

Attention and the Limits of Revealed Preference

a toy model, after Masatlioglu, Nakajima, and Ozbay (2012)

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Walk down a cereal aisle stocked with 60 boxes and you buy one of the four you actually look at. Type a query into a search engine and you click a link on the first page. The choice is made not from everything on offer but from the few options that draw your attention. Masatlioglu, Nakajima, and Ozbay (2012) build a theory of choice around this fact and ask a clean question: if a decision maker chooses from what she notices, and we never see what she noticed, what can her choices still tell us about her preferences? This note builds the simplest version of their model, a shopper facing three options, and shows that a choice pattern the textbook theory calls inconsistent reflects a single stable preference seen through limited attention, and that recovering that preference means watching how choices change when an option is removed.

1 The model

A decision maker chooses from a finite set of alternatives X . She has one preference relation $>$ over X , assumed strict, complete, and transitive: exactly the rational preference of Chapter 1. What is new is that she does not survey every option. Facing a menu $S \subseteq X$, she first forms a *consideration set* $\Gamma(S) \subseteq S$, the options she actually notices, and then picks the $>$ -best element of that set,

$$c(S) = \text{the } > \text{-best alternative in } \Gamma(S).$$

Her preference is standard; the only departure from the textbook model is the filter Γ sitting between the menu and the choice.

The content of the theory is a restriction on how attention may move as the menu changes. Masatlioglu, Nakajima, and Ozbay require Γ to be an *attention filter*: if the decision maker does not notice an option, then dropping that option from the menu leaves her attention unchanged,

$$\text{if } x \notin \Gamma(S) \text{ then } \Gamma(S \setminus \{x\}) = \Gamma(S).$$

The requirement is mild. Removing something she was already ignoring should not change what she looks at. Adding an option, by contrast, is free to redirect her attention, and that freedom is where the action lies.

2 A choice that looks inconsistent

A shopper considers three mobile plans: a *Basic* plan, a *Plus* plan, and a stripped-down *Plus-Lite* plan that offers a little less than Plus for the same price. Offered Basic and Plus together, she signs up for Basic. Offered all three, she signs up for Plus.

Chosen from the pair {Basic, Plus}, Basic is picked over Plus; chosen from the triple, Plus is picked while Basic sits right there, unchosen. The two choices cannot both come from one preference: the first

reads Basic $>$ Plus, the second Plus $>$ Basic. This is a violation of the weak axiom of revealed preference, and under the textbook model it marks the shopper as inconsistent.

3 A stable preference, filtered

Limited attention dissolves the contradiction. Suppose the shopper's true ranking is Plus $>$ Basic $>$ Plus-Lite, and that Plus-Lite does one thing: by being plainly worse than Plus, it makes Plus stand out. Without it on the menu Plus does not catch her eye, so she weighs only Basic; with it on the menu Plus becomes the option she notices. This is the attraction effect long documented in marketing, where an inferior decoy raises the share of the option it resembles.

A numerical example. Rate each plan on two attributes, data and service quality, with more of each better: Basic = (1, 3), Plus = (3, 2), and Plus-Lite = (2.4, 1.3). Plus-Lite is worse than Plus on both attributes, so Plus dominates it; Basic, with less data but higher quality, is not comparable to either. The ranking Plus $>$ Basic $>$ Plus-Lite together with an attention filter that overlooks Plus unless the decoy is present generates every choice the shopper makes.

<i>Menu S</i>	<i>Notices $\Gamma(S)$</i>	<i>Chooses $c(S)$</i>
{Basic, Plus}	{Basic}	Basic
{Basic, Plus, Plus-Lite}	{Basic, Plus, Plus-Lite}	Plus
{Basic, Plus-Lite}	{Basic, Plus-Lite}	Basic
{Plus, Plus-Lite}	{Plus, Plus-Lite}	Plus

Table 1. Choices generated by the ranking Plus $>$ Basic $>$ Plus-Lite and an attention filter under which Plus is overlooked unless the decoy is present.

