

IS STATUS QUO BIAS CONSISTENT WITH DOWNWARD-SLOPING DEMAND?

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We show that status quo bias combined with downward-sloping demand implies addictive behavior. This result does not depend on transitivity, a complete ordering, or even the existence of a preference relation that rationalizes choices. (JEL D11, D81)

By now, there is a large experimental literature showing some kind of status quo bias.¹ If the subject is given a coffee mug (candy bar) and later given the possibility of trading it for a candy bar (coffee mug) of equal value, the subject is likely to stick with the original allocation (Knetsch, 1989). Here, we ask whether status quo bias can be made consistent with downward-sloping demand curves. This paper thus differs in intent from a large body of research that incorporates a different notion of status quo bias into a more general formulation of revealed preference (e.g., Masatlioglu and Ok, 2005; Sagi, 2006); such research demonstrates that there are different sets of primitives that lead to different axioms of revealed preference. In this paper, we do not care which set of primitives holds or whether such results can be incorporated into the neo-classical model of consumer behavior (as Munro and Sugden, 2003, have done).² Instead, we undertake a strict behavioralist approach: Individuals display status quo bias and downward-sloping demand curves. Whether such behavior can be derived from a consistent set of assumptions is irrelevant to our purpose. Indeed, we do not require the existence of a preference relation that rationalizes choices at all—all that is required is choice behavior. What we want to find out is

the implications of such observed behavior; in particular, we want to determine whether status quo bias and downward-sloping demand curves are consistent with each other. The short answer is yes, but the consumer will display addictive behavior.³ The remainder of the paper will be devoted to demonstrating this result.

We will make the following set of assumptions:

A1: There are two goods, x (candy) and y (wine), which are continuously divisible.

A2: Prices and incomes are exogenously determined. That is, the person has a budget line and budget set.

A3: The individual chooses a point on the budget line.

A4: Strictly downward-sloping demand: if the person chooses x_t, y_t for a given budget set, b_t , and then the person is faced with a different budget set, b_{t+1} , that goes through x_t, y_t but where the relative price of x has gone down (up), then $x_{t+1} > x_t$ and $y_{t+1} < y_t$ ($x_{t+1} < x_t$ and $y_{t+1} > y_t$).⁴

I. AN INTUITIVE EXAMPLE

Before proceeding with the formal exposition, it is useful to consider the intuition behind the argument. To make the logic as accessible as possible, in the intuitive example, I will assume that individuals have indifference curves and that these indifference curves

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1. Plott and Zeiler (2005) review 45 experimental articles finding an endowment effect.

2. Bossert and Sprumont (2006) consider conditions for the existence of a relation such that the agent choice is no worse than the status quo but there is no status quo bias.

3. The addiction result can be seen as a generalization of the ostensibly unrelated literature on habit formation. See Pollak (1970) whose seminal contribution assumed a particular utility function and a linear habit formation function.

4. We only need to have *strictly* decreasing demand for the good that we are investigating and only for one price change (since prices only change once).

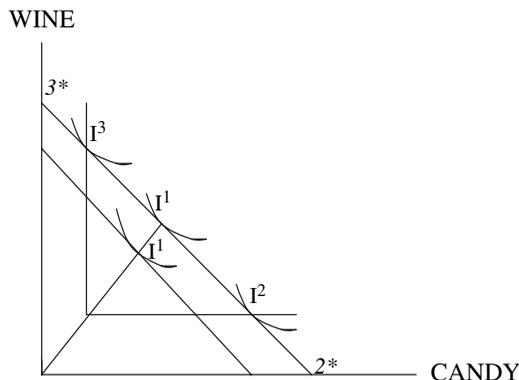
are homothetic. Before the subjects come to the experiment, they made choices based on their individual budget sets and preferences. The budget sets of these various individuals have the same slope (the market prices facing the individuals are the same), but the richer individuals have budget sets that are farther out. If individuals have status quo bias, then each individual's choice is based on his/her budget set and his/her unique set of indifference curves, which in turn are based on the reference point established by the individual's experiences and history. While we can use any time period for the analysis, let us suppose here that the time period of analysis is daily so that before and after the experiment, individuals decide each day how much candy and wine to choose. The experimenter divides the subjects into three groups. In the first group, the experimenter gives the subjects \$10 and then each subject gets to choose either candy or wine (or some combination in between). Knetsch actually did this with candy and coffee cups and found that the subjects split evenly between the two choices. In the second group, the subjects are given \$10 worth of candy and then later are allowed to trade in some or all of the candy for the equivalent value of wine. And in the third group, the subjects are given \$10 worth of wine and then later are allowed to trade in some or all of the wine for the equivalent value of candy. Hence, in all three groups, the budget set is shifted upward for the day, but in Group 1, the status quo ref-

erence point remains the same as it was before the experiment (and let us suppose that on average they choose equal amounts of wine and candy), in Group 2, the status quo reference point shifts the indifference curves toward preferring candy so that subjects will tend to keep the candy, while in Group 3, the status quo reference point shifts the indifference curves toward preferring wine so that subjects will tend to keep the wine or more of the wine than subjects in Groups 1 and 2.

