A Theory of Nonseparable Preferences in Survey Responses

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A person has nonseparable preferences when her preferences for the outcome of one issue or set of issues depend on the outcome of other issues. A model of individual-level responses to issue questions in public opinion surveys implies that when people have nonseparable preferences, their responses will change depending on the order of questions. An individual’s responses may also vary over time as her perception of the status quo changes. A telephone survey of a random sample of residents of Franklin County, Ohio, reveals that much of the public has nonseparable preferences on a wide range of issues. Results from a survey experiment confirm that aggregate-level question-order effects occur on issues for which people have nonseparable preferences, and order effects do not occur on issues for which most people have separable preferences. At the individual level, people with nonseparable preferences display greater response instability across question orders than people with separable preferences, and a respondent’s level of political information has little impact on response instability.

Since Converse’s “The Nature of Belief Systems in Mass Publics” (1964), students of public opinion have argued that most people lack well-defined or stable opinions on important political issues. Converse concluded “large portions of an electorate simply do not have meaningful beliefs, even on issues that have formed the basis for intense political controversy among elites for substantial periods of time” (1964, 245). Several empirical puzzles in opinion research appear to result from the public’s lack of meaningful beliefs. First, most people hold opinions on issues independently of their opinions on other issues, without ideological connections across them. Second, individuals’ responses to survey questions are often unstable. Converse’s original findings of response instability applied to over-time changes in an individual’s responses to issue questions, but response instability also results from seemingly trivial changes in the order or wording of questions.

Evidence in favor of Converse’s thesis comes from surveys in which researchers ask respondents their opinions on one issue after another without explicit links across the issues. For example, the American National Election Studies (ANES) ask respondents their opinions on the level of taxation and on the level of defense spending and on the level of welfare spending; but respondents are rarely, if ever, asked how their opinion on one issue might change given changes in policy on another issue. Although most public policy debates in Congress and in the media involve actors expressing contingent, conditional, or constrained preferences, survey researchers rely on survey instruments that presume the public’s preferences on the same issues are isolated, unconditional, and unconstrained.

In this article, I argue that many people’s preferences on political issues are not isolated, unconditional, and unconstrained; instead, their preferences on multiple issues are often nonseparable. A person has nonseparable

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preferences when her preferences on an issue or set of issues depend on the outcome of other issues. A person has separable preferences if her preferences on every issue and set of issues are independent of—or, can be separated from—the outcomes of other issues. Nonseparable preferences are a theoretically, empirically, and substantively important form of complexity in public opinion. I develop a model of the survey response that implies that a person's responses to questions in a public opinion survey may change depending on the order of the questions, even if her underlying preferences are unchanged. Using new survey instruments to detect nonseparable preferences, I demonstrate that large portions of a sample of the American public have nonseparable preferences for a variety of important policy issues; and a question-order experiment in the survey shows that order effects occur at the individual and aggregate levels when respondents have nonseparable preferences.

By demonstrating the empirical and theoretical importance of nonseparable preferences in survey responses, I argue that the conventional wisdom on public opinion underestimates the complexity of mass political preferences. This underestimation of the complexity of preferences has led survey researchers to rely on simple questions that assume people's preferences are separable. Based on responses to such questions, researchers may incorrectly infer that mass political preferences are poorly formed, unstable, or irrational.

### What Are Nonseparable Preferences?

Formal models of political behavior have incorporated the possibility that an individual's preferences across issues may be either separable or nonseparable (e.g., Enelow and Hinich 1984; Hinich and Munger 1997; Kramer 1972; Kadane 1972; Schwartz 1977). The distinction between separable and nonseparable preferences holds important implications for the outcome of votes on multiple issues (Benoit and Kornhauser 1994; Brams, Kilgour, and Zwicker 1997, 1998; Kadane 1972; Kramer 1972; Lacy and Niou 2000; Ordeshook 1986; Schwartz 1977), agenda manipulation in committees (Denzau and Mackay 1981; Enelow and Hinich 1984), elections to multi-member legislatures (Austen-Smith and Banks 1988), positions adopted by candidates in elections (Cox 1984; Lacy and Niou 1998), and the positions of voters and candidates in ideological space (Hinich and Munger 1997; Lacy 1994).

To define nonseparable preferences formally, let \( J = \{1,\ldots,J\} \), \( J > 2 \), be a set of issues. Let \( o = (o_1,\ldots,o_J) \) be a J-tuple of outcomes across all J issues. Define \( x \) and \( y \) as mutually exclusive and exhaustive nonempty subsets of \( o \), \( x' \) is an outcome that differs from \( x \) on at least one issue, and \( y' \) differs from \( y \) on at least one issue. Now suppose individual \( i \) has a reflexive and transitive weak preference relation, \( \succeq_i \), ordering all J-tuples of policy outcomes. Then \( i \)'s preferences are:

- **separable** if and only if for all \( x, y, x', (x, y) \succeq_i (x', y) \) and \( (x, y') \succeq_i (x', y') \).
- **completely nonseparable** if and only if for all \( x \) there exists a \( y \) and \( y' \) such that \( (x, y) \succeq_i (x', y) \) and \( (x', y') \succeq_i (x, y') \).
- **partially nonseparable** if and only if for some but not all \( x \) there exists a \( y \) and \( y' \) such that \( (x, y) \succeq_i (x', y) \) and \( (x', y') \succeq_i (x, y') \).

The definitions imply that any issue or set of issues may be nonseparable from any other issue or set of issues.\(^1\) If the J issues can be partitioned into two sets of issues, \( x \) and \( y \), such that a person's preferences for \( x \) and \( y \) are

\(^1\)Nonseparable preferences are also sometimes called dependent preferences (Keeney and Raiffa 1993), though I use the term nonseparable since it is more common in the political science literature. The definition of nonseparability in this paper is similar to N-K combinatorial models of genetic nets in biology (Kauffman 1969, 1974, 1986; Kauffman and Levin 1987), which are another application of combinatorial models to complex interaction problems. In Kauffman's N-K models, the evolutionary viability of each genetic trait may depend on the presence or absence of other traits; however, I am not aware that Kauffman's models include the possibility that the viability of sets of traits may depend on the presence or absence of other sets of traits. See Lacy (1994) and Kilgour (1998) for more detailed descriptions of the combinatorial approach to the separability of preferences.

Nonseparable preferences have been defined in other contexts, using different assumptions about the underlying issues and preferences. In the widely used spatial theory of voting (Enelow and Hinich 1984; Hinich and Munger 1997), any individual, \( i \), has a fixed ideal point \( \Theta_i = (\theta_{i1},\ldots,\theta_{iJ}) \) in \( o', \) a Euclidean space, and preferences representable by a weighted Euclidean norm, such that for any two vectors of outcomes, \( o \) and \( o' \), \( o \succeq_i o' \) if and only if:

\[ \|\Theta_i - o\|^2_A < \|\Theta_i - o'\|^2_A \] where \( A \) is the positive definite matrix of parameters:

\[
\begin{bmatrix}
a_{1i} & \cdots & a_{1J} \\
\vdots & \ddots & \vdots \\
a_{JI} & \cdots & a_{JJ}
\end{bmatrix}
\]

The spatial model of nonseparable preferences is limited in its generality since \( A \) is a symmetric matrix, which implies that issues \( j \) and \( k \) are completely nonseparable. That is, if a person's preference on \( j \) depends on the outcome on \( k \), then her preference on \( k \) must likewise depend on the outcome on \( j \). While the spatial model allows any issue to be nonseparable from any other issue, it does not capture the possibility that sets of issues may be nonseparable from other sets of issues. However, the spatial model is very useful for describing preferences in measurement models (Lacy, 2001).
separable while her preferences for issues in x or in y are nonseparable, then the person's preferences are weakly separable. A weakly separable individual preference profile can be partitioned into subsets of issues that are separable.

To illustrate the different types of preferences in a simple case, suppose that person \( i \) has a linear preference ranking over two issues, each of which has a binary, \([0,1]\), outcome. One possible preference ranking over the outcomes of the issues is \((1,1) > (1,0) > (0,1) > (0,0)\). This ranking is separable. When the outcome on the first issue is 1, then 1 > 0 on the second issue. When the outcome on the first issue is 0, then 1 > 0 on the second issue. Similarly, the person's preference on the first issue is unchanged by the outcome on the second issue. A quick check on whether a person's preferences are separable is the inverse rule: For two issues, a person's preferences are separable if and only if her most preferred outcome is the inverse of her least preferred outcome. For more than two issues, the inverse rule is a necessary but not sufficient condition for separable preferences.

An example of a partially nonseparable preference ranking is \((1,1) > (1,0) > (0,0) > (0,1)\). If the outcome on the first issue in the pair is 1, then 1 > 0 on the second issue. However, if the outcome on the first issue is 0, then 0 > 1 on the second issue. The person's preference for the outcome of the second issue depends on the outcome of the first issue; but, her preference on the first issue does not depend on the outcome of the second issue. Regardless of whether the outcome on the second issue is 1 or 0, the person always prefers 1 to 0 on the first issue.

