Eliciting Fast *and* Slow responses to nutritional labels

Paolo Crosetto, Laurent Muller

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Background

Long the field of rationality, deductive logic and normative modeling, Economics is slowly moving out of its old territories, and venturing in a world in which different behavioral factors are let free to play. Findings from cognitive and social psychology, as well as from marketing and neuroscience, are being integrated in the traditional paradigm, both enlarging and changing it.

This process has been going on for over a generation of scholars now, and it is entering a mature phase. The first wave of changes concerned the periphery of the paradigm, rather than its core: economists reacted to the abundant evidence of the empirical failings of the rational choice paradigm by adding constraints or terms to it. Examples are the concept of bounded rationality, or the attempts to go beyond the selfish nature of the rational decision maker adding terms to an otherwise standard utility function, as in the inequality aversion literature.

But change is more pervasive than that. The very foundations of the discipline are now being updated. Are preferences stable? Is there really a unique decision maker? In a recent book, Daniel Kahneman (2011) argues, supported by decades of studies, that there exist not one, but two decision systems. System One is fast, intuitive, relies on first impressions and heuristics, and is our default in most occasions. System Two is slow, deliberate, calculating, and enters the picture when called for. Economics has long dealt with System Two only, usually by directly assuming pure System-Two decision makers. Cognitive psychology has long dealt mainly with System One. Kahneman urges us at thinking at them both, and at the way they interact.

The two systems have already been extensively studied, both by psychology *and* by economics. A large part of experimental economics exists because of this very paradigm shift – the idea that there is more to people than calculating brains, and that through careful experimenting we can both reveal what's inside people's minds and its consequences on economic phenomena. Yet, methodological innovation has not followed suit. While all experimental economists are aware of Kahneman's work and many do use heuristics on a daily basis, most of the tools of the trade are direct emanation of a full-fledged rational choice approach, having been created starting from an expected utility benchmark. It is the case of virtually all tools used to elicit value, like the BDM mechanism or N-price auctions; of the protocols applied to social dilemmas, as the prisoner dilemma, public good or common pool resource games; of the games used to identify other-regarding preferences, as the trust, ultimatum, dictator games; and of the tools used to elicit risk preferences, as lotteries and multiple price lists.

The workflow used is rather simple in its weirdness. Experimental economists use these rational-choice, expected-utility maximizer calibrated tools, and then interpret differences in behavior with respect to the benchmark in various ways, towards their goal of distilling behavioral insights in economic situations. So risk aversion is a deviation from the risk neutral EU-maximising standard, overbidding a deviation from Nash play in auctions, inequality aversion (or altruism, or reciprocity, or...) could explain deviation from subgame-perfect Nash in the Ultimatum game, and similar considerations plus institutional arrangements help guide the researcher through public good games. The tools we use force us to see the world from the perspective we are striving to leave behind.

This project aims at introducing a methodological tool built no more on the assumption of a unique, monolithic, rational decision maker; but on the assumption that decision makers use a variety of both fast (heuristic, intuition, emotions) and slow (cost-benefit, deductive) reasoning strategies when faced with a problem. The tool is a protocol designed to elicit both fast and slow responses in a variety of multiple-choice frameworks, and it is applicable to both preference elicitation (including risk) and cognitive tasks.

The tool will then be tested in the domain of food choice, in which System One is usually believed to be predominant, and food labeling, that directly or indirectly appeal to System Two.

The method

The experimental protocol described here draws from Caplin et al. (2011), who introduced time in the incentive scheme to be able to properly incentivize a search task on a vast space. It differs from Caplin et al. (2011) both in aims and scope, and in a great number of technical details.

A decision maker (DM) i faces a choice among N alternatives, and is given T seconds to make up her mind. Each second t, her (provisional) choice c_{it} is recorded. At the end of the allotted time, the data obtained from the subject is a vector containing all the provisional choices, $\mathbb{C}_i = \{c_{it} | t = 1 \dots T\}$. One time point is then uniformly drawn $\bar{t} =\sim U(1, T)$, and the provisional choice recorded at that time $c_{i\bar{t}}$ is binding and determines the DM's payoff. If no choice had been submitted at time ($c_{i\bar{t}} = NA$), then the DM is assigned a uniform random choice in the alternative space, $c_{i\bar{t}} =\sim U(1, N)$.

