A BAYESIAN BLESSING: A BIBLICAL DECISION EXPLAINED BY GAME THEORY[1]

Leah Dodell*
Harvard University

Abstract: *This paper revisits one of the most debated tales from the Old Testament, Jacob's deception of his father Isaac, and models it in the framework of a Bayesian game. Solving for the equilibrium that occurs in the Torah reveals what conditions must hold for biblical characters to be willing to make the decisions that they make. The paper also examines how the protagonists' decisions would have changed if they had held different values. The analysis sheds light on which interpretations of the biblical story hold the most weight when its characters maintain consistent beliefs and act upon them in a sequentially rational manner.*

Key words: *Game Theory, Economics, Bayesian Games, Strategic Communication, Deception, Old Testament.*

BAYESOWSKIE BŁOGOSŁAWIEŃSTWO: BIBLIJNA DECYZJA WYJAŚNIONA PRZEZ TEORIĘ GIER

Streszczenie: *Artykuł ten analizuje jedną z najbardziej dyskutowanych opowieści ze Starego Testamentu o tym jak Jakub oszukał swojego ojca Izaaka i modeluje ją jako grę bayesowską. Rozwiązanie tej gry wyjaśnia warunki które muszą być spełnione aby postaci biblijne zachowały się tak jak jest to opisane w Torze. Artykuł analizuje również, w jaki sposób decyzje protagonistów zmieniłyby się, gdyby kierowali się oni innymi wartościami. Analiza rzuca światło na to, które interpretacje opowieści biblijnej mają największą wagę zakładając, że jej bohaterowie mają konsekwentne przekonania według których działają w sposób sekwencyjnie racjonalny.*

Słowa kluczowe: *teoria gier, ekonomia, gry bayesowskie, komunikacja strategiczna, podstęp, Stary Testament.*

[1] This paper was written while the author was with the Department of Economics at Emory University under the guidance of Professors Sue Mialon, Samiran Banerjee, and Karen Stolley.

* Leah Dodell, Public Affairs and Communications Department, Harvard University, 114 Mt Auburn St, Cambridge, MA 02138, email: leah_dodell@harvard.edu

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I. Introduction

In the Torah portion *Toledot*, or "Descendants", the Jewish patriarch Isaac faces a difficult choice. He knows that he must impart a paternal blessing on his elder son, Esau, who he favors over his younger son, Jacob. However, Esau has displayed "unworthiness to serve as the next figure in the patriarchal line" by marrying outside of the Hebrew clan (Berlin, 55). In addition, God told Isaac's wife, Rebekah, when she gave birth that "two separate peoples [would] issue from [her] body; one people shall be mightier than the other, and the older shall serve the younger", indicating Jacob's rightful place as the father of the Israelites (Berlin, 53). When Isaac calls Esau forth for his blessing, he is "old and his eyes [are] too dim to see" (Berlin, 55). And so a game of deception begins: Rebekah, upon hearing Isaac call for his son, runs to Jacob and convinces him to dress up as his brother and even cover himself in goat's hair to imitate Esau's hairiness. She then instructs him to go and receive the paternal blessing from Isaac.

The events that ensue are modeled below as a dynamic game in which Isaac's son first decides whether to tell the truth about his identity or to lie when he approaches his father. Upon hearing that either Jacob or Esau has arrived, Isaac then decides whether to verify the identity of his son (with "verify" meaning getting the affirmation of another person rather than simply asking for himself) and subsequently whether or not to give his son the blessing. What are the conditions that make the biblical outcome- Jacob lies and says that he is Esau, Isaac does not verify his son's identity, and Isaac blesses Jacob- possible? Why does Jacob choose to deceive his father, and why does his deception succeed? An answer can be found by modeling this story as a signaling game and solving for its equilibrium. Doing so gives this tale of "deception" a twist: Isaac must have wanted to bless Jacob over Esau in order to do so without verification. He was happy to be duped. This interpretation supports commentaries that claim that Isaac knows which son has arrived before him and decides to be deceived.