A completely nonseparable preference ranking is \((1,1) > (0,0) > (1,0) > (0,1)\). In this case, the person's preference for the outcome of either issue changes depending on the outcome on the other issue.

In some cases a set of issues may be nonseparable from another set even though each issue may be separable from the other issues. For example, suppose a person has the following linear preference ranking over the outcomes of four binary issues, dropping parentheses: 0000 > 1000 > 0100 > 0010 > 0001 > 1001 > 0110 > 1010 > 0101 > 0011 > 1100 > 1110 > 1101 > 0111 > 1011 > 1111. Each issue is separable from the remaining issues since the person prefers 0 to 1 on each issue regardless of the outcomes on the other issues. However, if the outcome on the first pair of issues is 10, then the person prefers 01 to 10 on the second pair of issues; but if the outcome on the first pair is 11, the person prefers 10 to 01 on the second pair. Therefore, the second pair of issues is nonseparable from the first pair, and the person's preference ranking is not separable. Such a preference ranking might be held by a person who is evaluating four new spending programs and wants none to pass, followed by only one passing, then two passing, then three passing, while her least preferred outcome is for all four to pass. However, if she knows that at least one of the first pair of spending programs passes, then her preferences for the remaining two programs depend on which of the first two spending programs pass.

When the issues have ordinal or interval rather than nominal outcomes, partially nonseparable and completely nonseparable preferences can each be further decomposed into positive and negative complements to indicate the direction of the relationship between the issues in a person's preference ranking. If two issues are positive complements, then as the level of one issue increases, a person wants the level of the other to increase as well. The issues are negative complements if a person wants the level of one issue to decrease as the level of the other issue increases. For example, if a person wants more money spent on education as taxes increase, then the two issues are positive complements. A person who wants spending on environmental cleanup to increase as anti-pollution regulations are relaxed (decrease) prefers the two issues as negative complements.

The key to understanding nonseparable preferences is that an individual's preferences are defined not over each issue, but over sets of issues. A person's preference for the outcome of any single issue or set of issues depends on the outcome of—or her beliefs about the outcome of—other issues. Nonseparable preferences may be rare on most issues of public policy. If people have predominantly separable preferences, then they compartmentalize their opinions in a fashion resembling Converse's argument that people lack connections across their opinions.

The pervasiveness of nonseparable preferences is an empirical question that no current surveys can answer. The best way to determine whether a person’s preferences over J issues are separable is to ask the person to rank all J-tuples of outcomes on the issues (Hinich and Munger 1994; Lacy 1994; Lacy and Niou 2000). In the case of a few issues with only a few possible outcomes on each issue, this approach may be feasible in survey research. However, if each of J issues has N possible outcomes, one would need a survey respondent to rank \( N^J \) different J-tuples of outcomes. Thus, asking respondents to rank all possible sets of outcomes on all possible issues quickly becomes infeasible in a public opinion survey.

To determine whether a person's preferences are nonseparable, survey researchers need a different approach. One quick method for uncovering nonseparable preferences in a survey is to ask respondents their preferences on an issue conditional on two different outcomes on a related issue: "If the status quo were A on issue k, what
would you prefer on issue j?,” and “If the status quo were B on issue k, what would you prefer on issue j?” If a person answers that her opinion on j would not change if the status quo changes on k, then her preferences between k and j are separable. If her opinion on j changes in response to changes in k, then her preference on j is non-separable from k. Of course, this approach requires some foreknowledge of which issues are likely to be non-separable from which other issues in the minds of respondents.

The closest a public opinion survey has come to the types of questions needed to uncover nonseparable preferences is the 1995 Pilot Study for the 1996 ANES, which probed perceived trade-offs across tax and spending issues (See Hansen 1998). For example, respondents were asked:

“Do you favor cuts in spending on national defense in order to increase spending on domestic programs like Medicare, education, and highways?”

“Do you favor an increase in the federal budget deficit in order to increase spending on domestic programs like Medicare, education, and highways?”

“Do you favor increases in the taxes paid by ordinary Americans in order to increase spending on domestic programs like Medicare, education, and highways?”

Responses to these three questions could reveal the means respondents prefer—defense cuts, tax increases, or deficit increases—to pay for increases in domestic programs. If a person prefers to cut defense or increase the deficit to pay for domestic programs and does not approve of a tax increase, then one could assume that the person’s preference for domestic spending depends on the means used to pay for the increase. Her preference for increased spending on domestic programs is then non-separable from the policies used to pay for them. Unfortunately, problems arise when interpreting responses to these questions because they are double-barreled: they ask the respondent’s attitude on two issues simultaneously. We do not know whether someone who answers “No” to all three questions really wants a cut in spending on domestic programs or whether she wants to increase spending on domestic programs, but only through other means (a tax increase on only wealthy Americans).

To uncover the extent of nonseparable preferences on a variety of issues in a sample of the American public, I commissioned a telephone survey of 416 residents of Franklin County (Columbus), Ohio, during February 1998. The survey includes questions about ten issues. Respondents’ preferences could be nonseparable across all combinations of these issues. To simplify the survey design and to reduce survey time, I sorted the ten issues into five pairs: spending on defense and spending on social programs, English as the official U.S. language and immigration, abortion and aid to low-income women and children (AFDC programs), spending on environmental cleanup and pollution regulations, and state income taxes and state spending to prevent crime (see questions in Appendix A). If the survey demonstrates nonseparable preferences across some pairs of issues, then, by extension, preferences could be nonseparable across other issues or sets of issues as well.

The survey randomly assigned each respondent to one of two survey forms, which presented the two questions in a pair in different orders. For example, the questions on state income tax and anti-crime spending are:

(1) “Do you think the state of Ohio should increase income taxes, cut income taxes, or keep income taxes where they are now?”

(2) “Do you think the state of Ohio should spend more money to fight crime, less money to fight crime, or continue spending the same as it does now?”

Respondents in Form 1 answered question (1) followed by question (2). Respondents in form 2 answered the questions in reverse order.

Following the initial pair of issue questions, respondents in both survey forms answered a series of questions designed to uncover nonseparable preferences. The follow-up questions on taxes and anti-crime spending are:

(3) “If the state of Ohio significantly cut income taxes, then would you want the state to spend more money to fight crime, less money to fight crime, or continue spending the same as it does now?”

(4) “If the state of Ohio significantly increased income taxes, then would you want the state to spend more money to fight crime, less money to fight crime, or continue spending the same as it does now?”

(5) “If the state of Ohio significantly reduced the amount of money it spends to fight crime, then would you

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2 After extensive searches of major polls and elections studies in the United States, I have yet to find the kind of questions needed to detect nonseparable preferences.

3 Residents of Columbus, Ohio, and the surrounding county are not an exactly representative sample of the American public, but they are close enough so that Columbus is a major test market for new products and marketing campaigns. Respondents were selected using random digit dialing and random selection of a respondent over the age of 18 from each household. The Center for Survey Research at Ohio State University conducted the survey. Two hundred phone numbers failed to produce interviews on multiple call-backs. Only ten respondents failed to complete the interview.
want the state to increase income taxes, cut income taxes, or keep income taxes where they are now?"

(6) "If the state of Ohio significantly increased the amount of money it spends to fight crime, then would you want the state to increase income taxes, cut income taxes, or keep income taxes where they are now?"

Each question was followed by a branching question— "is that a lot more (less), somewhat more (less), or a little more (less)?"—producing a seven-point response scale.

If a respondent offers a different answer to the two conditional follow-up questions on an issue, then her preferences on that issue are nonseparable from the other issue in the pair. For example, Table 1 presents a cross-tabulation of valid responses to questions (5) and (6). If respondents have separable preferences for taxes and anti-crime spending, then their response to question (5) should be identical to their response to question (6), and all responses should appear on the diagonal of the table. Responses off the diagonal indicate that the respondent has a different preference for the level of taxes depending on the level of anti-crime spending. Responses above the diagonal indicate people who want taxes to increase more (or decrease less) if anti-crime spending increases, but who want taxes to decrease more (or increase less) if anti-crime spending decreases. To these respondents, who are 44.5 percent of the respondents answering both questions, tax rates are a nonseparable positive complement of anti-crime spending. Below the diagonal, respondents want taxes to increase as anti-crime spending decreases, and they want taxes to decrease as anti-crime spending increases. To these respondents, 9.4 percent of those answering both questions, tax rates are a nonseparable negative complement of anti-crime spending. Though there may be a reason behind a preference that the two issues are negative complements, it is also possible that these responses are random or due to errors in responses, errors in interviewer coding, or some other typical stochastic component of surveys.

Table 2 presents the results for the remainder of the issues in the survey. Entries in columns 3 and 4 are the percentage of respondents whose preference on the issue in column 1 depends on the outcome of the issue in column 2, thus indicating nonseparable preferences. Nonseparable preferences are separated into positive complements and negative complements depending on the direction of change in the respondent's preference on the issue in column 1. The issues are ordered from the largest to the smallest percentage of respondents with nonseparable preferences.