All this is illustrated in Figure 1. Looking at the interior pair of axes, suppose that the horizontal axis is (candy, 0 wine) and the vertical axis is (0 candy, wine). The person starts the day with the lower budget line and the set of indifference curves I^1 . If the person is given \$10, then the person is on the upper budget set. The set of indifference curves will remain the same, but the relevant indifference curve will be the outer I^1 indifference curve. If the person is given \$10 worth of candy, then *in the extreme* the person's indifference curve will shift to I^2 , and when given a choice between keeping the candy and choosing \$10 worth of wine, he will keep the candy. If the person is given \$10 worth of wine, then in the extreme the person's indifference curve will shift to I^3 , and when given a choice between keeping the wine and choosing \$10 worth of candy, he will keep the wine.

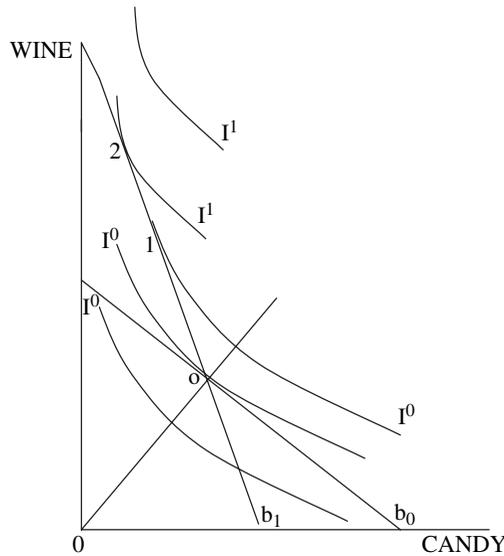
We will consider several generalizations. Looking at the outer pair of axes (now with origin 0, 0) and completely ignoring the inner

FIGURE 1
Illustration of the Experimental Results Using Indifference Curves



Notes: The person starts the day with the lower budget line and the set of indifference curves I^1 .

FIGURE 2
A Clockwise Rotation in Budget Line Results in Ever-Increasing Demand for Wine



Notes: In Period 0, the person has the set of homothetic indifference curves labeled I^0 and is constrained by the budget set b_0 . The point labeled 0 is the person's choice of wine and candy for the given budget set and indifference curves.

pair of axes, a person might be allocated 2* (candy, 0 wine). This results in indifference curve I^2 , which is southeast of indifference curve I^3 , the indifference curve that arises when the person is allocated 3* (0 candy, wine). In this case, Person 2 would trade off some candy for wine and Person 3 would trade off some wine for candy, but Person 3 would still have more wine and less candy than either Person 2 or Person 1. Note that in our analysis, the allocations need not be at the corners.

If this status quo bias is not completely ephemeral (i.e., it is not just an artifact of the experiment itself), then every day after the experiment the subjects in Group 3 will continue to buy more wine than the subjects in Group 2 because the experimenter has changed the status quo reference point for these two groups.⁵ So this is the essence of status quo bias—changing the status quo changes the reference point of the indifference curves in favor of the status quo—the more wine relative to candy in the status quo, the more wine the person will want to consume.

Now, if the experimenter can change the status quo, so should other events. Suppose

that on Monday instead of going to the experiment, one of the subjects goes shopping and discovers that the price of wine has decreased and the price of candy has increased so that the new budget has rotated through the previous day's purchases. This is illustrated in Figure 2, where b_0 is the original budget set, I^0 is the original set of indifference curves, and b_1 is the new budget set. Because of the change in relative prices, the subject purchases more wine than otherwise. That is, demand is downward sloping—Monday's purchases (Point 1) are to the northwest of Sunday's purchases (Point 0). Eventually, call it Tuesday (day is a metaphor and might represent a week or a month), Monday's pattern of consumption will be viewed as the status quo and treated as the reference point for the new set of indifference curves, I^1 . Monday's wine demand was dependent on the status quo (that is Sunday's consumption—0) and the new lower price on Monday. So Monday's consumption of wine was greater than Sunday's (if nothing changed that weekend). Tuesday's consumption of wine is dependent on Tuesday's budget set, which is assumed to be the same as Monday's and on the status quo (Monday's consumption—1). The status quo consumption

