealth from others, there may be a weakening of the social fiber.²⁸

²⁵ Katz (1989) makes an interesting comment in terms of the usefulness of a certain responsum of R. Meir of Rothenburg in 13th century Germany. The issue is the permissibility of employing a non-Jew to collect taxes on the Sabbath, an action forbidden to a Jew, for the purpose of avoiding a monetary loss to the Jew. He writes regarding the style and wording of the responsum: "... the analogy with the concrete example and the reliance on the principle underlying it are intertwined. If instead of ruling in the case of the tax collector, R. Meir of Rothenburg had ruled that any prevention of future profit ... would justify overriding the ban on 'telling a Gentile,' he would have done away with the doubts surrounding the meaning of his decision. In so doing, however, he would have deviated from the talmudic casuistic method and impeded the way to future development of halakhic decisions, for the relative flexibility of halakhah derived from its lack of systematization."

Although the discussion here is in terms of Talmudic and post-Talmudic legislation, the style used in the Bible is also similar: a very good example is that of the prohibition on destroying fruit trees in Deuteronomy 20:19,20. (See section IIIA below; text around footnote 31.)

²⁶ See Townsend et. al (1979).

²⁷ See Jensen and Meckling (1973), Frierman and Viswanath (1993), Eastman and Viswanath (1999).

²⁸ Also, excessive risk aversion on the part of suppliers of capital may slow down development; prohibiting a low-risk investment alternative may encourage investment in more high risk-high growth alternatives. See a similar argument by Knoll

Hence, it might be preferable to forbid usury altogether. However, suppose that at some time in the future, monitoring technology becomes very sophisticated, so that covenants could be incorporated in debt contracts, which would effectively eliminate these agency costs. At such a time, it would be desirable to, once again, permit usury, at least in some limited form.

On the other hand, rabbinic interpretation of the Law is also costly. Think of the process by which rabbinic re-interpretation would occur. Individuals must, after suffering from the effects of an “imperfect” biblical law, bring it to the attention of the rabbis. Given imperfect communication between different communities, and given the lack of a monolithic juridical organization (*bet din*), at any given time, there could be differing interpretations of a law in different localities. This would, of course, hinder the use of the law across communities.²⁹ Differential interpretation, of course, increases the chances of differential rulings by different rabbinic courts, and raises the issue of jurisdiction where the parties do not live in the same locality. Furthermore, rabbinic interpretations, derived through exegesis and understanding of the needs of the community, are more likely to be subject to error than a clearly stated Biblical law.

In other words, relative to the ex-ante option, the ex-post option is more costly in its implementation, even though the dead-weight cost due to suboptimal human actions is

(1993) who argues that the tax deductibility of corporate interest payments tends to reduce innovation and risk-taking.

²⁹ One example is the use of a bill of sale to a non-Jew to permit the working of Jewish fields on the Sabbath. R. Hayyim Halberstam, a well-known Chasidic rabbi of Zanz, Galicia in the Austro-Hungarian empire, in the middle of the 19th century permitted such a sale under certain circumstances. Other rabbis, such as R. Abraham Teomim of Buczacz (in an 1854 responsum), the Hatam Sofer (in 1835), were quite opposed. (See Katz (1989; chapter 10) for an extensive discussion of the issue.) Although not an environmental issue, it is an example of the difficulty of rabbinic interpretation and the absence of a uniform response on the part of halakhic authorities.

higher. Clearly, God has to trade-off the implementation costs against the dead-weight costs of suboptimal human actions over the centuries. His new expanded problem therefore becomes:

$$\underset{\underline{q}}{Max} \left[F(HW_1(\underline{q}), HW_2(\underline{q}), \dots, HW_t(\underline{q})) - C(\underline{q}) \right],$$

where \underline{q} is a vector of length k , where k is the number of different areas of legislation concern, and each element of the vector indicates whether to provide ex-ante or ex-post treatment for that area. More generally, each element of the vector is a point in a multidimensional space, sufficiently large to describe all the characteristics of legislation in a given area.

III. Empirical Implications and Testing

This theory has many implications and testable hypotheses, and, in particular, it goes beyond the particular realm with which we started, viz. environmental commandments. However, in keeping with the limited goals of this paper, we will restrict ourselves to the area of environmental laws.

Two kinds of tests can be devised. One has to do with which areas God would choose, for ex-ante legislation, and which areas he would choose for ex-post legislation. Clearly, these would have to do with the characteristics of the evolution of the human knowledge base, as well as the potential for incorrect human decision making in the light of the best possible ex-ante legislation, given the comprehensibility requirement.

Another test would look at the totality of ex-ante laws, as well as rabbinic interpretations of the Law at a particular point in time. In the last chapter, under the assumption that the consequence functions, $\gamma_1(a)$, $\gamma_2(a)$, ..., $\gamma_n(a)$, ... become finer and finer over time in the sense described there, we concluded that the later the generation of

human beings that God chose to give his Law to, the more detailed his commandments would be.³⁰ We can come to a parallel conclusion here for God's expanded problem, as well. That is, in areas where the knowledge base of a certain generation is greater, the level of detail of the (original Biblical and subsequently rabbinically re-interpreted) laws for that generation in those particular areas would be greater; in areas where human knowledge would be more limited, the level of detail would be correspondingly less. Furthermore, the greater the uncertainty of a given generation regarding knowledge in a given area, the less definitive and the more circumspect will Biblical legislation be, and rabbinic reinterpretation, in that generation, of that legislation as well.