Several interesting patterns appear in the table. First, on nearly all of the issues, a substantial percentage of respondents have nonseparable preferences. On tax rates and crime spending, environmental cleanup and anti-pollution regulations, and social and defense spending, over 25 percent of the sample have nonseparable preferences. English as the national language (conditional on immigration levels) and abortion (conditional on AFDC spending) are the only issues for which nearly everyone has separable preferences.

Second, most of the issues show a clear imbalance between the percentages of people who consider the

<table>
<thead>
<tr>
<th>Table 1 Nonseparable Preferences on Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column question: If the state of Ohio significantly increased the amount of money it spends to fight crime, then would you want the state to increase income taxes, cut income taxes, or keep income taxes where they are now?</td>
</tr>
<tr>
<td>Row question: If the state of Ohio significantly reduced the amount of money it spends to fight crime, then would you want the state to increase income taxes, cut income taxes, or keep income taxes where they are now?</td>
</tr>
<tr>
<td>Cut a lot</td>
</tr>
<tr>
<td>Cut a lot</td>
</tr>
<tr>
<td>Cut somewhat</td>
</tr>
<tr>
<td>Cut a little</td>
</tr>
<tr>
<td>Keep where they are</td>
</tr>
<tr>
<td>Increase a little</td>
</tr>
<tr>
<td>Increase somewhat</td>
</tr>
<tr>
<td>Increase a lot</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source: 1998 Franklin County, Ohio survey
TABLE 2 Percentage of Respondents with Nonseparable Preferences

<table>
<thead>
<tr>
<th>Issue</th>
<th>Conditional on</th>
<th>Positive Complements</th>
<th>Negative Complements</th>
<th>Order Effect</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean up environment</td>
<td>Pollution regulations</td>
<td>25.0%</td>
<td>46.4%</td>
<td>z = 2.11*</td>
<td>388</td>
</tr>
<tr>
<td>Income taxes</td>
<td>Anti-crime spending</td>
<td>44.5</td>
<td>9.4</td>
<td>z = 2.04*</td>
<td>382</td>
</tr>
<tr>
<td>Anti-crime spending</td>
<td>Income taxes</td>
<td>37.4</td>
<td>10.1</td>
<td>z = 3.12*</td>
<td>385</td>
</tr>
<tr>
<td>Social spending</td>
<td>Defense spending</td>
<td>8.9</td>
<td>31.4</td>
<td>z = 0.42</td>
<td>392</td>
</tr>
<tr>
<td>AFDC programs</td>
<td>Abortion</td>
<td>8.5</td>
<td>28.5</td>
<td>z = 2.97*</td>
<td>354</td>
</tr>
<tr>
<td>Pollution regulations</td>
<td>Clean up environment</td>
<td>21.4</td>
<td>12.5</td>
<td>z = 1.97*</td>
<td>397</td>
</tr>
<tr>
<td>Defense spending</td>
<td>Social spending</td>
<td>14.5</td>
<td>13.5</td>
<td>z = 0.41</td>
<td>384</td>
</tr>
<tr>
<td>Immigration</td>
<td>English</td>
<td>12.2</td>
<td>4.6</td>
<td>z = 0.86</td>
<td>367</td>
</tr>
<tr>
<td>English</td>
<td>Immigration</td>
<td>2.9</td>
<td>4.7</td>
<td>z = 0.48</td>
<td>383</td>
</tr>
<tr>
<td>Abortion</td>
<td>AFDC programs</td>
<td>1.7</td>
<td>2.9</td>
<td>z = 0.80</td>
<td>345</td>
</tr>
</tbody>
</table>

Source: 1998 Franklin County, Ohio, survey.

issues to be positive and negative complements. The imbalance indicates that my measure of nonseparable preferences on each issue is not picking up primarily random responses. If the changes in responses to the two conditional questions on an issue are mostly random, roughly equal numbers of people would change their responses in positive and negative directions. Most people prefer anti-pollution regulations and spending to clean up the environment as negative complements: the more of one there is, the less of the other is necessary. Most people also see spending on general social programs as a negative complement of spending on defense; increases in defense spending should be offset by decreases in social spending. The percentage of people who prefer defense spending as a positive complement of social spending is roughly equal to the percentage who prefer defense spending as a negative complement of social spending.

On immigration levels conditional on English as the national language and spending on AFDC programs conditional on abortion, the definitions of positive and negative complements become arbitrary. If a person's preference on aid to families with dependent children is a negative complement of restricting abortion, it means that as abortion becomes less available, she prefers spending more on AFDC programs. I define immigration as a positive complement of English as the national language if a person wants immigration levels to increase if English is the national language but wants immigration levels to decrease if it is not. Immigration is a negative complement of English as the national language if a person wants immigration to increase if English is not the national language but wants immigration to decrease if it is. As Table 2 shows, the number of respondents who prefer immigration as a positive complement of English as the national language is nearly three times greater than the number who prefer immigration as a negative complement of English as the national language.

Finally, it is not necessary that the percentage of people who have a nonseparable preference for one issue in a pair equal the percentage expressing a nonseparable preference for the other issue in the pair. Abortion and AFDC programs present the clearest example of partially nonseparable preferences. The level of spending on welfare programs for low-income women and their children has little bearing on respondents' preferences on abortion since only 4 percent of respondents have nonseparable preferences. However, 37 percent of respondents have a preference for the level of AFDC spending that depends on whether abortion is legal. If the government outlaws abortion, a substantial number of respondents want increases in spending on programs to help low-income women and their children. Taxes and spending on crime fighting are completely nonseparable to most people, as are anti-pollution regulations and environmental cleanup and social and defense spending.

Responses to the questions in the Franklin County survey reveal important substantive undercurrents of public opinion. On taxing and spending issues, 44.5 percent of respondents express a preference that income taxes should not decrease as anti-crime spending rises, suggesting that the public is more tolerant of tax increases—or at least less committed to tax cuts—if people believe that spending to prevent crime is increasing. This result contradicts portrayals of a public that separates spending priorities from tax issues and wants both tax cuts and spending increases (Sears and Citrin 1985). Surveys consistently reveal aggregate preferences for higher government spending and lower taxes since the questions on those surveys do not allow people to express their
preferences for spending increases conditional on the level of taxes, and vice-versa.

Opinions on AFDC programs conditional on abortion reveal that if abortion is restricted, the public may become more tolerant of increases in welfare spending. Also, the public may accept higher levels of immigration if English becomes the national language. Further use of conditional questions such as those in the Franklin County survey can reveal to policymakers how changes in policy on some issues will affect the public's preferences on other issues.

Demonstrating that large segments of a sample of the population have nonseparable preferences on a variety of issues is useful in its own right. But demonstrating that nonseparable preferences can explain one of the most perplexing phenomena in survey research—question-order effects—further confirms the importance of nonseparable preferences for studies of public opinion.

The Puzzle of Question-Order Effects

The order in which questions are presented to respondents in a survey can change responses to those questions. Consider the following famous example of two questions that appeared on surveys in the 1950s:

1) "Do you think a Communist country like Russia should let American newspaper reporters come in and send back to America the news as they see it?"
2) "Do you think the United States should let Communist newspaper reporters from other countries come in here and send back to their papers the news as they see it?"

When question (1) is asked before question (2), responses to question (2) lean heavily in favor of allowing reporters from Communist countries into the United States. When the order is reversed, responses to question (2) tend to oppose allowing Communist reporters into the United States (Hyman and Sheatsley 1956; Schuman and Ludwig 1983; Schuman and Presser 1981).

Since the question pairs that produce such order effects are about policy issues at the same level of generality, they are often referred to as part-part question-order effects. Other question-order effects—part-whole effects—arise when a person answers a specific then a general question. For example, if a respondent is asked whether she favors or opposes increases in social spending and also asked whether she favors or opposes increases in spending on education, her answers to the questions may depend on their order. If a person is asked the specific question first, she then removes that specific issue area from her interpretation of the general question. Thus, if a person favors increased spending on education but not on other social programs, she may answer that she favors spending and many others cite order effects as evidence that people lack fixed or well-formed preferences (1992, 32).

The conventional wisdom on question-order effects holds that each question in a survey activates certain attitudes or information in a respondent's mental file, making those attitudes or information more accessible. Responses to questions are influenced by the cognitive or affective considerations evoked by earlier questions in a survey.

Zaller (1992) and Zaller and Feldman (1992) explain question-order effects by arguing that most people do not have well-formed political preferences. Instead, "Most people possess opposing considerations on most issues, that is, considerations that might lead them to decide the issue either way" (Zaller and Feldman 1992, 585), and "which of these considerations is available at the top of the head at the moment confronting survey questions determines responses to the questions" (Zaller 1992, 39). The order of questions in a survey determines the set of considerations activated in a respondent's mental file when answering a question. Although Zaller does not adopt Converse's conclusion that large segments of the public lack "meaningful attitudes," he concludes that "... individuals do not typically possess 'true attitudes' on issues ... but a series of partially independent and often inconsistent ones" (1992, 93). That attitudes are partially independent seems to presume, as Converse argued, that the public is usually not aware of trade-offs or linkages across issues.