II. Literature Review

The Jacob-Isaac "Deception" Game relates to economic literature on Bayesian signaling games and strategic communication. In Bayesian games, players have incomplete information about each other's types (in this case, Isaac is blind and does not know which son is in front of him) but they have beliefs with certain probabilities (Isaac could face Jacob with probability p and Esau with probability $1-p$). In a basic

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signaling game as laid out by Cho and Kreps (1987), an informed sender who privately observes a random variable (or has the probability, *p*, of being of a certain "type") chooses a message that an uninformed receiver observes. The receiver then decides what action to take based on what the message conveys about the sender's type. Both players' payoffs depend on the sender's information as well as the action chosen by the receiver. The signaling game structure applies to strategic communication games in which the sender's, or speaker's, message is a verbal message that the receiver, or listener, must interpret.

Current literature on strategic communication distinguishes between "cheap-talk" games in which lying is costless and communication games in which the sender bears some cost for lying. Navin Kartik (2008) explains that such lying costs can arise for various reasons including a) ex post state verification that results in penalties if misreporting is detected, b) costs of manipulating information, and c) humans' intrinsic aversion to lying. Each of these factors plays a role in the Jacob-Isaac game and is reflected in characters' payoff rankings: a) if Isaac verifies Jacob's identity, Jacob will lose the paternal blessing that he seeks, b) it takes more effort for Jacob to pretend to be Esau or Esau to pretend to be Jacob than to simply state the truth, and c) although he desires the blessing, Jacob also values honesty to his father. Using his approach, Kartik finds pooling Perfect Bayesian Equilibria (PBE) that feature language inflation: all senders claim to be of a higher type than they truly are, or they tend to lie. However, receivers recognize that senders are lying and adjust their expectations accordingly.

Separating PBE can still arise when receivers are naïve. Kartik, Ottaviani and Squintani (2007) use the costly signaling game model in scenarios with receivers that will believe whatever they hear as true. The Jacob-Isaac game presents a twist to their model as the receiver in the game, Isaac, only pretends to be naïve. He blesses the son who claims to be Esau preferring that he actually be Jacob.

Isaac also has the opportunity to verify the truth of his son's message before taking his final action. Grossman and Milgrom (1981) present the idea of "verifiable disclosure" that explains that senders actually cannot lie but can merely withhold information because their information is verifiable. In the case of the signaling game between Isaac and his son, Isaac makes the active choice not to verify the truth of the message that he receives.

My presentation of the Jacob-Isaac game provides an economic communication model in which the receiver prefers being lied to because verification of the truth is costly for him. This model introduces a cost, (*t*), to the receiver for recognizing the truth when he does what he prefers. As in standard costly communication models, the sender of the more undesirable type in this model would receive a higher payoff if he

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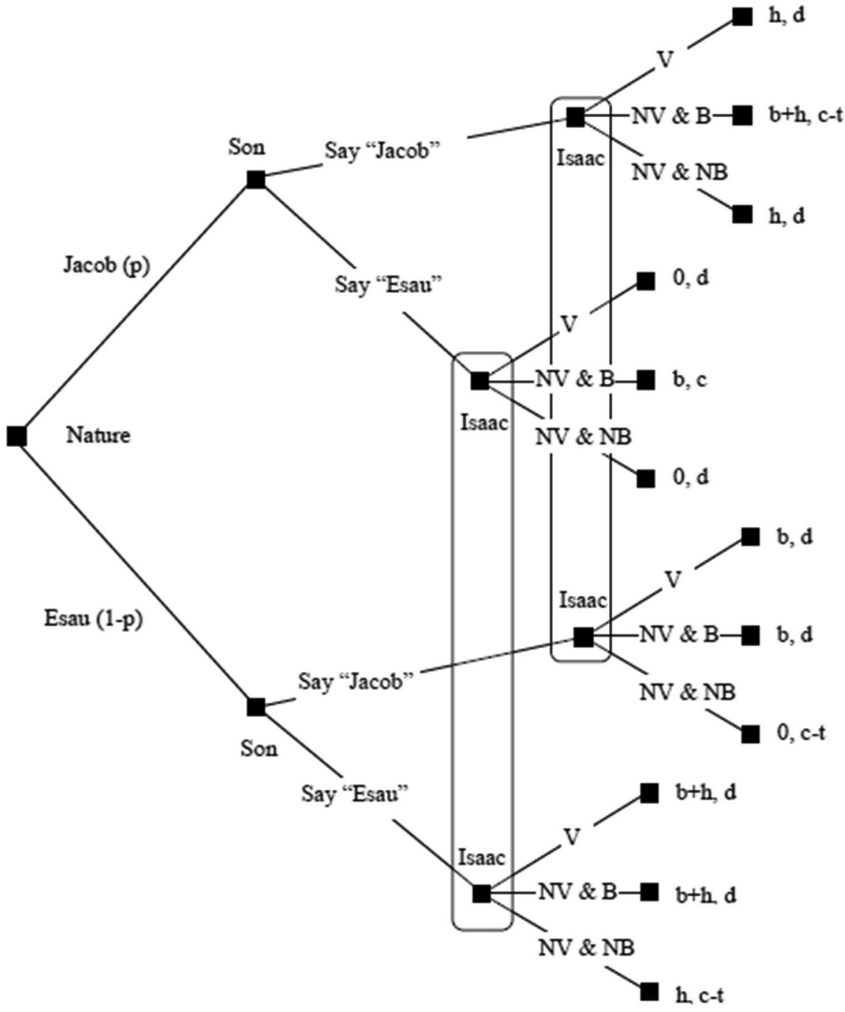
could induce the receiver to do what he wanted him to do by telling the truth, but he is more likely to get the receiver to do what he wants him to do by lying. However, the receiver prefers to remain "in the dark" about the lie. Such scenarios can arise when public awareness of receivers' knowledge could hurt their reputation. The model presented is a special case of a general model hence the general methods of Bayesian analysis are not needed in solving for equilibria.