We will examine Biblical laws in the following environmental areas to test our hypothesis:

- A. Wanton destruction (*Bal tashkhit*)
- B. *Shemitta*
- C. *Neta reva'i*
- D. Cruelty to Animals (*Tsar baalei khayyim*)
- E. Genetic Engineering (*Kilai ha-kerem* and other examples of *kilayim*)
- F. *Sha'atnez*
- G. Proper hygiene in the field
- H. Burial in the ground (*mevt mitsva*)
- I. Biodiversity (*Shiluakh ha-keyn*)

A. Wanton Destruction (Bal Tashkhit)

The basis for this law is Deuteronomy 20:19,20. "When you besiege a city for many days to wage war against it to seize it, do not destroy its trees by swinging an axe

³⁰ See text around footnote 15. Again, it must be emphasized that while we do not necessarily believe that the consequence functions grow monotonically finer with each generation, without any possible deviation. Rather, it is a not unreasonable assumption, which, furthermore, allows the construction of relatively powerful tests of our theory.

against them, for from it you will eat, and you shall not cut it down; is the tree of the field a man that it should enter the siege before you? Only a tree that you know is not a food tree, it you may destroy and cut down, and build a bulwark against the city that makes war with you, until it is conquered.” The commandment, as reflected in the text, seems to have two parts: one, an explicit commandment against cutting down food-bearing trees, and two, a limitation on the permission to cut down non-food trees – only for functional purposes.

Here is what the *Sefer haKhinukh* says under this *mitsva*.³¹ “It is likewise included under this negative precept not to cause any damage or loss: for instance, to set fire, tear clothing or break a vessel for no purpose. About all such actions or anything similar, in which there is destruction, the Sages of blessed memory would always say in the *Talmud* (e.g. *Talmud Bavli, Kiddushin 32A*), ‘but he clearly transgresses the injunction that *you shall not destroy*.’” The *Maharal*³² on this “comments that the comparison of people to trees has far-reaching significance. Just as trees must grow branches, twigs, flowers, and fruit to fulfill their purpose, so man is put on earth to be productive and labor to produce moral, intellectual, and spiritual truth.”³³ In other words, the underlying commandment seems to be a prohibition on the wanton destruction of worldly goods.

Is this a detailed/specific law or an unspecific one? At first glance it seems to be complicated, because it is completely silent about what is legislated in cases other than that of trees; this seems to be quite unspecific. On the other hand, in the matter of trees,

³¹ All translations from the *Sefer haKhinukh* are by Charles Wengrov, Feldheim Publishers.

³² R. Loew of Prague, ca. 16 century.

³³ *The Chumash*, the Stone edition.

the law is specific and forbids the cutting down of only food trees. The resolution to this conundrum, however, already exists in its description: we must separate the set into two – the set of fruit trees, and its complement. In the case of trees, where it is relatively clear that fruit trees need to be subject to the prohibition on destruction, the Bible provided the express specification. In case of other things, the Torah left the ruling unspecified, and subject to later rabbinic interpretation and understanding regarding what destruction could be “productive” in the *Maharal*’s terms.

He goes on to say: “... the *Torah* did not forbid chopping down fruit trees, except when they are cut down destructively; but it is certainly permitted to cut them down if any useful benefit will be found in the matter (*Talmud Bavli, Bava Kamma, 91B*).” This looks like a rabbinic modification of the original seeming blanket ban on cutting down food trees; however, this is a modification that can be read into the text on the basis of the qualification to the original commandment made in Deuteronomy 20:20.

B. Shemitta

The relevant biblical verses are in Leviticus 25-3:7, and Exodus 23:11. Exodus 23:10,11 says: “Six years shall you sow your land and gather in its produce. And in the seventh, you shall leave it untended and unharvested, and the destitute of your people shall eat, and the wildlife of the field shall eat what is left; so shall you do to your vineyard and your olive grove.” According to Leviticus 25:4,5: “But the seventh year shall be a complete rest for the land, a Sabbath for God; your field you shall not sow and your vineyard you shall not prune. The aftergrowth of your harvest you shall not reap,

and the grapes you had set aside for yourself, you shall not pick; it shall be a year of rest for the land.³⁴

This law could be considered a solution to externality problem inherent in the tragedy of the commons, except in this case the joint ownership of the land is not that of different individuals at a given point in time; rather it is the joint ownership of the land of people of different generations. *Shemitta* prevents over-cultivation of the land that would reduce its value for subsequent generations. Another approach to the need for *shemitta* legislation is as follows. The benefits of innovation accrue to the individual innovator as well as to society; even with the introduction of copyright and patent laws, the innovator cannot capture all the benefits of innovation. Consequently, in ordinary circumstances, the rate of innovation would be suboptimally low, because the payoff to the individual worker (who in Biblical times probably made a living from agriculture) from working on the land would be greater than the payoff from innovating. By prohibiting the individual's normal occupation at periodic intervals, the Bible rectified the relative profitability of innovation. One implication of this second approach is that as agriculture became less important in economic terms, the underlying reason for *shemitta* would vanish. And, in fact, in recent years, we have seen that rabbis have permitted circumvention of strict *shemitta* laws through the sale of the land to a non-Jew for the sabbatical year.³⁵

³⁴ Note that commentators generally agree that the *mitsva* of *Shemitta* is restricted to the Land of Israel.

³⁵ One problem with this interpretation of the rulings circumventing *shemitta* in the modern period is that they seem to have originated in R. Kook during the early part of the twentieth century, when agriculture was the mainstay of the Israeli economy. (Of course, R. Kook based himself on earlier responsa (e.g. the responsum of Rabbi M. Robbio, the Rabbi of Chevron, in *Teshuvot Shemen Hamor, Yorah Deah 4*, quoted by R. Jachter in *Kol Torah*, v. 9, no. 31), but those responsa were also from times when agriculture was important.