5. Of course, this differential may diminish over time.

reference point for Tuesday reflects a greater amount of wine than the status quo consumption reference point for Monday. As was shown in Figure 1, when the status quo changes, the indifference curves change in the same direction (in this case, preference for wine) because of status quo bias. In Figure 2, the new status quo ray (not drawn in) from the origin is to the left of the old status quo ray, so that the tangency of the new indifference curve to the budget line will be to the northwest of the tangency of the old indifference curve to the budget line. The new set of indifference curves is labeled I^1 . Therefore, the person will want to buy more wine than when the set of indifference curves was I^0 even though the budget set no longer changes. In a nutshell, status quo bias argues that the indifference curves will shift in favor of wine (hence the new indifference curves I^1) and a concomitant increase in wine consumption (Point 2). The same logic holds for Wednesday versus Tuesday. This process repeats itself: the reference point shifts, creating a new set of indifference curves with a greater bias in favor of wine; then consumption adjusts to reflect the new set of indifference curves, which shifts the status quo point and indifference curves, which shifts consumption toward more wine in response to the new set of indifference curves, and so on. When the experimenter gives wine to the subject, the subject's status quo reference point shifts in favor of wine; that is, his indifference curves shift in favor of wine. In a similar fashion, when the person consumes more wine (because the price has dropped), eventually (which we label as the next day) the person will view the change in consumption pattern as the new status quo with an accompanying change in his indifference curves. Because of status quo bias, where more wine (candy) in the status quo means a greater preference for wine (candy), the shift is in favor of more and more wine. The application of status quo bias to ordinary consumption predicts a kind of addiction.

We will now proceed with a more formal analysis.

II. STATUS QUO CONSUMPTION

The world that we consider is very simple. In the initial period, the experimenter (God) allocates a certain amount of x and y to the

individual (this is the status quo allocation in Period 0) and also announces the prices (thus income is also determined).⁶ The person must decide how much of each item to consume in that period. For simplicity, we will assume that in Period 0 the allocation is in equilibrium; that is, the desired choice by the individual is the allocation provided (God reads the individual's mind and makes an allocation that will be in equilibrium). Without the assumption of equivalence between the allocation by the experimenter and the choice by the subject, we would immediately have addiction.

In Period 1, the budget set rotates around the status quo allocation point so that the relative price of x decreases;⁷ there are no changes in the budget set in any of the following periods. In Period $t \geq 1$, the status quo is the consumption profile in the previous Period $t - 1$. In this example and in the real world, customary consumption is the obvious candidate for the status quo point. After all, in the real world, most of us are paid in money rather than in things so the endowment of goods (except possibly money itself) is not a good candidate for the status quo reference point although such an interpretation is possible. We can thus characterize the sequence in two equivalent ways. (1) In Period 0, the experimenter allocates a certain amount of x and y and announces the price ratio (equivalently budget set 0), and in Periods 1– N , the experimenter provides budget set 1; or (2) In Period 0, the experimenter allocates a certain amount of x and y and budget set 0, and in Periods 1– N , the experimenter provides the allocation of x and y equivalent to the person's choice of x and y in the previous period and a set of prices so that the budget set remains the same from Period 1 on.

Let (x^{sq}, y^{sq}) be the status quo, and let (x_{sq}, y_{sq}) be the person's choice given the status quo and the budget set. That is, the individual's choice (x_t, y_t) in Period t can be characterized by the function $Cx^t y^t(b_t)$ which chooses a point on b_t for any given status quo (x^t, y^t) . Thus, the choice function is "reference dependent" on the status quo consumption. Note that our

6. Presumably, before the experiment, the person had a status quo consumption profile of goods, S_{00} , with its attendant biases.

7. Note that in our example in the previous section, the rotation was in the opposite direction.

presentation does not require the choice to be optimal or that the individual can rank order the alternatives.

Let (x^{sa}, y^{sa}) and (x^{sb}, y^{sb}) be two possible status quo allocations on the same budget line for some Time Period t .

DEFINITION 1. *An individual has status quo bias if $(x_{sa} < x_{sb})$ and $(y_{sa} > y_{sb})$ whenever $(x^{sa} < x^{sb})$ and $(y^{sa} > y^{sb})$.*

This captures the essence of the status quo bias: If the status quo Position a is to the left of status quo Position b on the budget line, then the choice on the budget line when a is the status quo will be to the left of the choice when b is the status quo. For example, if the status quo allocation under A is 9 pounds of candy and 1 liter of wine (i.e., $x^{sa}, y^{sa} = 9, 1$) and the status quo allocation under scenario B is 1 pound of candy and 9 liters of wine (i.e., $x^{sb}, y^{sb} = 1, 9$) and the price of 1 pound of candy is equal to the price of a liter of wine, then under Scenario A the person will choose more candy and less wine than if the status quo position were B (e.g., $x_{sa}, y_{sa} = 7, 3$ and $x_{sb}, y_{sb} = 4, 6$). This can be seen as a generalization of the Knetsch example, where the subject was allocated either 0 cups and 1 candy bar or 1 cup and 0 candy bars, the budget set was the line through these two points, and the choice was discrete.⁸

DEFINITION 2. *An ever-increasing demand or addiction means that $x_{t+1} > x_t$ and $y_t < y_{t+1}$ for every Time Period t after a one-time counter-clockwise rotation in the budget set.*

We will now show that when there is status quo bias, a one-time decrease in the price of x will result in an ever-increasing demand for x .