III. The Model



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Jacob/Esau's payoffs:

h = value of honesty

b = value of receiving a blessing

Isaac's payoffs:

c = value of blessing Jacob/God's preference

d = value of blessing Esau/Isaac's personal preference

t = cost of blessing Jacob publicly

In this game, Isaac's son holds private information (whether he is Jacob or Esau) and his possible payoffs are defined using (h) as the value of honesty and (b) as the value of receiving a blessing. Nature moves first by determining whether the son Jacob comes forward (with probability p) or the son Esau comes forward (with probability $1– p$). The son then decides whether to say that he is Jacob or say that he is Esau. Next, Isaac faces two information sets: one from the scenario in which he hears that Jacob is before him and one from the scenario in which he hears Esau is before him. Because he is blind, he decides whether to verify that the son before him is who he claims to be by calling for someone else (V), not verify his son's identity and just go along with his word and bless (NV & B), or not verify his son's identity and not bless (NV & NB). His payoffs are defined using (c) as the value of blessing Jacob/fulfilling God's preference, (d) as the value of blessing Esau/fulfilling his own preference, and (t) as the cost of blessing Jacob publicly, which encompasses both the cost of breaking with tradition as well as hurting the son he loves.

The first scenario below presents payoff conditions that yield events depicted in the Bible (Jacob lies, Isaac does not verify his identity, and Isaac blesses him). The second scenario changes these conditions to see the impact it would have on characters' choices.

Scenario One

Scenario one is defined by $c > d > c\text{-}t$ and $b > h$. In other words, Isaac must prefer blessing Jacob to blessing Esau and prefer blessing Esau to blessing Jacob publicly. Jacob must value receiving the blessing over being honest. In the model below, sample payoff values are defined as $c = 3$, $d = 2$, $c - t = 1$ and $h = 1$, $b = 2$.

Within Isaac's information set "heard Jacob", the payoff to V is larger or equal to the payoff to NV & B for any probability distribution between the two nodes in the information set. In other words, V weakly dominates NV & B. Similarly, V weakly dominates NV & NB. Therefore, as marked in bold in the figure below, the best response of Isaac is to verify. Within information set "heard Esau", NV & B