C. Neta reva'i

Leviticus 19:23, 24 lay out the following commandment: “When you shall come to the land and you shall plant any food tree, you shall treat its fruit as forbidden; for three years they shall be forbidden to you, they shall not be eaten. In the fourth year, all its fruit shall be sanctified to laud *Hashem*.” The purpose of this commandment is not clear; however, it may, perhaps, be understood as an extension of the laws of *shmitta*.

D. Cruelty to Animals (Tsar ba'alei khayyim)

The tractate *Bava Metsia*, 85a relates a story about R. Judah the Prince, who had pity on some weasels; in that story, R. Judah cites the verse, “*Ve rakhamav al kol ma'asav*’ (His mercies are on all His works) from Psalms 145:9. R. David Kimkhi, a twelfth-century Bible commentator comments on this verse: “Even towards the different species of wild animals, domesticated animals, and birds, he is merciful; similarly, it is appropriate that man should follow in His ways, and he should not destroy life unless it is for a need, and to refrain from harm.³⁶ The discussion in *Bava Metsia* here does not adduce any other Pentateuchal sources. Maybe this is an example where there was no way of putting down the details of the law, and so God decided to include only the general verse in Psalms, and did not put specific prohibitions in place.³⁷

³⁶ My own translation; see *mikraot gedolot* for source text. Elsewhere in the Babylonian *Talmud* (in Tractate *Berakhot* 7a), the verse is applied to a heretic, whom R. Yehoshua b. Levi was trying to curse, but failed. The *Talmud* gives the reason for his failure as this verse, which shows that God shows mercy even towards his heretical creations.

³⁷ See the discussion in tractate *Bava Metsia*, elsewhere, regarding the Biblical or Rabbinic source of the law on ‘*tsar ba'alei khayyim*.’

However, there are three other Pentateuchal sources that are discussed elsewhere in the Babylonian Talmud in connection with the principle of *tsar ba'alei khayyim* (See *Bava Metsia* 33b.) These are *hakeym takim* (Deuteronomy 22:4),³⁸ *azov ta'azov* (Exodus 23:5),³⁹ and *lo takhsom* (Deuteronomy 25:4).⁴⁰ If these are the sources for the law on *tsar ba'alei khayyim*, then we have another case of specificity in one sub-area, and lack of specificity in another sub-area. Again, this can be explained in terms of the relatively frequent occurrence of the circumstances prohibited in *azov ta'azov*, and *lo takhsom*. Hence even if this law is not optimal for all time,⁴¹ God may have deemed it desirable to state it as a general law applicable for all time.

E. Genetic Engineering (Kilai ha-kerem)

The Biblical law on this issue is laid down in Leviticus, 19:19. “You shall observe my decrees: you shall not mate your animal into another species; you shall not plant your field with mixed seed ...” It can also be found in Deuteronomy 22:9-10. “You shall not sow your vineyard with a mixture, lest the growth of the seed that you plant and the produce of the vineyard become forbidden. You shall not plow with an ox and a donkey together.”

³⁸ You shall not see the donkey of your brother or his ox falling on the road and hide yourself from them; you shall surely stand them up, with him.

³⁹ If you encounter an ox of your enemy or his donkey wandering, you shall return it to him repeatedly.

⁴⁰ You shall not muzzle an ox in its threshing.

⁴¹ For example, if, for the purpose of understanding the functions of the brain, it were necessary to observe the reaction of animals upon being prevented from feeding in the presence of grain, one may consider this permissible, in keeping with the underlying purpose of the law.

This again is a case of a law that is specific in its details in the Deuteronomic formulation, but general in the formulation in Leviticus. This might be a way to obtain the best of ex-ante Biblical legislation as well as laying a basis for subsequent rabbinic exegesis extending the law to other cases of inter-breeding and, ultimately, genetic engineering. In keeping with this idea, it is worthwhile to note that while Deuteronomy 22:10 cautions “lest the growth ... become forbidden” in the English text, the Hebrew reads “*pen tikdash.*” The more general meaning of the root “*kdsh*” is to set apart. Hence, one possible meaning (not one made by traditional commentators) is that the fruit of mixed species will become unfit for consumption and must therefore be set apart.

In terms of the implications of our contracting model regarding the value, at times, of indirect, implicit and circumspectly worded legislation, it is instructive to read what Steven Druker (1997), the executive director of an organization fighting against genetic engineering, has to say about the Bible and the permissibility of genetic engineering:

(S)everal rabbis argue that the *kilayim* (hybridization) laws cannot be used to bar genetically engineered foods. Moreover, some go even further and suggest that because these laws do not specifically forbid genetic engineering, they therefore permit it. This conclusion seems unwarranted. For one thing, it’s difficult to imagine how the Torah could have conveyed a prohibition against transgenic foods. Only within the last fifty years have humans come to understand the nature and structure of genes, and only within the last thirty has the possibility of splicing genes between dissimilar species been seriously entertained. Within the context of Biblical language, it would have been very difficult to differentiate between the *macro* units of reproduction (sperm and ova) and the *micro* units (the genes within the sperm and ova), especially given humanity’s long-standing ignorance of molecular genetics. The Torah would have had to say something like: "Do not mix the seed of creatures that cannot mate" -- which instead of creating a meaningful ban on transgenic manipulations, would have spawned deep confusion. Thus, *Vayikra* (i.e. Leviticus, our explanation) 19:19 cannot be construed as indirectly permitting transgenic foods.

