

A Utility Theory of Privacy and Information Sharing

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INTRODUCTION

Utility theory is concerned with people's choices and decisions based on preferences and values (Fishburn, 1968). Representing satisfaction experienced, utility is derived from the self-attributed worth and goodness of an option compared to other options. Standard neo-classical economic theory describes utility as a set of internally-consistent assumptions about options in the wish to maximize utility (Fishburn, 1968). Utility theory has leveraged as one of the most dominant theories in economics as an underpinning of rational choice and game theory. Utility is usually revealed in people's willingness to pay different money amounts for different options, leading to the concept of revealed preferences (Samuelson, 1937).

Whereas economic utility studies primarily focus on prescriptive approaches to guide how people should behave to maximize their well-being (Arrow, 1951, 1958; Majumdar, 1958; Simon, 1959); decision sciences started capturing how people actually decide regarding choices in an uncertain world and over time (Becker & McClintock, 1967; Edwards, 1954, 1961; Luce & Suppes, 1965). Expected utility theory introduces a first temporal discussion of expectations of utility rather than the actual utility derived from a choice (Alchian, 1953; Marschak, 1950; Strotz, 1953). Von Neumann and Morgenstern (1953) introduced that outcomes of choices are not known with certainty but have probabilities of occurrence, which weighted linear combination allows inferences about the overall utility derived over time.

Since the end of the 1970ies, a wide range of psychological, economic and sociological laboratory and field experiments proved human beings deviating from rational choices as standard neo-classical profit maximization axioms to fail to explain how human actually behave (Kahneman & Thaler, 1991). Human beings were shown to use heuristics in the day-to-day decision making as mental short cuts that enable to cope with information overload in a complex world (Bazerman & Tenbrunsel, 2011; Kahneman & Tversky, 1979; Thaler & Sunstein, 2008).

As one of the most recent developments in utility theory studies, behavioral economics find human utility choices biased (Bowles, 2004; Camerer, Loewenstein & Rabin, 2004; Ebert & Prelec, 2007; Kahneman, 2011; Okada & Hoch, 2004; Putnam, 2002; Sen, 1971, 1993, 1995, 1997, 2002a; Zauberman, Kim, Malkoc & Bettman, 2009) by heuristics (Kahneman, Slovic & Tversky, 1982; Simon, 1979), analogical thinking (Colinsky, 1996; Gentner, 2002), and minimized effort (Allport, 1979; Shah & O'penheimer, 2008).

In particular, people's cognitive capacities to consider future outcomes in today's decisions are limited (Doyle, 2013; Laibson, 1997; Loewenstein, 1992; Milkman, Rogers & Bazerman, 2009; Read, Loewenstein & Kalyanaraman, 1999; Read & van Leeuwen, 1998). Laibson's (1997) hyperbolically decreasing discounting functions more accurately describe choice behaviors of individuals, who tend to be impatient for smaller rewards now rather than waiting for larger ones later (e.g., Ainslie, 1992; Becker & Murphy, 1988; Doyle, 2013; Estle, Green, Myerson & Holt, 2007; Frederick, Loewenstein & O'Donoghue, 2002; Green, Fry & Myerson, 1994; Green & Myerson, 2004; Hansen, 2006; Henderson & Bateman, 1995;

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Kirby, 1997; Kirby & Marakovic, 1995; Laibson, 1997; Loewenstein & Prelec, 1993; Mazur, 1987; Meyer, 2013; Murphy, Vuchinich & Simpson, 2001; Myerson & Green, 1995; Rachlin, Raineri & Cross, 1991; Sterner, 1994). Dynamically inconsistent preferences reverse as people are patient when deciding for the future and impatient when choosing for now (Hornsby, 2007; Laibson, 1997; McClure, Ericson, Laibson, Loewenstein & Cohen, 2007; Meyer, 2013; Reed & Martens, 2011; Thaler, 1981).