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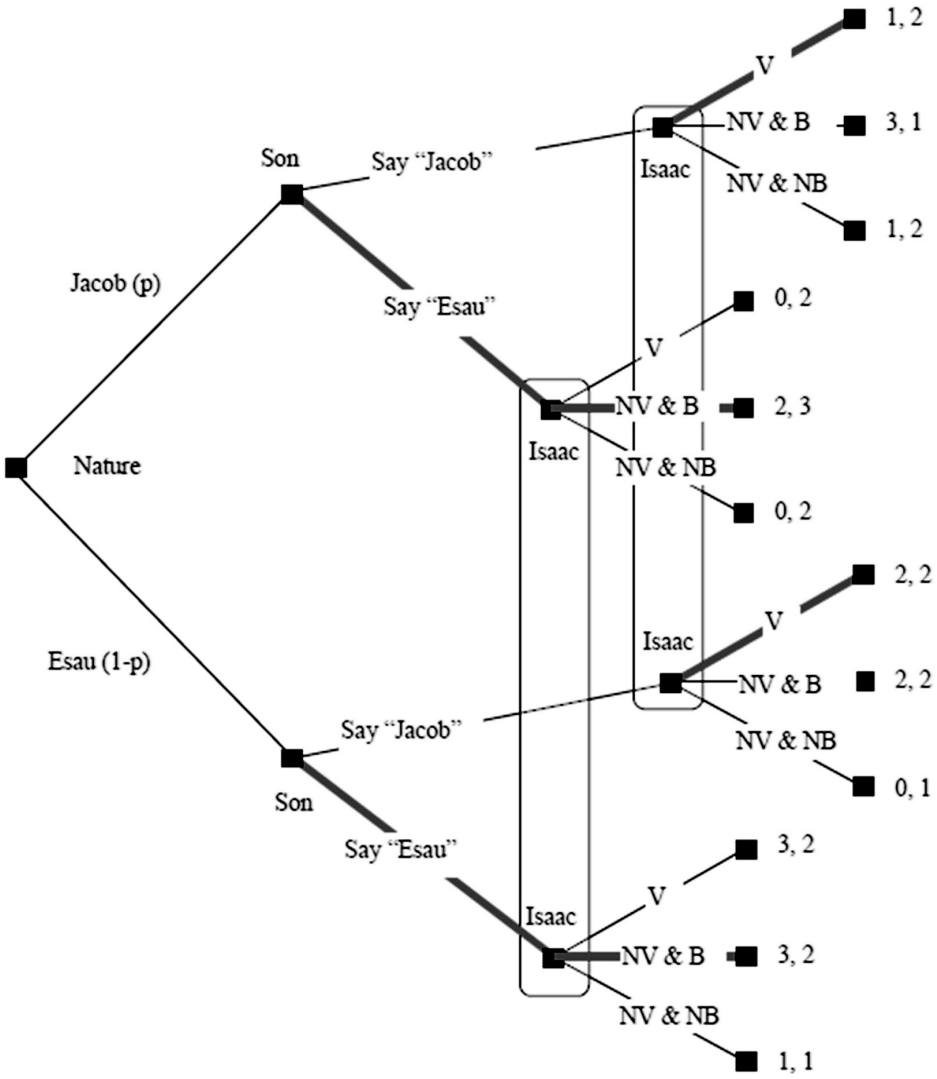
weakly dominates V, and it also strictly dominates NV & NB. As marked in bold, the best response of Isaac is therefore NV & B. Using backward induction, Jacob's best response is to "say Esau" while Esau's best response is to "say Esau." In the unique equilibrium of this game both sons choose to identify as Esau and Isaac chooses not to verify and bless.