F. Sha'atnez

Deuteronomy 22:11 says: “You shall not wear combined fibers, wool and linen together.” We include this law in our list of environmental laws, because it seems to be an extension of the laws of *kilai ha-kerem*; however, the exact environmental implications of *sha'atnez* are unclear.

G. Proper Hygiene in the Field

Deuteronomy 23:13 says: “You shall have a place outside the camp, and to it you shall go out.” The next verse continues: “You shall have a shovel in addition to your weapons, and it will be that when you sit outside, you shall dig with it; you shall go back and cover your excrement.”^{42,43} These verses deal with the disposal of bodily wastes (fecal matter and urine), and include a general injunction to keep sanitation facilities separate from living quarters. This verse is discussed in the Babylonian Talmud in three different locations: *Berakhot* 25a, *Yoma* 85 and *Ketubot* 5a. The discussion in *Ketubot* 5a reads the verse differently, and interprets the word *azeynekha* (lit. weapons), as *ozneykha* (your ears) and goes on to talk about *lashon hara*, etc., which is not relevant for us.

The discussion in *Berakhot* 25a seems to be the most relevant for our subject. Although the original verse does not make any distinctions, in this tractate, the rabbis make a distinction between fecal matter and urine, probably based on their understanding that urine was not as dangerous as feces from a sanitary viewpoint.

⁴² Translation from *Tanakh*, the Stone Edition.

⁴³ Josephus (*Wars* ii.147-149) describes a similar method of burying excrement which was employed among the Essenes. (cited in Craigie; 1976, p. 300).

H. Burial in the Ground (*Meyt mitsva*)

Two verses in Deuteronomy discuss the injunction to not leave a hanged criminal overnight. Deuteronomy 21:22 introduces the topic with “If a man shall have committed a sin whose judgment is death, he shall be put to death, and you shall hang him on a gallows,” while the next verse continues with the injunction that “His body shall not remain for the night on the gallows, rather you shall surely bury him on that day, for a hanging person is a curse of God, and you shall not contaminate your land, which Hashem, your God, gives you as an inheritance.” One understanding of these verses would be that the intent of the commandment is to avoid the harmful health effects of leaving a decomposing body above ground. Again, the use of the word ‘contaminate’ in the phrase “contaminate your land” is worth remarking.

Elsewhere, the Babylonian Talmud discusses the case of a corpse of a person without any near relative, or anybody else who could bury him. In such a situation, even a priest (*koheyn*), who is normally prohibited from defiling himself with a dead body is commanded to bury the corpse (*meyt mitsva*). This commandment, too, shows the desirability of disposing speedily of a corpse.⁴⁴

I. Biodiversity (*Shiluakh ha-keyn*)

The main biblical source here is Deuteronomy 22:6,7, which reads: “If a bird’s nest happens to be before you on the road, on any tree or on the ground – young birds or eggs – and the mother is roosting on the young birds or on the eggs, you shall not take the

⁴⁴ The traditional interpretation here emphasizes “*kavod ha-beriyot*,” the sanctity of a human body.

mother with the young. You shall surely send away the mother and take the young for yourself, so that it will be good for you and will prolong your days.”⁴⁵

Under the heading of this commandment, the *Sefer haKhinukh* says: “At the root of this precept lies the aim to set the thought in our heart that the watchful care of God, blessed is He, is over the human species individually – as it is written, ‘*For his eyes are upon the ways of man*’ (Job 34:21) – and for the other kinds of living creatures, over the species in a general way. In other words, His desire is for the endurance of his species. Therefore, no species among all kinds of creatures will ever become extinct and perish, from the eggs of the vermin to the horned buffalo, since the day they were created – is all by His pronouncement and his desire about this.”

The same point is made in a less homilistic manner by Craigie (1976). After rejecting the theory that the commandment is related to a humanitarian concern for the parental relationship in the animal world, he says:

“It is more likely that the law has to do with the conservation of food supplies. The Israelites were permitted to eat certain clean birds; the obvious reason for taking the young birds would be in order to provide food for the family. ... If a nest was found with a mother bird and eggs or young birds in it, the natural thing to do would be to take all of them, thereby acquiring more food. The effect of such action, however, would be bad; in commercial language, it would be exchanging a long-term profit for an immediate gain. To take and kill the mother would be to terminate a potential future supply of food. To take the mother and leave the others would not be possible, for they would not be able to survive without the mother. Thus by taking the young bird (or eggs), but letting the mother go, food was acquired without the source of food for the future being cut off.”

Supporting Craigie’s suggestion is the understanding of most Biblical commentators, who understand that the commandment is not to take the eggs, but rather

⁴⁵ Translation from <http://bible.ort.org>.

that if the eggs are taken, the mother should be sent away. In any case, both the author of the *Sefer haKhinukh*, as well as Craigie (1976) seem to suggest a connection between the *mitsva* of *shiluakh ha-keyn* and biodiversity. However, the point is not made explicitly and the commandment remains quite vague. This might be read to support the idea that the benefits and costs of biodiversity are not clear; certainly, the circumstances under which the goal of biodiversity should be pursued are not clear. It might, therefore, behoove human beings to be careful in establishing environmental legislation in this area.

IV. Conclusion and Policy Implications

Jews have lived and survived under the laws of the Bible for several millennia. Hence it is reasonable to hypothesize that these laws are, in some sense, optimal, and to analyze them from an optimization perspective. In this paper, we look at the laws in the Bible that apply to environmental matters. We construct a paradigm, wherein God decides on the optimal set of laws to provide mankind. We assume that His Laws must satisfy a comprehensibility criterion and set out a framework that would allow us to distinguish between areas where He would choose to set out laws in detail, areas where he would choose to set out general statements, and areas which He would leave to the rabbis to formulate in the light of an expanded human knowledge base. We then look at a set of laws in the Bible that might be construed as having environmental content, and we seek to test our theory on the basis of these laws.