Schuman and Ludwig (1983) offer a different explanation of question-order effects. When respondents answer questions similar to those about Communist journalists in the United States and American journalists in on education when it is asked first, but that she does not favor increased spending on (other) social programs when the general question is second. When the order of questions is reversed, the respondent will answer that she favors spending on social programs (which include education). Many similar question-order effects can be explained as providing information to respondents about the content and purpose of questions.

Zaller describes question-order effects as an "embarrassment to the conventional view of opinions" (1992, 32). Schuman and Presser argue that "...order effects of all kinds seem to us to constitute one of the most important areas for methodological research. ... At this point research needs to be aimed not merely at producing more examples, but at understanding why those already obtained occur" (1981, 77).

Whether attitudes and information are accessed through a memory-based or impression-driven process is often not clear from the research on question-order effects. See Lodge, McGraw, and Stroh (1989) for details on memory-based and impression-driven models of evaluation. For further discussion of question order and response effects, see Bickart 1992; Feldman 1992; Krosnick 1992; Krosnick and Shuman 1988; Strack 1992; Tourangeau 1992; Tourangeau et al. 1989a, 1989b; Tourangeau and Rasinski 1988.
Communist countries, many respondents follow the norm of evenhandedness, which dictates that whatever one actor is allowed to do, all others should be allowed to do. The norm explains order effects on questions about trade restrictions between the United States and Japan and contributions by labor and business groups to political campaigns. The norm of evenhandedness does not explain many common order effects, including questions about issues such as taxes and spending levels.

Schuman and Presser speculate that question-order effects arise when "the respondent needs to feel, or at least to appear, consistent in his or her answers" (1981, 28). A problem with this explanation is that "consistent" is not defined meaningfully or precisely. It is not clear why one would presume a person wants to offer consistent answers to two different questions unless her underlying preferences on the issues are interdependent. Zaller observes that Schuman and Presser's explanation of order effects "... implicitly abandons the notion that individuals possess a single, fixed opinion ..." (1992, 32).

These theories do not explain why some issues generate order effects and others do not. Conventional psychological theories offer little more than a tautology: question-order effects occur when one issue is a relevant consideration for another issue, and an issue is a relevant consideration for another issue if it generates a question-order effect. As the model in the next section demonstrates, nonseparable preferences provide a clear mechanism for question-order effects, which arise even if people have stable preferences.

A Model of the Survey Response

The model requires the following set of definitions. Recall that $J = \{1, \ldots, J\}$, $J \subseteq$ is a set of issues and that $o = (o_{11}, \ldots, o_{J})$ is a J-tuple of outcomes across all J issues. Now define $o_j$ as the outcome of generic issue $j$, $o_{-j}$ as a J-1-tuple of outcomes on all issues except $j$, and $o_j \equiv o_{-j}$. $O_j = \{o_{1j}, \ldots, o_{Jj}\}$ is a set of possible outcomes on issue $j$, $L = 2$, and $O$ is the set of all $O$.

I define a survey as an ordered list of questions, $Q = (q_1, \ldots, q_M) \subseteq J$, about M issues, $M = 2$. $q_{t} \in Q$, $q_{k} \subseteq Q$ if $q_{t}$. Each survey question, $q_{t}$, presents a respondent with a set of responses $R_{j} = (r_{1j}, \ldots, r_{Nj})$, $N = 2$. The set (and number) of responses to each question need not be equal. $R$ is the set of responses to all questions in a survey. $r_{1j}$ is individual $i$'s response to question $j$, $r_{-j}$ is her response to all questions other than $j$, $r_{ik} \subseteq r_{i-j}$ is her response to issue(s) $k$, and $r_i$ is an M-tuple of her responses to all questions in the survey. Finally, $s_i = (s_{i1}, \ldots, s_{ij})$ is a set of i's beliefs about the status quo on all issues in $J$.

The model rests on a minimal set of assumptions about survey respondents and the survey instrument.

**Assumption 1**: Individual $i$ has a reflexive and transitive weak preference relation, $\succeq_i$, ordering all J-tuples of policy outcomes, $o = (o_{1}, \ldots, o_{J})$.

**Assumption 2**: $R_{1, \ldots, M} = O_{1, \ldots, M}$

The set of responses available on the M issues in the survey is exactly equal to the set of possible outcomes on those issues. In other words, the survey is perfect in the sense that every possible outcome on a public policy issue is available as a response to a question about that issue. One might find this assumption about surveys unreasonably generous, but it is important to demonstrate that question-order effects can occur even without measurement error (Achen 1975).

**Assumption 3**: For any $r_{j} = o_{j}$, $r'_{j} = o'_{j}$, and $r_{-j} = o_{-j}$, $(r_{j}, r_{-j}) \succ_{i} (r'_{j}, r'_{-j})$ if and only if $(o_{j}, o_{-j}) \succ_{i} (o'_{j}, o_{-j})$.

Preferences are defined on $O$ and induced on $R$. For present purposes, the function mapping preferences on $O$ to survey responses in $R$ is such that every respondent picks the survey response that corresponds to her preferred outcome. This assumption implies that respondents answer questions sincerely and attempt to reveal their true preferences for outcomes.

**Assumption 4**: When a person offers a response to survey question $q_{t}$, she does not know $[q_{t+1}, \ldots, q_{M}]$.

The respondent is asked each question without foreknowledge of upcoming questions, which is the format of nearly all telephone surveys and face-to-face interviews such as the ANES.

The important behavioral assumption in the model is:

1. A model of question-order effects when preferences are measured with error appears in Lacy (2001).

2. The model can be extended to cases where respondents offer strategic responses by further specifying their beliefs about other respondents' preferences and by specifying a survey aggregation function that maps a collection of survey responses into policy outcomes. Such an exercise is beyond the scope of this article and unnecessary for the results that follow. However, the results that follow are consistent with a model in which the survey aggregation function is monotonic and respondents eliminate weakly dominated response strategies.
Assumption 5: When a respondent answers a survey question \( j \), she offers a constrained response, \( r_i (q_j | r_{i(1)}^{*}, \ldots, r_{i(j-1)}^{*}, s_{i(j+1)}, \ldots, s_j) \), given her responses to previous questions, \( (r_{i(1)}^{*}, \ldots, r_{i(j-1)}^{*}) \) and her beliefs about the status quo, \( s \), on other issues not (yet) probed in the survey.

Whenever a person answers a survey question, she offers a constrained response. She answers each question conditional on her responses to all previous questions in the survey and on her beliefs about the status quo on all issues not (yet) asked in the survey. The assumptions imply the following result (proof in appendix) about any individual's survey responses.

Result: \( r_{i}^{*} (q_j | r_{i(k)}^{*}), q_k < q_j, r_{i}^{*} (q_j | s_k), q_j < q_k \), if and only if \( i \) has nonseparable preferences for issues \( j \) and \( k \), and \( r_{i(k)}^{*} s_k \).

This result states that a person's response to question \( j \) after answering question (or set of questions) \( k \), will differ from her response to question \( j \) asked before question(s) \( k \) if and only if her preference for \( j \) is nonseparable from \( k \) and her beliefs about the status quo on \( k \) are not the same as her response to \( k \). If a person answers question \( j \) before question(s) \( k \), her answer to \( j \) is conditional on her beliefs about the status quo on issue \( k \). If she answers \( j \) after \( k \), her answer to \( j \) is conditional on her response(s) to \( k \).

To illustrate the logic behind the result, I turn to the classic order effect produced by questions about Communist journalists. Suppose a survey respondent has nonseparable preferences for journalists crossing national boundaries, such as \( [A,C] > [A,\neg C] > [\neg A,\neg C] > [\neg A,C] \), where \( A \) means American journalists are allowed in Communist countries, and \( \neg A \) means they are not. Similarly, \( C \) means Communist journalists are allowed in the U.S.; \( \neg C \), they are not. The preference ranking is partially nonseparable—separable for \( A \), nonseparable for \( C \).\(^9\) The respondent most prefers that the two countries allow each other's journalists free access. The worst outcome for the respondent is for the United States to allow free access while Communist countries do not. Suppose the survey respondent is first asked whether Communist journalists should be allowed in the United States. If she believes that American journalists are not allowed in Communist countries, then her most preferred outcome (and survey response) is \( [\neg A,\neg C] \), implying a response of \( \neg C \).

Now reverse the order of the questions. If the respondent is first asked whether American journalists should be allowed in Communist countries, she considers whether Communist journalists are currently allowed in the U.S. Based on her preference ranking, her beliefs about \( C \) are irrelevant since she prefers \( A \) to \( \neg A \) regardless of \( C \). She answers \( A \), American journalists should be allowed abroad. Next she is asked whether Communist journalists should be allowed in the U.S. Given that she has already answered \( A \) on the first question, her most preferred outcome (and response) is \( C \). The order of the questions changes her response to \( C \). Many other nonseparable preference rankings will also yield question-order effects.