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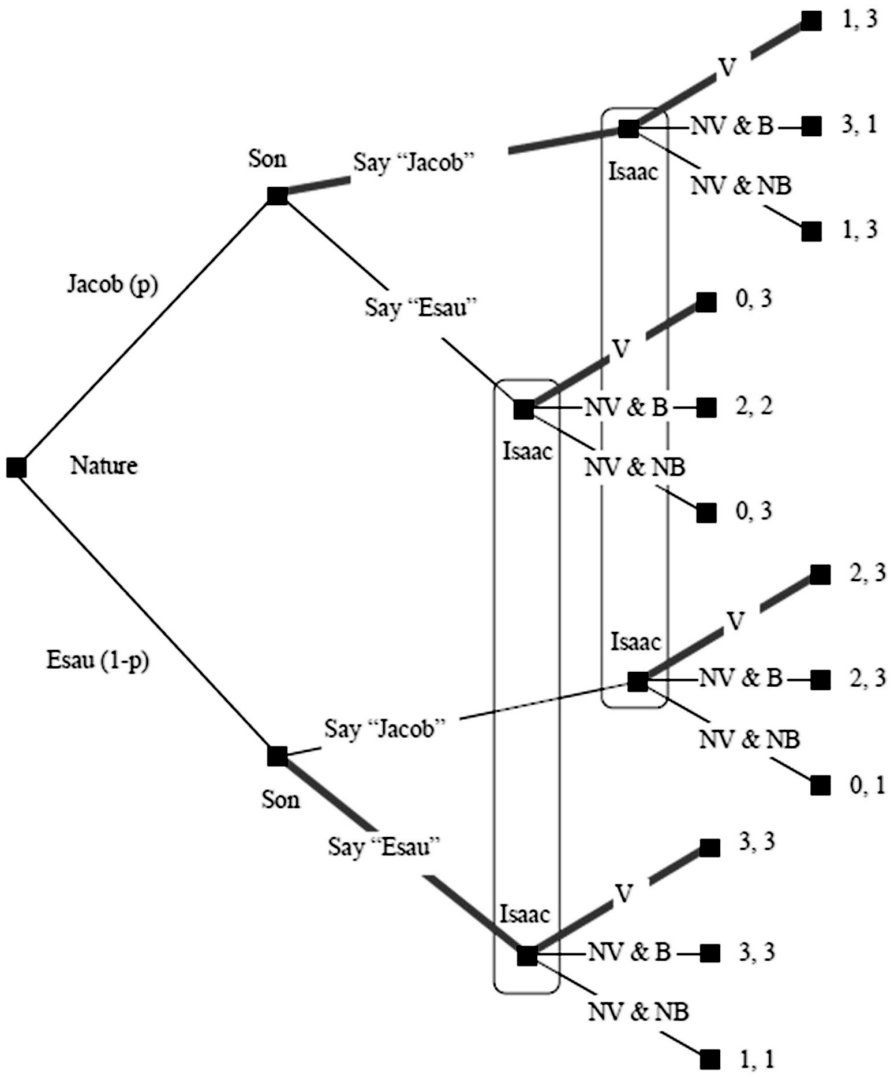
Scenario Two

If Isaac actually preferred blessing Esau to blessing Jacob (d > c > c-t and b > h), a different biblical outcome would have occurred. In the model below, sample payoffs are defined as d = 3, c = 2, c - t = 1, and h = 1, b = 2.



Now, V weakly dominates when Isaac hears either Jacob or Esau, and each son prefers to tell the truth about his identity. This shows that, in order for what occurs in

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the Torah to occur, Isaac must have truly preferred blessing Jacob over blessing Esau. He wanted to be duped.

IV. Other Applications of the Model

The signaling game above presents Isaac as a devious biblical character. He was not an old man easily manipulated; rather, he was wily enough to find a way to bless his deserving son without having to directly hurt the son he loved. Other situations that could be modeled using this type of signaling game with "desired deception" can be found in both medicine and popular entertainment.

In medicine, although doctors are expected to tell the truth to their patients, some ethicists argue that there are cases in which patient deception may be morally acceptable. Daniel K. Sokol (2007) offers a list of "moral safety checks" that can help doctors determine whether their proposed deception is permissible. One of the final checks asks doctors to consider "whether the patient, if aware of all the facts, would probably have consented to the deception" (Sokol, 2007, p.986). After potentially consulting a patient's relatives to judge said patient's likely preferences, if a doctor determines that the patient would want a grim truth withheld from them, then "the proposed deception is morally permissible and possibly even morally required" (ibid.). The doctor-patient scenario could be modeled as a similar game to the model above in which the doctor determines whether to tell the truth about the patient's diagnosis, and the patient determines whether to verify the doctor's statement or take it as the truth. It should be noted that in this example the analysis is more complex, since the physician who decides to "lie" or "tell the truth" does not know the type of the other player, i.e., whether the patient prefers to know, or not to know the truth. That was not the case with Jacob's deception of Isaac. Yet, since the method of the analysis remains the same in both cases, the biblical game serves as a source of a valuable insight for understanding the medical dilemma.

This kind of signaling model can also be used to represent the work of magicians in popular culture. Magicians deceive their audiences knowing that their audiences want to be deceived. If audience members wanted to know the truth behind magicians' tricks, the well-known equilibrium in which magicians choose to lie and audience members choose not to verify and accept the magicians' tricks would not be possible.

The Jacob-Isaac model sheds light on two major biblical characters' true objectives and, in doing so, provides a framework for other signaling games in which players prefer deception.

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