We suggest that when the optimality of a certain action is clear, given the information set in antiquity, the Bible prescribes detailed laws. When the optimal action depends on other intervening factors, the Bible lays out general prescriptions and proscriptions. When the knowledge base of the first generation of human beings

receiving the Word of God was too sparse, He considered it best to leave legislation to rabbinic exegesis and legislation.

Considering the gaps in our knowledge of how the environment works, it may be argued that the lesson of the Biblical model is that environmental agencies should focus less on rules and much more on prudential judgment.⁴⁶

⁴⁶ See Appendix A.

Appendix A: Two Examples of the Implementation of the Endangered Species Act

The following two instances provide a good example of the kind of detailed legislation that is, arguably, contrary to the Biblical approach to legislation, which depends more upon standards than rules.

The first case involves twenty-eight residents in Southern California who lost their homes in order to protect an endangered species. The Stephen's kangaroo rat is a protected animal, so much so that it is illegal for homeowners to alter their land in any way that would interfere with the rat's habitat. This includes tilling the land in order to protect homes from brush fires. And this was exactly the case in Southern California, where twenty-eight homes burned to the ground due to the laws written to protect the rats. However, it is ironic to note that the very law that is written to protect the rats ended up destroying them along with the twenty-eight homes. The law may have protected the rats' habitat against human acts, but in so doing, it brought about the rats' own demise. Because the fires could not be prevented (through the tilling of the land), the fires were allowed to destroy the houses and the rats that coexisted there. (Howard, 1995)

The second case involves Tuan Ming-Lin, an immigrant farmer in Kern County, California (Kanner 1995). Lin was arrested for criminal conduct in February 1994 for violating the Endangered Species Act. His tractor was impounded and he was pressured by the feds to give up over half his farmland (363 acres of his 720 acre farm that he bought for \$1.5 million) and pay \$172,425 to fund the operation of a wildlife preserve. Lin's crime: he ran over five Tipton kangaroo rats with his tractor.

There was some question about whether or not Lin even knew there was such a regulation because he didn't speak English. But what is even more questionable is the behavior of the federal agencies in dealing with this case. Eventually, the threats and

character assassination of Lin (that came out in the press) proved to be false, and the feds dropped their case against him. They filed charges against Lin's corporation instead. For Lin's part, he agreed to donate \$5,000 to a local habitat conservation fund and promised not to farm his land until he obtained a permit to do so (which takes up to six months). We can only wonder and speculate about what moves officials to ignore the promptings of common sense and surrender to the bizarre.

Appendix B: A Note on Methodology

While most economists would probably be comfortable with the approach taken in this paper, some of the modeling details – particularly relating to God – might create discomfort for readers from other disciplines. Economists have long been used to the "as if," or positivistic modeling approach. This "as if" approach allows the modeler to assume that individuals act as if to maximize the value of clearly and mathematically defined utility functions, provided the model generates behavioral implications. Of course, most people would agree that people do indeed try to increase their own happiness, however defined – the positivistic approach pushes this assumption one notch further and models individuals as engaging in an actual calculus of utility. Nevertheless, this approach does not presume any verisimilitude for the model; rather, the primary criterion is that the model should be successful in explaining observed phenomena, as well in generating new testable hypotheses.

It is, indeed, this approach that we have taken in this paper to model God's decision. We do not claim that we know what God is thinking; in fact, Judaism teaches that God transcends human understanding.⁴⁷ As such, we could hardly claim to describe His behavior. However, the Jewish Bible does describe God's actions; and the Bible with the elaboration of the Talmud gives us anthropomorphic descriptions of God's motivations, as well. Again, we do not suppose that the rabbis of the Talmud took these motivations literally. Nevertheless, given that human beings can relate to God only in human terms, God, Himself, in the Bible, faces the need to countenance the use of anthropomorphic metaphors,⁴⁸ so as to make it easier for his creatures to follow his commandments. We make use of a similar strategy in our paper, as well, in modeling

⁴⁷ See Maimonides, "Guide to the Perplexed."

⁴⁸ See my face, etc. Yissa haShem panav eleykha, etc.

God as a utility maximizer. The criterion by which this modeling use is to be judged is success in explaining Biblical phenomena, as well as in generating further testable hypotheses.

Assuming, then, that it is valid to give God a utility function, the next question is to ask if it is appropriate to use human welfare as an argument in this utility function. While it is clear that the God of the Bible has man's spiritual welfare in mind, it may not be as obvious that He also has man's material welfare in mind. However, this is the traditional understanding of Jewish commentators. We will provide several examples of this, both from Bible commentary as well as from the Talmud.

Ibn Ezra, in his commentary on the verses, that Aaron and his descendants are supposed to use to bless the children of Israel over the centuries (Numbers: 6: 24-26), says on the first part of the verse, "May God bless you and safeguard you," that it refers to an increase in lifespan and wealth. On the second part, "... and safeguard you," he says that the blessing is that the wealth should not be stolen. Similarly, the Sforno says that the first part refers to a blessing of wealth and material goods citing Ethics of the Fathers (3:21), "If there is no flour, there is no Torah."

During the Exodus from Egypt, God takes care of the physical needs of the Children of Israel for forty years by providing them with manna (Exodus 17:4) and with water (Numbers 20:8). In fact, when God asks Moses and Aaron to speak to the rock that it should give them water, the provision of the water is not only for the people, but also for their cattle. This prompts Rashi ad loc to say, citing the Tanhuma (Perek 9), "From here, we learn that the Torah is considerate regarding the wealth of the Children of Israel."