This protocol sits at the crossroads of traditional, rational choice and behavioral, fast-and-slow tools. Its incentive scheme (that assumes self-interested individuals, at least with respect to the outcome of the choice) will induce the DM to use both systems in the task. Since for all the time she spends making up her mind the DM faces a randomly allocated outcome, her immediate interest is to provide a fast, System 1 response that could improve on the random outcome. Next, since the clock is ticking and each second has positive probability of being binding, the DM must – still under time pressure – consider if its initial choice was the best she could do, and use higher-order cognitive resources typical of System 2 to improve on her choice.

The DM is hence incentivized to give *both* a fast *and* a slow response to the choice situation. The method allows the researcher to reliably observe in one and the same task the use of heuristics, the shift to cost-benefit considerations, and the transition between the two.

The method implements a multiple choice environment. It is highly portable across domains – as all it requires are a set of choices, without putting restrictions on what the alternatives can be (lotteries, products, labels, answers to a quiz, shapes, ...). Its portability and the facility with which it adds a time dimension to an existing set of problems mean that it faces potential widespread application within the field.

Food labeling

While ultimately the aim is to apply this elicitation method to several topics, including risk elicitation, discrete consumer choice and consumer confusion, in a first paper this method has been applied to food choice and nutritional labeling – a domain where there exists a clear fast-slow cleavage,

An extensive literature exists on the effect of food labeling (for reviews see Grunert and Wills, 2007; Drichoutis et al., 2011; Vyth et al., 2012) on food choice and diets (Crosetto et al., 2016). Food choice is one of the main terrains in which System One and System Two considerations clash. It is eminently a System One affair: most of the time we choose intuitively, we rely on habits shaped by social norms and culture, we are subject to hundreds of stimuli in a few seconds and we usually choose when hungry – i.e., in a state of relative cognitive impairment. At the same time, food labels convey information that would be most relevant to System Two: long-term health-related information that needs to be understood, processed, integrated in our decision patterns, information on location, ingredients, and more. This is one of the fundamental motivations of moving from 'nutrition fact' tables on the back of pack – that speak only to System Two – to front-of-pack, color-coded information – that has the potential to appeal to System One.

In the literature it has long been argued that color-coded labels are 'more intuitive'; the other side of the debate has repeatedly stressed that this comes at a cost, as simple labels offers coarse information and are strictly inferior – from a System Two perspective – to the nutritional tables or the analytical labels providing almost complete information.

The application of the experimental design to this issue is straightforward. We ask subjects two types of simple nutritional discrimination questions: analytic, detailed questions (*'which of these products contains less*

Salt?'), and aggregate, comprehensive questions (*'which of these product has overall the best nutritional quality?'*)v. At the same time, we vary the type of label that is presented alongside the product. Subjects have to find the correct option among a small set of 4 products. As in Crosetto et al. (2016), references are induced, and performance can be objectively measured. The fast&slow protocol will allow us to assess which label helps subjects find earlier a *good* approximation of the correct answer, if not right away the optimal answer. Coarse labels give less information and might lead to (quick) error; but the converse – i.e. that analytical labels that give lots of information lead to the optimal response – need not necessarily be true. By varying the difficulty of the task and the degree of informativeness and of discriminatory power of the label, we are able to assess if analytical labels actually help, in which time frame, and if a quick-and-dirty first approximation is not overall better than the pondered, costly System Two reconsideration that might (or might not) happen next.

We test four different labels: aggregate color-coded labels (as the Nutri-Score system being studied in France for front-of-pack adoption, see Julia et al. (2015)); multiple color-coded lables, universally known as Multiple Traffic Lights; reference intake daily percentages, now almost universally adopted; and the combination of MPL and RI, used in the United Kingdom. We expose subjects to three types of tasks:

1. screens displaying only the nutritional label, to assess the clean cognitive effect;
2. screens displaying only the product image, to assess the role of healthiness beliefs;
3. screens displaying both the label and the picture of the product, to gain in external validity

Our sample includes 193 subjects, recruited from a general-population sample managed by GAEL and composed of adults living in the Grenoble Metro Area (south-eastern France, roughly half a million people). Each subject faces all four labeling schemes and all three types of screens, for a grand total of 24 screens per subject.