The order effect arises as a respondent attempts to reveal her most preferred set of outcomes across multiple issues when she does not know which issues will be probed in the survey. A respondent begins a survey by answering the first question conditional on her beliefs about the status quo on all other issues. As she answers a series of questions, she switches off the constraints imposed by her beliefs about the status quo and switches on the constraints imposed by her responses to previous questions. When a person is asked to give her preference on any one issue, she is forced to make assumptions about what the outcome will be on all related issues. Order effects will occur when a person has nonseparable preferences on an issue and not when a person has separable preferences. Nonseparable preferences may manifest themselves in survey responses as unstable or ill-formed opinions.

Nonseparable Preferences and Question-Order Effects: Evidence from a Survey Experiment

I test the model at the aggregate and individual levels. At the aggregate level, the model implies that question-order effects will appear only on issues for which a large percentage of respondents have nonseparable preferences. At the individual level, the model implies that people who have nonseparable preferences will exhibit larger changes in their responses due to question order than people who have separable preferences. I first test the prediction of the model at the aggregate level. I then review a competing theory of question-order effects—that they are due to a respondent's level of political

\(^9\) The person prefers \( A \) to \( \neg A \) regardless of the outcome on \( C \). She prefers \( C \) to \( \neg C \) when the outcome on the other issue is \( A \), yet she prefers \( \neg C \) to \( C \) when the outcome on the other issue is \( \neg A \).
information—and test whether information or nonseparable preferences better explain question-order effects.

Current empirical evidence of question-order effects is based on comparing aggregate-level responses to different surveys in which respondents answer questions in different orders. One weakness of current theories of question-order effects is that they do not provide an a priori prediction for which issues will generate order effects. A theory of survey responses based on nonseparable preferences can provide an a priori prediction: an issue will exhibit aggregate-level question-order effects only if a large percentage of respondents have nonseparable preferences. Not all issues for which respondents have nonseparable preferences will generate question-order effects in the aggregate. If some respondents prefer that two issues are positive complements while others prefer that they are negative complements, then their question-order effects may cancel out in the aggregate.

To test the hypothesis that aggregate question-order effects are due to nonseparable preferences, I included a question-order experiment in the Franklin County survey. Within each of the five blocks of issue questions, I randomized the order of the initial two questions (i.e., questions (1) and (2) of the tax and crime-spending questions presented earlier); I also randomized the order of the five blocks of issues in order to avoid systematic order effects across the blocks. I hypothesize that aggregate-level responses between the two forms differ only on the issues for which significant numbers of respondents have nonseparable preferences. As with most of the existing research on order effects, I focus on pairs of issues in order to simplify the experimental design. However, once I demonstrate that order effects are the result of nonseparable preferences across pairs of issues, the extension to order effects across more than two issues is immediate.

In Table 2 the column labeled “Order Effect” reports the results of a nonparametric Mann-Whitney test for differences in the distribution of responses between the two survey forms. They are also among the top half of issues in the percentage of respondents who have nonseparable preferences.

Expected patterns appear in the difference in mean responses across the issues. Spending on environmental cleanup, spending to fight crime, spending on AFDC programs, income taxes, and pollution regulations have values ranging from (−3) decrease a lot, to (0) keep at current levels, to (3) increase a lot. When the tax question appears before the crime question, the mean response to cutting taxes is −0.96. When it appears after the crime question, the mean is −0.67, indicating a slight but statistically significant reduction in respondents’ support for a tax cut. When the crime spending question appears before the tax question, the mean response to anti-crime spending is 1.34, indicating an aggregate preference for higher spending; when the crime spending question appears after the question about taxes, the mean response is .89, indicating less willingness to increase spending.

Responses to questions about pollution limits and spending on environmental cleanup exhibit a similar pattern. When the question on pollution limits appears first, the mean response is −2.21, indicating that industries should be required to put out less pollution. When the question appears after the question about spending on environmental cleanup, the mean response is −1.96, indicating weaker anti-pollution regulations. Respondents are more likely to favor stricter anti-pollution regulations if they have not already expressed their preference for an increase in spending on environmental cleanup. When the question about spending on environmental cleanup appears before the question about pollution regulations, the mean response on spending is .93 (increase spending a little). When the order of questions is reversed, the mean response to the spending question is 1.34. This result is less intuitive but still explainable. Sixty-three percent of respondents who answer the pollution question first prefer that industries be allowed to put out much less pollution, compared to 53 percent who offer the same response if the pollution question appears second. Many of these respondents may have a preference for pollution regulations that exceeds the endpoint of the scale (i.e., industries should not be allowed to pollute). Once these respondents commit to allowing industries to put out some pollution—even if it is a lot less than current levels—they then respond that the government should spend more to clean up the environment.

The abortion question generates an order effect on the AFDC question. When the AFDC question appears first in the pairing, the mean response is 0.66, or increase spending a little. When the AFDC question follows a question about abortion, the mean response is 0.11, keep

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10 I use the Mann-Whitney test since the distributions of responses on some questions are nonnormal. The results are substantively identical using t-tests and γ.
spending at current levels. Just months prior to the survey, the Ohio state legislature passed three new laws to restrict access to abortions.11 Respondents who answer the AFDC question first may express a willingness for higher spending, conditional on their belief that the status quo is restricting abortions. But, after people express their preference to keep abortion legal (as over 70 percent did), respondents express a preference for AFDC spending at current levels, conditional on their response that abortion should be legal.

Abortion should fit Zaller and Feldman's model of an issue on which most people have conflicting considerations since deeply held concerns for human life and for individual choice could point them to either side of the debate (Alvarez and Brehm 1995). Given the model proposed by Zaller and Feldman, one might expect that abortion would be highly sensitive to question-order effects due to the often close balance of considerations on either side among well informed people. But abortion does not exhibit question-order effects at the aggregate level since most people separate their preference on the issue from their preferences on other issues, such as the level of government spending on families with dependent children.

None of the other issues in the survey exhibit question-order effects. Only one issue, social spending, exhibits a high percentage of respondents with nonseparable preferences but no question-order effect. Significant numbers of respondents prefer social spending and defense spending as negative complements; as one increases, the other should decrease. These respondents are concerned about balancing the budget. A sizable percentage of respondents also view these issues as positive complements—as one increases, the other should, too—probably due to concerns about balancing priorities. That is, many people believe that as defense spending increases, social spending should increase in order to keep spending priorities in balance. In the aggregate, the countervailing nonseparability cancels out the question-order effect.12

Other popular theories of the survey response cannot explain why question-order effects arise in the aggregate on some issues but not on others. Zaller and Feldman's model hinges on the idea that order effects are created by the activation of relevant considerations in a survey and on the greater impact of these newly activated considerations on less informed respondents than on more informed respondents. Their model is unclear about which issues are relevant for which other issues and why all seemingly relevant issue pairs do not produce question-order effects. Zaller recognizes this ambiguity, writing "Although specifying that use of one consideration can increase the accessibility of related considerations, [the accessibility axiom] says nothing about what it means for different considerations to be related. I am therefore implicitly relying on common understanding to determine when considerations are related to one another" (1992, 48–49). All of the issue pairs in the Franklin County survey may be related to each other in common understanding, but only about half of the issue pairs are nonseparable to a third or more of the respondents.

Although the aggregate-level results offer strong confirmation of the predictions of the model, an individual-level test offers additional evidence of the role of nonseparable preferences in question-order effects. Existing studies of order effects do not probe how the order of questions changes an individual's survey responses since once the respondent answers the questions in one order, the order effect has already occurred. Presenting the questions to the respondent again in a different order is a viable research design only if the respondent has completely forgotten the questions. Using data from the split-half sample, I can determine how a different question order would change responses by imputing respondents' answers to the questions if they had been in the other half of the sample.

To impute responses on an issue, I use respondents' party identification, ideological orientation, race, gender, income, age, response on the other issue question in the pairing, their level of political knowledge, and dummy variables indicating whether the respondent has nonseparable preferences on the issue (one dummy for positive complements, another for negative complements).13 I calculate regression coefficients separately for respondents in each half of the survey using OLS, ordered probit, or binary probit depending on whether the responses on the issue are on a seven-point, four-point (abortion), or two-point scale (English as the official language). Coefficients from the regressions provide a predicted response on each issue for each respondent who answered a question in a different order than the respondents used to estimate the

11The restrictions included parental consent for minors, a mandatory counseling session twenty-four hours prior to the procedure, and restrictions on state medical insurance coverage for abortions.

12I pretested the survey on samples of undergraduate students and found question-order effects and substantial percentages of nonseparable preferences on the same issues as in the telephone survey, with one exception. Among college students, a significant percentage have nonseparable preferences for English as the official U.S. language and levels of legal immigration. These issues also produce question-order effects in surveys of college students.