In Mishna Keritot (6:3), which discusses an "*asham talui*" or suspended guilt-offering, R. Obadiah mi-Bartenura explains why the Torah allowed a person who was

uncertain that he had committed a sin (which would have required a sin-offering) to bring a suspended guilt-offering as atonement until such time as the matter should be clarified. He says that the purpose is to protect the person from the physical suffering that he would be liable for if he had actually committed a sin and not brought a sin offering, because “the Torah is solicitous of the physical (well-being) of the Jew.”

Finally, in the Babylonian Talmud, in tractate Rosh-haShanah (27a), one of the gemara’s explanations as to why the shofar used for Rosh ha-Shanah is plated with gold, while the one associated with fasts (Babylonian Talmud, Tractate Taanit) is plated with silver, is that the Torah is “solicitous of the wealth of Israel.”⁴⁹ Rashi, ad loc, explains that we learn of the Torah’s solicitousness regarding the wealth of Israel from Leviticus 14:36. The context there is of a house that is stricken with a *tzaraat* affliction. If the house exhibits the recognized signs of the affliction, the Kohen is to declare it impure, rendering all its contents impure. The verse says, “The Kohen shall command, and they shall clear the house before the Kohen comes to look at the affliction, so that everything in the house should not become contaminated and afterward shall the Kohen come to look at the house.” Rashi, in Leviticus, explains that the Torah was concerned even for such trifling items as the earthenware in the house, which, if they were to become impure, would have to be destroyed – everything else could be used or saved in one way or another.

⁴⁹ Similar explanations are given in Yoma 39a and Yoma 44b for other items, as well.

Bibliography

- Background on the Daily Daf*. Kollel Iyun Hadaf, Har Nof, Jerusalem, Israel.
(<http://www.shemayisrael.co.il/dafyomi2/kesuvos/backgrnd/ks-in-015.htm>)
- The Chumash*, The Stone Edition. (1993). Mesorah Publications, Brooklyn, N.Y.
- Craigie, P.C. (1976). *The Book of Deuteronomy*, William B. Eerdmans Publishing Company, Grand Rapids, Michigan.
- Drori (1980) "Genetic Engineering: Preliminary Discussion of its Legal and Halachic Aspects, *Techumin*, vol. 1, page 280 ff.
- Druker, Steven (1997). "Are Genetically Engineered Foods in Accord with Jewish Law? A Comprehensive Analysis of the Problems," *Alliance for Bio-Integrity*, (<http://www.bio-integrity.org/Halakha.html>).
- Eastman, Wayne and P.V. Viswanath. "Bond-Stockholder Conflict: Contractual Covenants vs. Court-Mediated Ex-post Settling-Up," Working paper, Pace University, May 1999.
- Frierman, Michael and P.V. Viswanath. (1994). "Agency Problems of Debt, Convertible Securities, and Deviations From Absolute Priority in Bankruptcy," *Journal of Law and Economics*, v. 37, no. 2, pp. 455-76.
- Howard (1995). "The Death of Common Sense," U.S. News and World Report.
- Hardin, Garrett. (1968). "The Tragedy of the Commons," *Science*, v. 162, pp. 1243-1248.
- Jachter, Rabbi Howard. (2000). "The Heter Mechira – Part One," in *Kol Torah*, v. 9, no. 31.
- Jensen, Michael and William H. Meckling. (1976) "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, v. 3, no. 4, pp. 305-60.
- Kanner (1995). "California Killer Rat Gets Off." *The Wall Street Journal*, May 24.
- Katz, Jacob. (1989). *The Shabbos Goy: A Study in Halakhic Flexibility*, The Jewish Publication Society, Philadelphia.
- Knoll, Michael S. (1993). "Prometheus: How the Corporate Interest Deduction Discourages Innovation and Risk-Taking," *Villanova Law Review*, v. 38, p. 1461 ff.
- ha-Levi, Aharon. (1978). *Sefer haKhinukh*, translated by Charles Wengrov, Feldheim Publishers.
- Tanach*, the Stone Edition. (1996) Mesorah Publications, Brooklyn, N.Y.

Townsend, Robert. (1979). "Optimal contracts and competitive markets with costly state verification," *Journal of Economic Theory*, v. 21, pp. 265-293.

Tyson, Mike (1995). "Introduction: We Are All Prisoners." *The Ethical Spectacle*, v. 1, no. 9, September. (Also found at <http://www.spectacle.org/995/pd.html>)

Other Books and Articles

R. Binyamin Frost. “*Kitvei Halakha: The Laws of Kashrus.*”

Kantor, Mattis. “*The Jewish Time Line Encyclopaedia.*”

Aubrey Rose (ed.), *Judaism and Ecology*, Cassell Publisher Ltd./World Wide Fund for Nature, 1992.

Lillian Ross, *The Judaic Roots of Ecology*, Central Agency for Jewish Education, 1983.

Sue Fishkoff, *Greening of the Middle East*, The Jerusalem Post Magazine, October 27, 1995.

Nogah Hareuveni, *Ecology in the Bible*, Ne'ot Kedumim (Biblical Gardens), Kiryat Ono, Israel.

“Ecology and the Jewish Spirit: Where Nature and the Sacred Meet,” ed. Ellen Bernstein, Jewish Lights Publishing, 2000.

Nachum Amsel, *The Jewish Encyclopaedia of Moral and Ethical Issues*, published by Jason Aronson, 1994. pp 61-64.

CDCHUT HASEVIVA: HEBEITIM RAAAYONIYIM UMISHPATIYIM BMEKOROT HAYEHUDIYIM by Prof. Nachum Rakover (Sifriyat Hamishpat Haivri: Jerusalem, 1993) 160 pages.