PROPOSITION 1. *Given the above assumptions, if there is status quo bias, then a one-time rotation in the budget set around the status quo that results in the relative decrease in the price of x will result in an ever-increasing demand for x .⁹*

8. Going back to the indifference curve analysis in Figure 1, our definition of status quo bias allows for the point of tangencies to the budget line to be southeast (or northwest) of either one or both allocations (as long as they satisfy the other criteria). In a nutshell, the more northwest the status quo is on the budget line, the more northwest the person's set of indifference curves and the more northwest the indifference curve tangency to the budget line.

9. Note that ever increasing does not mean that there is no supremum, nor does it mean that the supremum is where the budget is solely devoted to x .

Proof. Suppose that in Period 0, the status quo allocation is the choice given the budget set, b_0 that is, $x^0, y^0 = x_0, y_0 = Cx^0y^0(b_0)$. That is, the status quo at $t = 0$ is in equilibrium.

Suppose next, that in Period 1, the budget set swivels around (x_0, y_0) so that the relative price of x decreases. The new budget set is b_1 . Because the status quo had been in equilibrium, the status quo in Period 1 is the same as the status quo in Period 0; that is $(x^0, y^0) = (x_0, y_0) = (x^1, y^1)$. Thus, $x_1, y_1 = Cx^0y^0(b_1) = Cx^1y^1(b_1)$ where $x_1 > x_0$ and $y_1 < y_0$. That is, when the relative price of x falls, the demand for x increases and the demand for y decreases (A4).

Note that $b_t = b_1$ for all $t \geq 1$.

In Period t , the status quo point is the consumption profile in Period $t - 1$. Thus, in Period 2, the consumption profile x_1, y_1 will be seen as the status quo. Therefore, in Period 2, the individual will choose $x_2, y_2 = Cx^2y^2(b_1) = Cx_1y_1(b_1)$. Because $x^2 = x_1 > x_0 = x^1$ and $y^2 = y_1 < y_0 = y^1$, status quo bias will result in $x_2 > x_1$ and $y_2 < y_1$. In Period 3, x_2, y_2 will be seen as the status quo, and the whole process will start over again. The chosen allocation will continue to shift toward greater x and less y . Hence, status quo bias can be seen as implying addiction, where the individual buys more and more of the item.¹⁰ q.e.d.

Alternatively, the status quo could be viewed as a weighted sum of the present status quo and the previous status quo. Clearly, this does not change the analysis; it just makes each move smaller.

III. CONCLUDING REMARKS

Asset bubbles and collecting stamps might be characterized as a type of addiction, but it is unlikely that consumer behavior is in general addictive. If one day the relative price of peas decreases, it is unlikely that you will start on a never-ending spiral of eating more and more peas. So one might question the validity of one or both of the behavioralist

10. Starting with Becker and Murphy (1988), there have been a host of papers that have assumed addictive behavior rather than deriving addictive behavior from more primitive relationships as we have done here. For a recent example, see Aspestegeula and Ballester (2004) who assume that the person is addicted and then derive the preference relationships rather than deriving addiction from status quo bias.

assumptions employed in this paper. In this case, downward-sloping demand seems more universally true than status quo bias but perhaps that is just the status quo bias of a neoclassical economist. Still, there is some experimental evidence arguing against status quo bias. Plott and Zeiler suggest that most (but not all) of the observed status quo bias may be an artifact of previous research methodology. From a more theoretical perspective, Mandler (2004) claims that people do not want to make choices right away when they are put into a new situation because they do not have a complete ordering. Hence, what appears to be status quo bias may just be cautionary behavior. Status quo bias may be ephemeral rather than persistent.

In the end, it is important to emphasize that the argument here is not against the behavioralist enterprise in general but rather against one particular well-cited result—status quo bias. There may well be other behavioral relationships that are contradictory of both standard neoclassical economics and status quo bias. For example, Koszegi and Rabin (2006) have a model that is based on expectations rather than on the status quo. But whatever the set of behavioral observations or assumptions, one should undertake the kind of exercise undertaken in this paper and determine whether the *set* of behavioral observa-

tions implies behavior that is consistent with the real world.

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