13All of the results that follow hold even if information and nonseparable preferences are not included in the imputing regressions. However, since I am testing theories that survey responses are influenced by nonseparable preferences or by information, these variables should be included in the imputing regressions.
model's parameters. For example, if a respondent received the tax question first and the crime-spending question second, I impute her response to the crime question if it were asked first by using coefficients from the model estimated for all respondents who were actually asked the crime question first. Similarly, I impute responses on the tax question if it were asked second by using coefficients from the model estimated for all respondents who were asked the tax question second. I then have a measure of each person's response on each question as well as their predicted response if they had answered the question in a different order. The difference between these two responses is a measure of how a person's response would change depending on the order of the questions in the survey. The model predicts that people who have non-separable preferences on an issue will exhibit systematic (nonzero) shifts in their responses between the two question orders. I use the difference in responses as the dependent variable rather than the absolute value of the difference since I seek to explain systematic rather than random changes in responses due to question order.

A rival hypothesis holds that a respondent's level of political information produces shifts in responses due to question-order (Zaller 1992; Zaller and Feldman 1992). Each question in a survey brings a potential consideration to the top of the head of a survey respondent. If a person is highly aware of politics and has many different considerations accessible on any issue, then the activation of any one of those considerations due to previous survey questions should have less of an impact on the person's response than on the response of someone who has few considerations. Thus, previous questions in a survey are responsible for a relatively larger number of considerations for less politically aware respondents than for more aware respondents.

Proponents of the considerations-based model of response instability might argue that the relative balance of considerations on either side of an issue determines instability, not the number of considerations a person possesses. This argument would imply that a respondent's level of political information is not related to order effects only if people with greater information have exactly balanced considerations and the activation of a new consideration as a result of a previous question tips the balance of considerations in one direction on an issue. Even then, the impact on an informed person's response would not be nearly as great as its impact on the response of someone who has no considerations on either side of the issue.

Such an uninformed person would have the previous question in the survey as her only consideration.

The Franklin County survey includes three questions that gauge the respondent's level of political knowledge (see Appendix A). A respondent could answer 0 to 3 of these questions correctly, thus creating a four-point information scale (Delli Carpini and Keeter 1996). The considerations-based model of Zaller and Feldman implies that the greater a respondent's level of information, the smaller the difference in her responses across question orders.

Table 3 presents the results of ordinary least-squares regressions, with robust standard errors, of the difference in individual responses between two question-orders regressed on the respondent's level of political information and whether the respondent has nonseparable preferences. Separate dummy variables tap positive and negative complements, so the omitted category is separable preferences. A respondent's level of information is a statistically significant predictor of differences in responses for only two of the ten issues: taxes and anti-pollution regulations. Nonseparable preferences, however, are statistically significant for seven of the ten issues, including the two issues for which information is statistically significant.

On tax rates, anti-crime spending, pollution regulations, social spending, and abortion, only one type of nonseparable preference generates order effects. The type of

14Franklin (1989) details this method of imputing values for questions not asked in a survey.

15The distribution of responses on the information scale is (0) 6.25 percent, (1) 17.07 percent, (2) 27.16 percent, (3) 49.52 percent. Due to limits of survey time, I could not include additional information questions. The results are unchanged if I use education level, frequency of newspaper reading, or a combination of these measures as an indicator of political awareness (Lacey 2001).

16I use OLS since the predicted values for opinions on abortion and English assume noninteger values; however, the results are unchanged if I transform the predicted values for abortion and English to integers. King et al. (2001) have developed a method for creating multiple imputed data sets for data containing missing values (see also Gelman, King, and Liu 1998). In a split-half sample with respondents randomly assigned to survey forms, the data are missing completely at random. An advantage of King's method is that it accounts for uncertainty in the predicted values of imputed responses. It also imputes values for responses that are missing when the respondent refuses to answer a question or does not have an opinion. I estimated the model using King et al.'s software package, Amelia. After creating five data sets of imputed values for each pair of questions, averaging the OLS coefficients across the estimates derived from each data set, and adjusting the standard errors for uncertainty in the imputations, I found that the results change only minimally. The results for information are no longer statistically significant for income taxes and abortion. The results for nonseparable preferences (negative complements) for English reach statistical significance ($p < .01$), while the results for abortion (positive complements) are no longer statistically significant. Responses for pollution regulations violate the somewhat strict normality assumptions in Amelia.
**Table 3** Predictors of Individual-Level Question-Order Effects

<table>
<thead>
<tr>
<th>Issue</th>
<th>Positive Complements</th>
<th>Negative Complements</th>
<th>Information</th>
<th>Constant</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income taxes</td>
<td>-.71* (.16)</td>
<td>-.48 (.31)</td>
<td>.31* (.09)</td>
<td>-.55* (.22)</td>
<td>353</td>
</tr>
<tr>
<td>Anti-crime spending</td>
<td>.38* (.15)</td>
<td>.11 (.25)</td>
<td>.01 (.07)</td>
<td>-.59* (.20)</td>
<td>361</td>
</tr>
<tr>
<td>Clean up environment</td>
<td>.67* (.24)</td>
<td>.70* (.21)</td>
<td>-.09 (.09)</td>
<td>-.41 (.26)</td>
<td>358</td>
</tr>
<tr>
<td>Pollution regulations</td>
<td>.01 (.17)</td>
<td>.58* (.16)</td>
<td>-.18* (.09)</td>
<td>.47 (.19)</td>
<td>367</td>
</tr>
<tr>
<td>Defense spending</td>
<td>.86* (.20)</td>
<td>.69* (.27)</td>
<td>.07 (.09)</td>
<td>-.41 (.21)</td>
<td>374</td>
</tr>
<tr>
<td>Social spending</td>
<td>.34 (.33)</td>
<td>.99* (.19)</td>
<td>-.03 (.09)</td>
<td>-.19 (.23)</td>
<td>392</td>
</tr>
<tr>
<td>AFDC programs</td>
<td>-.39 (.33)</td>
<td>.19 (.18)</td>
<td>-.04 (.09)</td>
<td>-.31 (.23)</td>
<td>311</td>
</tr>
<tr>
<td>Abortion</td>
<td>-.41* (.20)</td>
<td>.59 (.34)</td>
<td>-.07 (.06)</td>
<td>.26 (.15)</td>
<td>309</td>
</tr>
<tr>
<td>Immigration</td>
<td>.14 (.24)</td>
<td>.02 (.55)</td>
<td>.12 (.09)</td>
<td>-.15 (.23)</td>
<td>333</td>
</tr>
<tr>
<td>English</td>
<td>.29 (.21)</td>
<td>.00 (.11)</td>
<td>.00 (.02)</td>
<td>-.03 (.05)</td>
<td>304</td>
</tr>
</tbody>
</table>

Note: Entries are ordinary least squares coefficients, with heteroskedastic-consistent standard errors in parentheses.
* indicates p<.05, two-tailed.
Source: 1998 Franklin County, Ohio, survey

Generating the order effects on all of these issues is the one with the greater frequency in the sample (see Table 2).

On two issues both the positive and negative complements are significant predictors of order effects. On environmental cleanup, people with nonseparable preferences that are either positive complements or negative complements are more likely to respond that spending on environmental cleanup should go up if the question appears before the question on pollution regulations. If the question appears after the question on pollution regulations, both types of people are less likely to approve increases in spending on environmental cleanup. This result is explainable. A respondent who considers environmental spending and regulations to be negative complements might answer the spending question by saying that spending should increase. But if she first answers the regulation question, she might say that regulations should increase significantly, after which she will answer the spending question by saying that spending should decrease. A respondent who sees spending and regulations as positive complements and who answers the spending question first may say that spending should decrease. When she answers the regulation question first, she answers that regulations should increase and then answers that spending should increase as well since the two are positively related.

A similar pattern holds for defense spending since both types of nonseparable preferences are statistically significant. Also in this case, respondents with nonseparable preferences are split between those who prefer that the level of defense spending decline as social spending increases (budget balancers) and those who prefer that the level of defense spending increase as social spending increases (priority balancers).

The results lend further confirmation to the hypothesis that question-order effects are due to nonseparable preferences and not to a respondent's level of political information or to the activation of new considerations.
Further Implications of Nonseparable Preferences

Temporal Instability

Although the model in this article applies specifically to question-order effects, nonseparable preferences may explain other forms of instability in survey responses. Much of the literature on public opinion presumes that if people have well-formed preferences, their responses to survey questions should not change over time. Converse (1964) uncovered significant over-time instability in responses to a panel study that presented a sample of Americans the same set of issue questions in 1956, 1958, and 1960.17

The model of the survey response in this article can explain over-time instability in individual responses. If people have nonseparable preferences and we expect their survey responses to be stable over time, we must also expect that the status quo or people's perceptions of it are unchanged, not only on the issue under consideration, but also on any related issues. In a changing world, survey responses are likely to change as well, though changes in survey responses do not necessarily reveal changes in preferences.

Waves of a panel study presented close together (weeks, maybe months) are susceptible to question-order effects if respondents remember their responses to questions on previous waves of the panel. Similarly, if respondents recall the format of the previous survey, they can look ahead on the current survey and condition their responses not only on previous questions but also on subsequent questions, recalled from the previous wave of the survey.

Temporal shifts in survey responses may arise from sources other than nonseparable preferences. Respondents may gather new information that shifts their induced preferences. They might revise their interpretation of the categories of response provided by the interviewer in closed-ended questions. Nonseparable preferences may multiply the extent of these changes since a change in a respondent's information, perception, or preference on one issue will create a domino effect on her revealed preferences on other issues.