Judaism and the Environment in the Fall 1991 XXII issue of *Journal of Halakha and Contemporary Society* by R. Eli Turkel.

Rabbi Saul Berman (YU) has collected source material on this subject.

Rakover, Prof. Nakhum, *ECOLOGY IN JUDAISM* in *Encyclopedia Judaica*, Decennial Book 1973-1982, p. 227-229.

JUDAISM AND GLOBAL SURVIVAL by Richard H. Schwartz, Ph.D. (Vantage Press: New York, 1984)pp.40-52.

Challenge: Torah Views on Science and Its Problems, edited by Aryeh Carmell and Cyril Domb (New York: Feldheim, 1976).

Conservative Judaism 44:1. Fall 1991. Entire issue dedicated to Jewish environmental thought and action.

Down to Earth Judaism: Food, Money, Sex, and the Rest of Life, by Arthur Waskow (New Jersey: William Morrow, 1995).

Ecology and the Jewish Spirit: Where Nature and the Sacred Meet edited by Ellen Bernstein. (Woodstock, VT: Jewish Lights Publishing, 1998.)

A Garden of Choice Fruit: 200 Classic Jewish Quotes on Human Beings and the Environment, Edited by David E. Stein (Philadelphia: Shomrei Adamah, 1991). Available from Shomrei Adamah, 212.807.6376.

God in Search of Man by A.J. Heschel (New York: Farrar, Straus, and Giroux, 1955).

It's a Mitzvah! Step-by-Step to Jewish Living, by Bradley Shavit Artson. New York: Rabbinical Assembly, 1995. See chapter 17 on *Bal Tashchit* (prohibition of waste). "Leader's Guide" available.

The Jewish Sourcebook on the Environment and Ecology by Ronald H. Isaacs. (Northvale, NJ: Jason Aronson, 1998.)

Jews, Money, and Social Responsibility: Developing a "Torah of Money" for Contemporary Life, by Lawrence Bush and Jeffrey Dekro (Philadelphia: The Shefa Fund, 1993). To order, call 1-800-92-SHEFA/215-247-9704.

Judaism and Ecology, a study guide produced by Hadassah and Shomrei Adamah. Send \$12.00 to Dept. of Jewish Education, Hadassah, 50 W. 58th St., New York, NY 10019.

The Sabbath: Its Meaning for Modern Man, by Abraham Joshua Heschel (New York: Farrar, Straus, Giroux, 1951).

Seasons of Our Joy: A Handbook of Jewish Festivals, by Arthur Waskow (Boston: Beacon Press, 1982).

Seek My Face, Speak My Name, by Arthur Green (Northvale, NJ: Jason Aronson, 1992).

Spirit and Nature: Why the Environment is a Religious Issue, edited by Steven C. Rockefeller and John N. Elder (Boston: Beacon Press, 1992). See "Learning to Live with Less" by Ismar Schorsch.

Texts and Commentaries on Biological Diversity and Human Responsibility: A Study Guide (1996). Available from COEJL.

This Sacred Earth: Religion, Nature, Environment edited by Roger Gottlieb (New York: Routledge, 1995).

To Till and To Tend: A Guide to Jewish Environmental Study and Action (1994). Use [COEJL order form](#).

Torah and Flora, by Louis I. Rabinowitz (Sanhedrin Press, 1979).

Trees, Earth and Torah: A Tu B'Shvat Anthology edited by Ari Elon, Naomi Hyman, and Arthur Waskow. (Philadelphia: The Jewish Publication Society, 1999.)

"With all Your Possessions": Jewish Ethics and Economic Life by Meir Tamari (New York: Free Press, 1987).

Bal Tashchit: the development of a Jewish environmental principle (http://www.coejl.org/learn/je_tashchit.shtml)

One can see the development not only of Jewish law but of a Jewish environmental ethic by tracing the principle of *Bal Tashchit*, do not destroy or waste, from its biblical origin through later rabbinic interpretation. The six texts below, arranged in chronological order, show the expansion through time not only of the legal prohibition itself, but also the growing depth of understanding about the ethical dimensions of this prohibition.

Texts

1) When, in your war against a city, you have to besiege it a long time in order to capture it, you must not destroy its trees, wielding the ax against them. You may eat of them, but you must not cut them down. Are the trees of the field human to withdraw before you into the besieged city? Only trees that you know do not yield food may be destroyed.

(Deuteronomy 20:19-20)

2) Whoever breaks vessels, or tears garments, or destroys a building, or clogs a well, or does away with food in a destructive manner violates the negative mitzvah of *bal tashchit* (*Kiddushin* 32a)

[Talmudic rulings on *bal tashchit* also prohibit the killing of animals for convenience (*Hullin* 7b), wasting fuel (*Shabbat* 67b), and a minority opinion classifies the eating of extravagant foods when one can eat simpler ones as a violation of this precept (*Shabbat* 140b).]

3) It is forbidden to cut down fruit-bearing trees outside a besieged city, nor may a water channel be deflected from them so that they wither. Whoever cuts down a fruit-bearing tree is flogged. This penalty is imposed not only for cutting it down during a siege; whenever a fruit-yielding tree is cut down with destructive intent, flogging is incurred. It may be cut down, however, if it causes damage to other trees or to a field belonging to another man or if its value for other purposes is greater. The Law forbids only wanton destruction.... Not only one who cuts down trees, but also one who smashes household goods, tears clothes, demolishes a building, stops up a spring, or destroys articles of food with destructive intent transgresses the command "you must not destroy." Such a person is not flogged, but is administered a disciplinary beating imposed by the Rabbis.