Field and laboratory experiments provide widespread empirical evidence for hyperbolic discounting and self-control failures (Frederick et al., 2002; Hoch & Loewenstein, 1991; Sen, 1971, 2002b) on money management (Alberini & Chiabai, 2007; Chabris, Laibson & Schuldt, 2008; Collier & Williams, 1999; Harrison, Lau & Williams, 2002; Keller & Strazzera, 2002; Kirby & Marakovic, 1995; Laibson, 1997; Laibson, Repetto & Tobacman, 2003; Salanié & Treich, 2005; Slonim, Carlson & Bettinger, 2007; Thaler & Shefrin, 1981; Warner & Pleeter, 2007), financial benefits (Cairns & van der Pol, 2008), credit card debt (Meier & Sprenger, 2010; Shui & Ausubel, 2004), medical adherence (Trope & Fishbach, 2000), public health (Bosworth, Cameron & DeShazo, 2006; Cameron & Gerdes, 2003; Chapman, 1996; Duflo, Banerjee, Glennerster & Kothari, 2010; Horowitz & Carson, 1990; van der Pol & Cairns, 2001), addiction (Badger, Bickel, Giordano, Jacobs, Loewenstein & Marsch, 2007; Becker & Murphy, 1988; Heyman, 1996; Laux & Peck, 2007; Madden, Bickel & Jacobs, 1999; Petry & Casarella, 1999), social security (Mastrobuoni & Weinberg, 2009), fiscal policies (Keeler & Cretin, 1983), commitment (Duflo, Kremer & Robinson, 2008; Sen, 1977, 2002b), health exercise (DellaVigna & Malmendier, 2004, 2006), employment (DellaVigna & Paserman, 2005), procrastination (Reuben, Sapienza & Zingales, 2010), diet (Read & van Leeuwen, 1998), subscription discipline (Oster & Scott-Morton, 2005), animal care (Green et al., 1994; Mazur, 1987), and consumption (Milkman, Rogers & Bazerman, 2008; Read et al., 1999; Wertenbroch, 1998). Failures to disciplinedly stick to plans for giving in to immediate desires (Ainslie & Haslam, 1992; Read, Frederick & Airoldi, 2012; Strotz, 1956) are explained by people caring less about future outcomes in the eye of future uncertainty (Luce & Raiffa, 1957; Shackle, 1955), perceived risk (Mas-Colell, Whinston & Green, 1995), and transaction costs (Chung & Herrnstein, 1967; Epper, Fehr-Duda & Bruhin, 2011; Frederick et al., 2002; Kirby & Herrnstein, 1995; Mazur, 1987; Read, 2001). Presenting temporal snapshots for now and later concurrently helps overcome myopia and decision-making fallibility (Puaschunder & Schwarz, 2012). In all these studies missing is an investigation of human decision making on preferences for information sharing and privacy.

Although communication and non-communication are day-to-day decisions of individuals; to this day, there is no stringently tested utility theory of information sharing and privacy. We lack a coherent decision science framework about when people choose to share information and when they rather want to stay silent for the sake of privacy. From the economic perspective, information sharing may impose temporal irreversible lock-ins or tipping points. The point of information sharing may be a reference point, in which one bit of more communication gives less utility than one bit of less information shared, hence one bit of more privacy, grants more utility in the sense of Kahneman & Tversky's (1979) behavioral decision science finding 'losses loom larger than gains.' There may also be a marginal decreasing utility derived from one bit more information shared but an exponential marginal utility gain from one more unit of information received given the fact that information can be put into context and an exponentially increasing marginal utility of information. Education, for instance, is the only good with an exponential marginal utility increase, as the more information one holds, the more complex connections one can make and use.

In the past, communication was depicted to decentralize organizations (Crémer, Garicano & Prat, 2007). Media was initially promoted to offer means of information transfer, political participation and protection against political abuse (Delli Carpini & Keeter, 1989; Neuman, Just & Crigler, 1992; Norris

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