The Causes of Divided Government

Nonseparable preferences, and survey instruments designed to detect them, also clarify debates about the causes of divided government. Fiorina (1992) and Alesina and Rosenthal (1994) argue that moderate voters intentionally divide government between a legislature of one party and an executive of the other party in order to engineer moderate policy outcomes. Empirical research has rejected the hypothesis that voters who prefer divided government are most likely to split their tickets (Lacy 1998; Sigelman, Wahlbeck, and Buell 1997). These studies rely on answers to the following question from the ANES as an independent variable in vote choice models: "Do you think it is better when one party controls Congress; better when control is split between the Democrats and the Republicans; or doesn't it matter?" Of respondents who answered the question in 1992, 31 percent prefer one party control, 38.5 percent prefer divided government, 26.8 percent answer that it does not matter, and the remainder answer "don't know."

The ANES question on divided government cannot tap nonseparable preferences, and we cannot know what respondents are thinking when they answer the question. Some Democrats in 1992 may say that they prefer unified government because Democrats control Congress and they hope the president will be a Democrat. Republicans may say that they prefer divided government thinking that Congress will be controlled by the Democrats, therefore they prefer divided government since it implies a Republican president. Among Republicans (excluding Independents who lean Republican) in the 1992 ANES sample, 35 percent prefer unified government and 46 percent prefer divided government. Among Democrats, 37 percent prefer unified government; 34 percent, divided government. The differences between Republicans and Democrats in their preferences for unified and divided government suggest that the ANES question does not separate those respondents who prefer divided government unconditionally from those who prefer divided government only because their preferred party does not control Congress.

A voter who prefers divided government has nonseparable preferences for the candidates for the executive and the legislature. Suppose that the outcome (D,R) represents a Democratic president and a Republican majority in the House of Representatives. Four outcomes are possible in American national elections, holding the Senate aside: (D,D), (R,R), (D,R), and (R,D). A partisan Democrat would have the preference ranking (D,D) > (D,R) (or (R,D)) > (R,D) (or (D,R)) > (R,R), while a

17 While the public was seemingly fickle in its issue positions, partisanship remained fairly stable, exhibiting an over-time correlation slightly above 0.7. Krosnick and Berent (1993) demonstrate that the difference in over-time correlations between party identification and issues is due largely to differences in the survey instruments. Also see Feldman (1989).
partisan Republican would have the reverse ordering. Both preference orderings are separable: regardless of which party holds the legislature, a Democrat prefers a Democratic president and a Republican prefers a Republican president. Someone who prefers divided government would have a preference ranking such as \((D, R) > (R, D) > (D, D) > (R, R)\), which is completely nonseparable. If the president is a Democrat, the voter prefers a Republican Congress; but if the president is a Republican, the voter prefers a Democratic Congress. Similarly, if Congress is held by Republicans, the voter prefers a Democratic president; but if the Congress is held by Democrats, the voter prefers a Republican president. A voter who prefers unified government, such as \((D, D) > (R, R) > (D, R) > (R, D)\), also has completely nonseparable preferences. Some voters may have partially nonseparable preferences if their preference for who controls the House depends on who is president, but not vice versa. A necessary condition for Fiorina's or Alesina and Rosenthal's models of intentional ticket splitting to be correct is that voters must have nonseparable preferences for the executive and legislature.

To determine whether voters have nonseparable preferences for the president and Congress, I included the following questions on the 1994 Ohio Political Survey, a random-digit-dialing post-election telephone survey:

"If the president is a Democrat, would you prefer that the Democrats or the Republicans control Congress?"

"If the president is a Republican, would you prefer that the Democrats or the Republicans control Congress?"

Forty percent of respondents prefer Republican control of Congress regardless of who is president, and 23 percent prefer Democratic control of Congress regardless of the party of the president. Eighteen percent of respondents prefer divided government: if the president is a Democrat, they want a Republican Congress; but if the president is a Republican, they want a Democratic Congress. The remaining 19 percent of respondents prefer unified government. Since the respondents who prefer unified government and those who prefer divided government both have nonseparable preferences, over one-third of the 1994 Ohio sample has nonseparable preferences for control of the presidency and Congress.

Similar questions appeared on the 1998 Ohio Political Survey in a split-half design in which half of the respondents (\(N = 146\)) answered the following party-specific questions:

"When the president is a Democrat, do you prefer that the Democrats control Congress or the Republicans control Congress?"

"When the president is a Republican, do you prefer that the Democrats control Congress or the Republicans control Congress?"

The other half of the sample (\(N = 159\)) answered candidate-specific questions:

"With Bill Clinton as president, do you prefer that the Democrats control Congress or the Republicans control Congress?"

"Suppose Bob Dole were president. Then would you prefer that the Democrats control Congress or the Republicans control Congress?"

In the half-sample presented with the party-specific questions, 26 percent prefer that the Democrats control Congress regardless of who is president, 20.5 percent prefer that the Republicans control Congress, 25.3 percent prefer divided government, and 10.3 percent prefer unified government. The remainder of respondents answered "don't know" or "doesn't make a difference." In the half-sample that answered the candidate-specific questions, 26.4 percent prefer Democratic control of Congress regardless of who is president, 32.9 percent prefer Republican control, 18.2 percent prefer divided government, and 10.3 percent prefer unified government.

Similar questions about preference for control of the presidency conditional on which party controls Congress appeared on a 1996 national survey by Smith et al. (1999). In a multivariate model of vote choice in the 1996 presidential election, they find that voters who have nonseparable preferences are more likely to split their tickets, confirming Fiorina's hypothesis that voters intentionally divide government. A substantial percentage of voters have nonseparable preferences for control of the legislature and executive; most of these voters prefer divided government rather than unified government; and voters who prefer divided government appear to act on their preference in the voting booth.

The questions included on the 1994 and 1998 Ohio Political Surveys and the 1996 survey by Smith et al. (1999) demonstrate that the ANES question about divided government overestimates the percentage of people who prefer divided government. Some respondents actually prefer straight Republican or straight Democratic government, but they express a preference for divided government given that their preferred party does not already control at least one branch of government. In overestimating the prevalence of preferences for
divided government, the ANES question dilutes the extent to which people who truly prefer divided government might act on their preferences by splitting their tickets. Further research on the electoral causes of divided government should include questions similar to those in the 1994 and 1998 Ohio surveys or Smith et al.'s 1996 survey. Better yet, respondents should be asked to rank all possible combinations of partisan control of the executive and legislature (DD, DR, RD, and DR).

**Survey Design**

The theory and experiments in this article also have general implications for the design and implementation of surveys. The Franklin County survey probes opinion on ten issues. Each issue could be nonseparable from each of the other issues, leaving ninety different possible separability relations across the issues, not including the possibility that some sets of issues could be nonseparable from other sets. Since two conditional questions are needed to test whether each of the ninety relations is nonseparable, ten issues require 180 questions to measure the full extent of nonseparability. Such a large number of questions would take far too much time on most conventional surveys. By dividing the ten issues in the survey into five pairs, I simplified the survey design and reduced survey time in order to illustrate the simple point that people have nonseparable preferences on some pairs of issues. The Franklin County survey almost assuredly underestimates the extent and impact of nonseparable preferences in survey responses.

While I would not recommend that anyone conducting research on issue preferences examine all possible combinations of issues for evidence of nonseparable preferences, I do recommend that researchers include questions to detect nonseparable preferences when such preferences may have substantive, theoretical, or empirical implications for their research. An ideal survey probing preferences on a limited number of issues with a limited number of alternatives would ask respondents to rank all possible outcomes.\(^1\)

When it is not possible to ask respondents to rank all possible outcomes, researchers should give respondents foreknowledge of the questions in a survey. Question-order effects arise in survey responses when respondents do not know the content of upcoming questions. Without such knowledge, respondents may offer responses on some questions conditional on their beliefs about the status quo on other issues not probed in the survey. As respondents answer subsequent questions, they may want to revise their answers to previous questions. Allowing respondents foreknowledge of the questions will allow them to reveal their most preferred set of outcomes across all issues.

In several experiments in which I presented Ohio State University students with questions similar to those in the Franklin County survey, aggregate-level question-order effects disappear when respondents hear the entire questionnaire before answering questions. To eliminate question-order effects and other response effects, respondents should be allowed to see or hear the entire questionnaire. Internet surveys and face-to-face interviews may prove better than telephone surveys for minimizing response effects.

**Conclusions**

Some readers may object to the assumptions or results of the model in this article since it is a significant departure from the conventional wisdom about the cognitive capacities and motivation of the average survey respondent. Yet whatever one thinks of the assumptions under the model, it generates a prediction about question-order effects that no current theory seems capable of explaining. The prediction—that nonseparable preferences produce question-order effects—is confirmed empirically at the aggregate and individual levels. The model also predicts the very phenomenon—unstable survey responses—that researchers evince to dismiss the assumption that people have fixed and well-formed preferences. If a model that assumes people have fixed preferences is able to generate the result that has been so often declared as evidence undermining the assumption of fixed preferences, then response instability cannot prove or even suggest that respondents lack fixed preferences.

