



Introspective unawareness and observable choice [☆]



Evan Piermont

Department of Economics, Royal Holloway, University of London, United Kingdom

ARTICLE INFO

Article history:

Received 14 August 2016

JEL classification:

D01
D810
D830

Keywords:

Unawareness
Uncertainty
Epistemic preferences
Dynamic choice

ABSTRACT

This paper explores the behavior of a decision maker (DM) who is unaware of some of the options available to her. The DM has a preference over consumption alternatives that is informed by her epistemic state: what she knows and what she is aware of. The main result is a characterization, via observable choice, of *introspective unawareness*—a DM who is both unaware of some information and aware she is unaware. Under dynamic introspective unawareness, the DM is unwilling to commit to future choices, even when given the flexibility to write a contingent plan that executes a choice conditional on the realization of uncertain events. This is a behavior that cannot be explained by uncertainty alone (i.e., without appealing to unawareness). In a simple strategic environment, the acknowledgment of unawareness can lead to strategic concealment of choice objects (i.e., actions), in turn, leading to a desire for incomplete contracts.

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1. Introduction

This paper explores the behavior (i.e. observable actions) of a decision maker (DM) who is unaware of some of the options available to her. Due to the consideration of observability, the primary interest is in the DM's preferences (hypothetically embodied by choice data) and how patterns in preference change in response to the structure of awareness. I argue, unawareness produces distinct patterns, and so, attempting to model unawareness with uncertainty, regardless of how complex, will fail. As an example of when such issues arise and how they might alter predictions, I consider a simple contracting environment. I show that when unawareness is taken into account, players can have an incentive to conceal mutually beneficial actions.

To highlight the distinction between uncertainty and unawareness, consider Hal, who will buy a new smartphone in six months. He will have three options at the time of purchase: x , y , and z . Hal might not know which phone he would most like to purchase six months from now. This uncertainty could arise because he does not know the technical specifications of the phones, their price, etc., and his true preference depends on the realization of these variables. Contrast this to the case where Hal has never heard of phone z . Here, he is unaware of z , and so naturally, of any preferences there regarding. Importantly, if Hal is unaware of a piece of information (the existence of phone z), he is unable to make any choice based directly on this information.

[☆] I thank Felipe A. Araujo, Mark Azic, Eddie Dekel, Simon Grant, Joseph Halpern, Edi Karni, Peter Klibanoff, Bart Lipman, Daniel Martin, Ian Morrall, Sofia Moroni, Tymofiy Mylovanov, Teddy Seidenfeld, Marciano Siniscalchi, Burkhard Schipper, Asher Wolinsky, the conference participants at RUD 2016 and LOFT 2016, my advisors Luca Rigotti and Roee Teper, Françoise Forges, and two anonymous referees for their helpful and insightful comments and suggestions. This project began while I was a graduate student at the University of Pittsburgh.

E-mail address: Evan.Piermont@rhul.ac.uk.

More subtle, but just as fundamental, is our acknowledgment of our own unawareness. Indeed, most people would readily admit they cannot conceive of all future technologies or trends, or exhaustively list the set of choices to be confronted in the upcoming week. This recognition of unawareness is important because it suggests that the things a DM is unaware of may play an indirect role in her decision making, even if they cannot be directly acted upon. Central to the analysis, then, is the DM who is (1) unaware and (2) aware she is unaware. A DM in such an epistemic state is referred to as *introspectively unaware*. By contrast, a DM who does not satisfy the second criterion would be referred to as *naively unaware*. In the presence of introspective unawareness, Hal might envision a world in which he prefers something to x and y ; of course, he cannot know this *something* is z , as that would require him to be aware of z .

Under either uncertainty or introspective unawareness, Hal has a natural inclination to delay making his choice: if he cannot start using the phone for six months, he might as well wait until then to choose. However, the motivation for delay is different under the different types of ignorance. Under uncertainty, he would like to wait so as to make a decision based on the realization of the relevant variables (for example, the price of the phones). Under introspective unawareness, he would like to wait in case he becomes aware of something better than whatever he would have chosen today. If Hal had been naively unaware, he would have had no reason to delay; he would not consider the possibility of becoming aware of new information.