To check the table, verify two things row by row:

- Each choice is the $>$ -best plan among those noticed. In the first row she notices only Basic, so she picks Basic. In the second row she notices all three, and Plus is first in the ranking Plus $>$ Basic $>$ Plus-Lite. In the last two rows she notices both plans and picks the higher-ranked one, Basic over Plus-Lite and Plus over Plus-Lite.
- The filter rule holds. It only restricts menus with an ignored option, and the only such menu is the pair {Basic, Plus}, where Plus is ignored. Dropping Plus leaves the menu {Basic}, whose only option is Basic, so attention stays at {Basic}, as the rule requires.

4 What a choice reversal reveals

Return to the analyst, who sees the choices in Table 1 but never the consideration sets. What can she learn about the ranking? Not by reading a choice as a preference for everything available. Plus is chosen from the triple while Basic is available, yet concluding Plus $>$ Basic would be wrong in method even where it happens to be right in fact: Basic might simply have gone unnoticed, so its mere availability says nothing.

The reliable inference comes from removals. Masatlioglu, Nakajima, and Ozbay show that for any option $x \neq c(S)$ in the menu,

$$\text{if } c(S) \neq c(S \setminus \{x\}) \text{ then } c(S) > x.$$

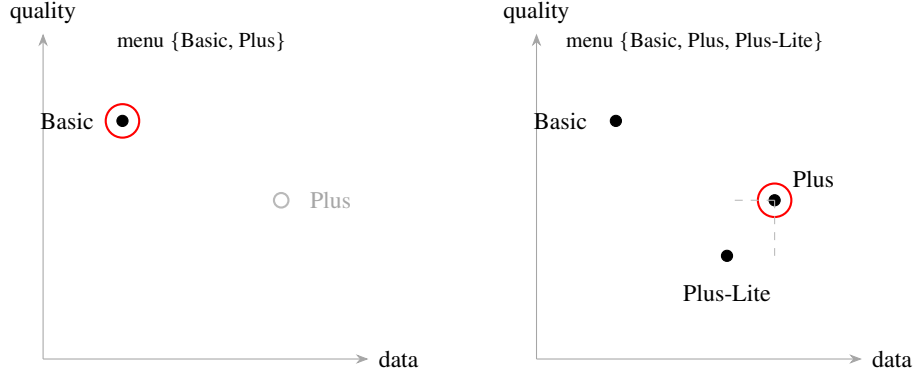


Figure 1: Three plans in attribute space (more of each attribute is better). Left: without the decoy the shopper overlooks Plus (gray) and picks Basic (red). Right: Plus-Lite, worse than Plus on both attributes, draws attention to Plus, which she then picks. Her ranking never changes.

(Removing the chosen option itself always changes the choice, so it reveals nothing.) The logic runs through the attention filter in two steps:

- If x had been ignored in S , the filter would leave attention unchanged when x is dropped, $\Gamma(S \setminus \{x\}) = \Gamma(S)$, and so the choice would not change either. Since the choice does change, x must have been noticed in S .
- The shopper noticed x and still chose $c(S)$, so she prefers $c(S)$ to x .

Apply this to Table 1 by dropping, one at a time, each option other than the one chosen:

- From the triple, where Plus is chosen: dropping Basic leaves $\{\text{Plus}, \text{Plus-Lite}\}$, where Plus is still chosen, so nothing is learned; dropping Plus-Lite leaves $\{\text{Basic}, \text{Plus}\}$, where Basic is chosen, so the choice changes and the analyst learns $\text{Plus} > \text{Plus-Lite}$.
- From each pair, dropping the unchosen option leaves a single option, which is the one chosen before, so the choice never changes.

This is all she learns: she cannot rank Basic against Plus, nor Basic against Plus-Lite, from these data. Limited attention buys a stable explanation of behavior that looked erratic, and it is paid for in how much of the preference that behavior can reveal.

Lesson: When a chooser acts on what she notices, availability is not consideration, and the familiar rule that a chosen option beats every available one claims more than the data support. Preference is revealed only where removing an option reverses a choice, the one moment at which the option was surely seen. $\square$

References

Masatlioglu, Y., D. Nakajima, and E. Y. Ozbay (2012) “Revealed Attention.” *American Economic Review* 102(5): 2183–2205.