(Maimonides, *Mishneh Torah*, Laws of Kings and Wars 6:8,10)

4) One should be trained not to be destructive. When you bury a person, do not waste garments by burying them in the grave. It is better to give them to the poor than to cast them to worms and moths. Anyone who buries the dead in an expensive garment violates the negative mitzvah of *bal tashchit*. (Maimonides, *Mishneh Torah*, Mourning 14:24)

5) The purpose of this mitzvah [*bal tashchit*] is to teach us to love that which is good and worthwhile and to cling to it, so that good becomes a part of us and we will avoid all that is evil and destructive. This is the way of the righteous and those who improve society, who love peace and rejoice in the good in people and bring them close to Torah: that nothing, not even a grain of mustard, should be lost to the world, that they should regret

any loss or destruction that they see, and if possible they will prevent any destruction that they can. Not so are the wicked, who are like demons, who rejoice in destruction of the world, and they are destroying themselves. (*Sefer Ha-Hinukh*, #529)

6) Yea, "Do not destroy anything" is the first and most general call of God... If you should now raise your hand to play a childish game, to indulge in senseless rage, wishing to destroy that which you should only use, wishing to exterminate that which you should only exploit, if you should regard the beings beneath you as objects without rights, not perceiving God Who created them, and therefore desire that they feel the might of your presumptuous mood, instead of using them only as the means of wise human activity -- then God's call proclaims to you, "Do not destroy anything! Be a *mentsh*! Only if you use the things around you for wise human purposes, sanctified by the word of My teaching, only then are you a *mentsh* and have the right over them which I have given you as a human. However, if you destroy, if you ruin, at that moment you are not a human but an animal and have no right to the things around you. I lent them to you for wise use only; never forget that I lent them to you. As soon as you use them unwisely, be it the greatest or the smallest, you commit treachery against My world, you commit murder and robbery against My property, you sin against Me!" This is what God calls unto you, and with this call does God represent the greatest and the smallest against you and grants the smallest as also the greatest a right against your presumptuousness.... In truth, there is no one nearer to idolatry than one who can disregard the fact that things are the creatures and property of God, and who presumes also to have the right, having the might, to destroy them according to a presumptuous act of will. Yes, that one is already serving the most powerful idols -- anger, pride, and above all ego, which in its passion regards itself as the master of things. (Rabbi Samson Raphael Hirsch, *Horeb*, #56)

Discussion

The original biblical prohibition that came to be called *bal tashchit* (text #1) was very specific. Taken in its most literal sense, it prohibits only the destruction of fruit trees, only when they are destroyed by cutting with an ax, and only during wartime. During Talmudic times, (text #2) the objects, methods of destruction, and situations which fall under *bal tashchit* were greatly expanded. Early sages reasoned that if the principle applied even under the duress of a war-time situation, how much the more so must it apply at other times (See, e.g. *Sifrei* on *Parashat Shofetim*). Similarly, these sages deduced that other means of destruction besides direct destruction with an ax (such as destroying trees by diverting a source of water) were also forbidden. Finally, they ruled by analogy that not only trees, or even natural objects as a whole, were regulated by *bal tashchit*, but rather anything of potential use, whether created by God or altered by humanity.

Maimonides (text #3) makes explicit this talmudic expansion. He also sets clear limits on *bal tashchit*. First, it only applies to wanton destruction -- there are exceptions when it is permissible to cut down trees. Second, he distinguishes between the protection of trees, which he considers to be from Torah, and prohibition against destruction in general, which he considers to be rabbinic only, and thus carrying a lighter penalty. He also (text

#4) starts moving toward a more general ethical principle underlying *bal tashchit* -- that it trains a person not to be destructive.

The *Sefer Ha-Hinukh* (text #5), a thirteenth century text which explicates in detail the 613 mitzvot, elaborates greatly upon this notion of ethical training. It states that the underlying purpose of *bal tashchit* is to help one to learn to act like the righteous, who oppose all destruction and waste. Doing so helps "good become a part of us." Finally, Rabbi Hirsch (text #6), the leading Orthodox rabbi of nineteenth century Germany, sees in *bal tashchit* the most basic Jewish principle of all -- acknowledging the sovereignty of God and the limitation of our own will and ego. When we preserve the world around us, we act with the realization that God owns all and is above all. When we destroy, however, we are, in essence, worshipping the idols of our own desires, living only for ego gratification, without a thought for the Divine. (Indeed, in an earlier passage (#62), *Sefer Ha-Hinukh* goes so far as to state that idolatry concerns God precisely because it is destructive of the natural order.) By observing the mitzvah of *bal tashchit*, we restore our harmony not only with the world around us, but with the Divine Will, which we place ahead of our own.

Response to the referee's comments:

We thank the referee for his/her comments. Several of the problems encountered by the referee may be due to our inadequate explanation of our methodology. Consequently, at the suggestion of the editors, we have added an appendix providing clarification and support for our methodology.

We agree with the referee regarding the use of more standard translations. Our original tendency to provide our own translations in some cases was due to a desire to provide a more literal translation, which might be useful in some contexts; however, we agree that the advantage of having a more "objective" translation outweighs the benefit of our more literal translations.

We have tried to correct the factual errors that the referee has pointed out. We have also clarified in the text, what we mean by finer consequence functions -- in particular, it is **not** meant to apply to Jewish knowledge.

We considered modifying the section on usury to take the referee's views into account. Ultimately, we have left it unchanged because we did not understand why there would have been a prohibition on usury in the referee's approach. Still, we think that the technological/sociological perspectives that the referee has suggested have considerable validity.

Thank you.