Limitations in the cognitive capacity—such as short-term memory—of survey respondents can be incorporated into the model without changing its predictions. Some respondents may have limited memories, in which case question-order effects would appear only for issues close together in the survey. One could add an assumption to the model that only issues within \(t\) places of each other in the survey generate question-order effects; beyond \(t\), a respondent's memory of previous questions fades. The value of \(t\) probably varies across respondents, thus some respondents will exhibit question-order effects only for adjacent pairs of questions while others

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\(^1\) For an example of such a survey conducted on the Internet, see Lacy and Niou (2000).
may exhibit question-order effects across an entire survey. The empirical results presented in this article focus on question-order effects only on issues that immediately precede or succeed each other since most studies of question-order effects have adopted such an approach. Further research should examine how far apart issues can be in a survey before the question-order effect vanishes.

Nonseparable preferences are an important component of public opinion that prevailing theories of survey response do not incorporate and that most existing surveys do not measure. By introducing new survey instruments to detect nonseparable preferences, I find that large segments of the public have nonseparable preferences on many important issues of public policy. Such preferences reveal a previously unrecorded level of sophistication and complexity in public opinion. Instead of adopting the well-established though not well-tested belief that the world is too complex for survey respondents to have stable or well-formed preferences, we should instead provide survey respondents with new ways to express the complexity of their preferences.

Not only are nonseparable preferences common, but they also explain one of the most perplexing problems in survey research: part-part question-order effects. While many scholars have offered explanations of question-order effects, the explanations do not predict a priori which issues will generate or be susceptible to order effects. A model of thesurvey response that incorporates nonseparable preferences predicts that aggregate- and individual-level order effects will occur when people have nonseparable preferences on an issue.

A new test of question-order effects at the aggregate and individual levels provides strong support for the model. Aggregate-level question-order effects appear only on issues for which large segments of the survey sample have nonseparable preferences. Individual-level shifts in survey responses due to question-order are better explained by nonseparable preferences than by a respondent's level of political information.

Social scientists should determine whether people have separable or nonseparable preferences in a variety of contexts. For example, further study of the effects of nonseparable preferences may prove critical to contingent valuation surveys in economics and psychology. Nonseparable preferences may explain much of the political behavior that is often attributed to irrationality or low information. Eventually we may also seek to explain who has nonseparable preferences and why. Are the politically sophisticated or well educated more likely to have nonseparable preferences? Are committed partisans, whose parties must weave together diverse groups of voters, more likely than independents to have nonseparable preferences? These are questions we will be able to answer only after survey researchers make more extensive use of survey instruments that tap the complexity of public opinion.

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Appendix A
Survey Questions

The following four blocks of questions, along with the tax and crime-spending block described in the text, appeared in random order in the survey. Questions (1) and (2) in each block were randomized. At the beginning of the survey, interviewers instructed respondents to say "no opinion" if they did not have an opinion on an issue.

AFDC Programs and Abortion

(1) Do you think that abortion should be outlawed or kept legal? Follow-up: If outlawed, even in cases of rape or incest? If kept legal, in all cases or only in special cases such as rape or incest?

(2) Do you think the amount of money the government provides for low-income women and their children should go up, go down, or remain at current levels? Follow-up: Go up (down) a lot, somewhat, or a little?

If the government outlawed all abortions, then would you want the amount of money the government provides for low-income women and their children to go up, go down, or remain at current levels? Same follow-ups as question (2).

If the government keeps abortion legal, then would you want the amount of money the government provides for low-income women and their children to go up, go down, or remain at current levels? Same follow-ups as question (2).

If the government significantly reduced the amount of money it provides for low-income women and their children, then would you want abortion outlawed, or kept legal? Same follow-ups as question (2).

If the government significantly increased the amount of money it provides for low-income women and their children, then would you want abortion outlawed, or kept legal? Same follow-ups as question (1).
Spending to Clean up Environment and Pollution Regulations

1) Do you think the amount of money the U.S. spends cleaning up the environment should go up, go down, or remain at current levels? Follow-up: Go up (down) a lot, somewhat, or a little?

2) Do you think the amount of pollution industries are allowed to put out should go up, go down, or remain at current levels? Follow-up: Go up (down) a lot, somewhat, or a little?

If the U.S. spends a lot more money cleaning up the environment, then would you want the amount of pollution industries are allowed to put out to go up, go down, or remain at current levels? Same follow-ups as question (2).

If the government lets industries put out a lot more pollution, then would you want the amount of money the U.S. spends cleaning up the environment to go up, go down, or remain at current levels? Same follow-ups as question (2).

If the government lets industries put out a lot less pollution, then would you want the amount of money the U.S. spends cleaning up the environment to go up, go down, or remain at current levels? Same follow-ups as question (1).

Immigration and English as the National Language

1) Every year the U.S. government allows a certain number of immigrants to enter the country legally. Should we allow more immigration into the U.S. each year, less immigration, or keep immigration at current levels? Follow-up: A lot more (less), somewhat more (less), or a little more (less)?

2) Do you think that the U.S. government should or should not adopt English as the national language?

If the U.S. government significantly increased the number of legal immigrants it allows to enter the country each year, then would you think the government should or should not adopt English as the national language?

If the U.S. government significantly reduced the number of legal immigrants it allows to enter the country each year, then would you think the government should or should not adopt English as the national language?

If the U.S. government adopts English as the national language, then would you want the government to allow more immigration into the U.S. each year, less immigration, or keep immigration at its current level? Same follow-ups as question (1).

If the U.S. government does not adopt English as the national language, then would you want the government to allow more immigration into the U.S. each year, less immigration, or keep immigration at its current level? Same follow-ups as question (1).

Social Spending and Defense Spending

1) Do you think the U.S. should spend more money on social programs, less money on social programs, or continue spending the same amount it does now on social programs? Follow-up: A lot more (less), somewhat more (less), or a little more (less)? If a respondent asked which social programs, interviewers answered "Education, job training, medical research."

2) Do you think the U.S. should spend more money on national defense, less money on national defense, or continue spending the same amount it does now on national defense? Follow-up: A lot more (less), somewhat more (less), or a little more (less)?

If the U.S. significantly reduced the amount of money it spends on national defense, then would you want the U.S. to spend more money on social programs, less money on social programs, or continue spending the same amount it does now on social programs? Same follow-ups as question (1).

If the U.S. significantly increased the amount of money it spends on national defense, then would you want the U.S. to spend more money on social programs, less money on social programs, or continue spending the same amount it does now on social programs? Same follow-ups as question (1).

If the U.S. significantly reduced the amount of money it spends on social programs, then would you want the U.S. to spend more money on national defense, less money on national defense, or continue spending the same amount it does now on national defense? Same follow-ups as question (2).

If the U.S. significantly increased the amount of money it spends on social programs, then would you want the U.S. to spend more money on national defense, less money on national defense, or continue spending the same amount it does now on national defense? Same follow-ups as question (2).

Information Questions

"Which party would you say is more liberal—the Democrats, the Republicans, or are you not sure?"
“Which party has a majority of seats in the U.S. House of Representatives—the Democrats, the Republicans, or are you not sure?”

“Do you happen to know what job or political office is now held by Al Gore?”

Appendix B
Proof of Result

Proof: Drop i. For sufficiency, if i’s preference for issue j is nonseparable from issue or set of issues k, then there exists an $o_k$ and $o'_k$ such that $(o_j, o_k) \succsim_i (o'_j, o_k)$ and $(o_j, o'_k) \succsim_i (o_j, o_k)$, which, by Assumption 3, implies $(r_j, r_k) \succsim (r'_j, r_k)$ and $(r_j, r_k) \succsim (r, r'_k)$. If $q_k < q_j$, then $r_j = r(q_j l r_k)$. If $q_k > q_j$, then $r_j = r(q_j l r'_k)$. Maximizing this function with respect to $o_j$, dropping i, and rearranging terms:

$$o_j l o_k = \theta_j - (a_{jk}/a_{kk})(o_k - \theta_k),$$

which is i’s constrained ideal point on issue j. Person i’s response on j, conditional on her beliefs about the status quo on k, substituting for $o_k$, is:

$$r(q_j l s_k) = \theta_j - (a_{jk}/a_{kk})(s_k - \theta_k)$$

But i’s response on j conditional on a previous response of $r'_k$ to k, substituting $r'_k$ for $o_k$, is:

$$r(q_j l r'_k) = \theta_j - (a_{jk}/a_{kk})(r'_k - \theta_k)$$

If preferences for j and k are nonseparable, then $(a_{jk}/a_{kk})$ is nonzero. If $(s_k - \theta_k) (r'_k - \theta_k)$ and if $(a_{jk}/a_{kk}) = 0$, then $r(q_j l s_k) = r(q_j l r'_k)$. For necessity, if the respondent’s preferences are separable, then $(a_{jk}/a_{kk}) = 0$ and $r(q_j l s_k) = r(q_j l r'_k)$.

References