Preliminary results

The results of the label-only treatment – used to calibrate the method and to see if it reliably delivers both fast *and* slow choices – are highly encouraging. Figure 1 summarises the finding of this treatment.

The Figure shows the rate of correct choices in time, over the thirty allotted seconds, by treatment. We ask an *aggregate* question; that is, the question revolves around the general nutritional quality of a product. The aggregate color-coded label ('o' in the figure) gives directly the correct solution, and not surprisingly it is the fastest; in this condition, subjects arrive at good rates of correct answers in a very fast span of time – less than 5 seconds. At the other side of the spectrum, the RI, numeric-only label ('xxx' in the plot) has opposite properties: it takes a long time for it to be effective – as it mainly appeals to System Two – but it eventually picks up. Interestingly, the mixed label, that combines colors *and* numbers, ('ox' in the plot) gives the convex hull of the color-only 'ooo' and number-only 'xxx', giving direct evidence that subjects *first* process the coarse color information for a quick-and-dirty approximation, and *then* move to looking at the numbers.

The rest of the analysis is ongoing; a discrete choice duration model is being fine-tuned to fit the label+product and product-only data.

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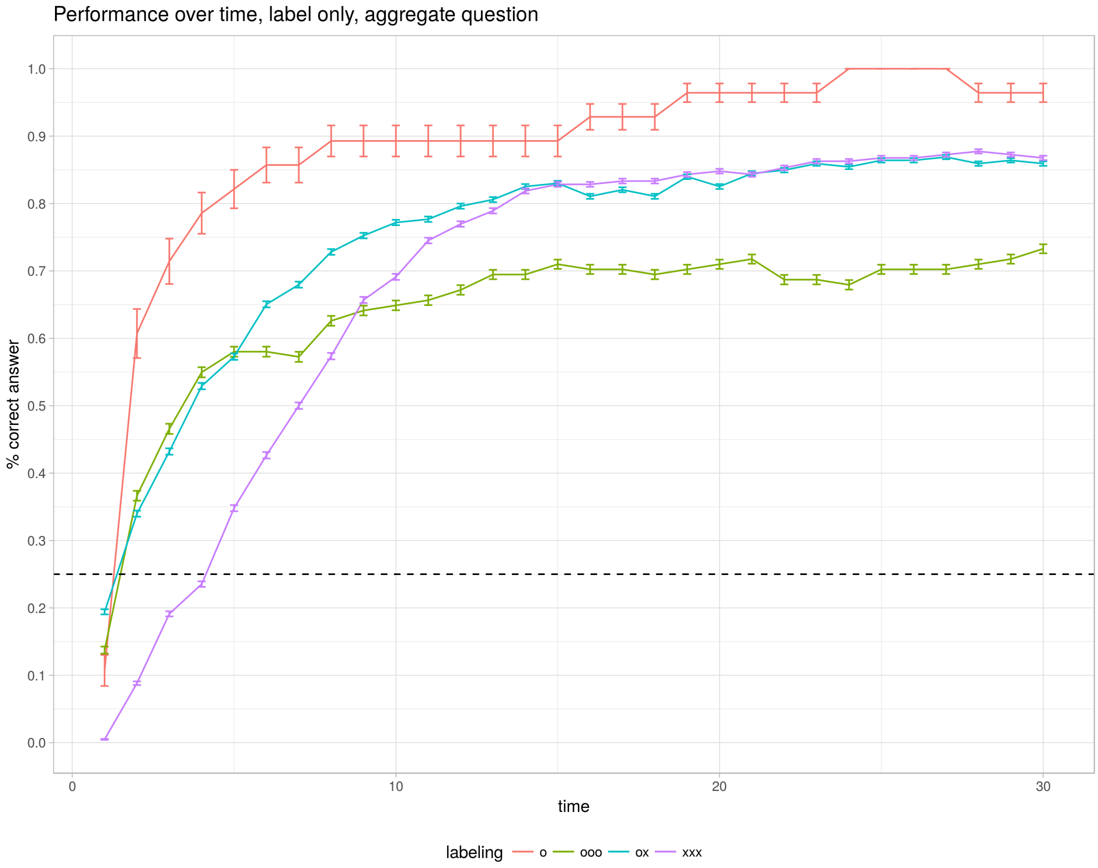

Figure 1: Rate of correct choices in time by treatment

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