Hal is going to get his mother, Avril, to purchase the phone on his behalf, and has to instruct her *today* about which phone to purchase in six months. If Hal is either uncertain or introspectively unaware of his preference, it will not be optimal for him to specify any single phone. In the case of uncertainty, however, he could leave detailed instructions that would carry out his optimal choice: in the event the prices are $(\$x, \$y, \$z)$, purchase phone x , ... etc. A commitment to consume (in the future) a particular alternative given the state of affairs is referred to as a *contingent plan*. If Hal's optimal decision depends only on the realization of some variables, it is enough to specify a contingent plan that depends on said variables. Contrast this to the case in which Hal is introspectively unaware. He cannot articulate any plan he is sure will carry out his optimal decision. This is because he would need to describe objects he is currently unaware of and to include such information in a contingent plan would require he is aware of it.

The main results of this paper show that the observable criterion for introspective unawareness is a strict preference for delaying choices at a positive cost rather than committing to a contingent plan, even when *any* plan is available. In particular:

- (★1) *When the DM is fully aware, she is always willing to commit to some contingent plan.*
- (★2) *Without full awareness, the DM might prefer costly delay to every contingent plan.*
- (★3) *If the DM is unwilling to commit to any contingent plan, then she must be introspectively unaware.*

So a preference for costly delay that cannot be appeased by the appeal to contingent planning is the behavioral indication—in an exact sense—of introspective unawareness. The intuition is exactly as in the above example: the DM's language is not rich enough to specify the optimal contingent plan (unawareness), but is rich enough that she knows this fact (awareness of unawareness). Because the DM is not aware of *what* she is unaware of, the strength of her aversion to commitment to a contingent plan is purely subjective. This can lead to behavior, particularly in strategic environments, that is substantially different than what is predicted by standard models.

After buying him his phone, Avril wants to hire Hal to write a computer program over his summer break. If Hal does not accept the offer, he could spend the summer working on developing his own app. Hal, being introspectively unaware, knows he does not fully understand what he could accomplish on his own. So, when contemplating a contract, he will weigh the benefit against his subjective assessment of this outside option.

The best language for Avril's job depends on the soon to be realized state s_1 or s_2 . Hal is currently only aware of the programming languages: `C++` (which is better if state s_1 is realized) and `JAVA` (better if state s_2 is realized). Hal, after thinking about what kind of app he could design with his current skill set, will accept the contract $c = [\text{C++}, \text{JAVA}]$ in which he writes the program for Avril, using `C++` if state 1 is realized and `JAVA` in state 2 is realized.

In state s_2 , `HASKELL` is truly the best language and Avril knows this. She believes, however, that were Hal to become aware of `HASKELL`, he would begin to investigate purely functional programming. This would draw his attention to the paucity of his awareness, and ultimately lead him to increase his subjective assessment of the outside option. In other words, by expanding his awareness a little, Hal becomes *more* averse to commitment, because he now believes there are many great possibilities that he might shortly become aware of. Therefore, it is possible that although $\hat{c} = [\text{C++}, \text{HASKELL}]$ is a strict improvement over c for both parties, it will be rejected; although the use of `HASKELL` is mutually beneficial, its existence will be concealed.

1.1. Decision theory, logic, and unawareness

Directly incorporating unawareness into a decision theoretic model introduces subtleties that need to be dealt with judiciously. First, one must take care to ensure the process of eliciting preferences from a DM does not affect her preferences. While asking a DM to rank risky prospects ostensibly does not affect her risk preference, asking her to contemplate objects of which she was formerly unaware would most certainly affect her awareness. Second, the *type* of unawareness considered (e.g., naive or introspective, object-based or state-based, etc.) must be rich enough to produce observable patterns, even

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